Reducing Abortion Rates Without Restricting Legal Access to Abortion: Evidence from Comparative Analysis of Relevant Policies and Demographic Indicators in 15 Post-Soviet Countries and Adaptive Agent-Based Modeling of Unintended Pregnancies

by

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A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved February 2023 by the
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ARIZONA STATE UNIVERSITY

May 2023

ABSTRACT

Abortion is a controversial topic internationally. Most current debates about abortion concern when, if at all, it should be legal. However, researchers have shown many times that after an abortion ban, maternal and infant mortalities rise significantly, as women who seek out abortions do so regardless of abortion legality. So, is it possible to reduce abortions in a population without delegalizing abortion and, if so, how? Why do some countries have higher abortion rates than others in the presence of the same law?

This dissertation answers both questions. First, I present historical evidence in the first comprehensive comparative analysis of all 15 post-Soviet countries, which have very similar abortion laws originating from the Union of Soviet Socialist Republics (USSR). Second, I use those findings to build the first agent-based model (ABM) of unintended pregnancies in a hypothetical artificial population.

USSR was the only country in the world to complete its demographic transition through abortion instead of modern contraception, and the Soviet government passed the first law in the world to allow abortion upon request in 1920. After the USSR dissolution in 1991, post-Soviet countries maintained very similar abortion laws, but had very different abortion rates for most years. Analysis of fertility data from post-Soviet countries shows that the prevalence of some specific contraceptive methods, namely the rhythm method ($r = 0.82$), oral pill ($r = 0.56$), and male condom ($r = 0.51$) are most strongly correlated with high abortion rates, and that sex education is a factor that reduces the rates in otherwise similar countries ($p = 0.02$).

The ABM shows that even basic sex education results in fewer abortions than no sex education or abstinence-based sex education ($p < 0.01$). In scenarios without sex

education, basic quality of post-abortion contraceptive counseling (PACC) is better than no PACC or low-quality PACC at reducing abortions ($p < 0.01$). Still, the higher the quality of sex education or PACC, the fewer abortions in the artificial population. The ABM is adaptive and policy makers can use it as a decision-support tool to make evidence-based policy decisions regarding abortion, and, potentially, other sociobiological phenomena with some adjustments to the code.

DEDICATION

I dedicate this dissertation and all the hard work completed for it to my late grandmother, Dr. Farida Rakhimovna Tantasheva, who was an Associate Professor of Organic Chemistry at Kazan State University (Kazan, Russia). She retired to raise me shortly after my birth and never got the chance to complete her second doctorate degree. Professor Tantasheva passed away before I graduated from high school, so I hope this dissertation adds a small bit to her huge legacy.

ACKNOWLEDGMENTS

This work would have never been possible without the support of the most incredible people I have been lucky enough to have in my life.

First, I would like to thank my co-chairs Dr. Jane Maienschein and Dr. Monica Gaughan. Jane, thank you so much for being an amazing mentor in so many ways for almost seven years now, starting from when I was just a tiny undergrad. Monica, thank you so much for welcoming me with open arms in 2018 and always being so supportive of all my choices. I have learned so much from you both and I am incredibly grateful for all the support, advice, and care you have given me over the years.

Next, I would like to thank my wonderful committee members – Dr. Manfred Laubichler and Dr. Karin Ellison. Thank you so much for guiding me through some very complex principles and all university policies. I look forward to continuing similar work under your guidance in the future, Manfred.

Additionally, I thank Jessica Ranney and Kris Johnson for being some of the most caring and supportive people I have met during my graduate studies and for helping me with all miscellaneous bureaucratic processes and random life questions along the way.

Most importantly, I thank my family for their support. I thank my late grandfather Dr. Evgeney Berdnikov, my parents, Dr. Liliya Ziganshina and Dr. Ayrat Ziganshin, and my brother, Dr. Bulat Ziganshin, for always setting incredible examples for my work ethic and career choice. I thank my husband, Klaus Lienhard, for always supporting me emotionally and carrying the financial burden of our household while I was completing this degree. I cannot thank my British Aunt, Dr. Tilli Tansey enough, as I would not have been able to come to ASU in 2014 in the first place without her help.

Last, but definitely not the least, I would like to acknowledge and thank our incredible pets. I thank our late cats Cyla and Kal, who have made me a much better and kinder human being and have helped me to relax and unwind after long days of research and writing. I thank our cat Daisy for teaching me love with healthy boundaries, and I thank our newest cat Professor Noodle, PhD, appropriately named for all the cheerfulness and happiness he brought to our household during my graduate studies.

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INTRODUCTION

A Controversial Tale as Old as Historical Records

Induced abortion has long been a controversial topic internationally, which makes it an ever-relevant research topic, especially in 2022 in the United States, after the *Dobbs v. Jackson Women's Health Organization* Supreme Court case that jeopardized many women's right to an abortion upon request (*Dobbs v. Jackson* (2022)). Induced abortion is the intentional termination of pregnancy by surgical means, like vacuum aspiration, or medical means, like misoprostol and mifepristone. Abortion can also be spontaneous, which is when the pregnancy ends in a non-viable embryo or fetus for any reason. Spontaneous abortion is often referred to as a miscarriage. I do not discuss spontaneous abortion in this project, which focuses specifically on intentional termination of pregnancy.

The use of induced abortion to control a woman's fertility is almost as old as the written history of (wo)mankind. There are extensive records of abortions in ancient Greece and Rome as a means of controlling population growth (Dickison, 1973). In ancient times, most abortions happened via herbal tonics instead of surgery (Depierri, 1968; Flemming, 2020). Midwives or educated laypeople, mostly women, used those herbal tonics and even performed occasional surgical abortions on other women (Flemming, 2020).

One of the first written records of surgical induced abortion dates to 2737 B.C. in one of the oldest Chinese medical books (Joffe, 2009). Another record from 500-515 B.C. describes a similar, but much more detailed, procedure on Chinese royal concubines (Glenc, 1974). Glenc argues that humans performed or attempted surgical abortions for thousands of years before that time and this specific procedure was only recorded for future reference of royal doctors (Glenc, 1974).

Since then, abortion procedure has evolved for both surgical and non-surgical abortions. In the twenty-first century, the most popular abortion method is vacuum curettage, also called vacuum aspiration, uterine aspiration, suction curettage, uterine curettage (Stubblefield, Carr-Ellis & Borgatta, 2004). This method requires an experienced gynecologist, a hospital bed, analgesics and antimicrobial agents, and multiple surgical instruments. A medication abortion, in contrast, only requires a physician who can assess the patient and prescribe the medication, plus two pills a woman must take orally to complete the abortion – mifepristone and misoprostol (MacNaughton et al., 2021). The biggest downside of medication abortion is that it is only safe until about 12 weeks of gestation, while the vacuum curettage is safe both before and after 12 weeks (Stubblefield et al., 2004; MacNaughtonet al., 2021).

Another way in which abortion delivery has evolved concerns its financial context. Midwives and all other early abortion providers almost always charged for their services, but the amount varied greatly among different providers based on their location and target clientele (Glenc, 1974; Joffe, 2009). In the modern times, abortion happens within the context of the healthcare system of a country. The price of abortion depends on the way the healthcare system is financed, as physician's time and equipment account for most of the surgical abortion cost, while mifepristone and misoprostol pills account for most of the medication abortion cost. Most countries in the world do not subsidize the cost of surgical abortion through their healthcare systems, so the cost largely falls on the patient. However, most countries also include mifepristone and misoprostol in their essential drug list (all modeled after the World Health Organization list), which means that the government subsidizes some cost of those drugs and stocks them to guarantee the supply to all citizens (Purgato & Barbui, 2012; WHO, 2022).

Throughout time, there are lots of records of philosophers, physicians, politicians, and other thinkers discussing the morality of abortion and arguing against it or in favor of it (Joffe, 2009). Such arguments and polarization of abortion continue to 2022 and show that people still are keenly interested in abortion and its regulation. While there are many arguments about abortion, the most prevalent one is about its legality – should abortion be legal, and if so, when and for what reasons? This might seem like quite a strange debate for a medical procedure, as individual doctors usually govern the availability of other procedures for their patients. **Over time, abortion has transitioned from a practice for women that was governed by women to a practice for women governed by lawmakers, who were and still are mostly men.**

There are many different reasons that people hold different beliefs about abortion, but many point to religious texts as their main source of arguments against abortion being legal and widely available. Most religious leaders oppose abortion, some more extremely than others. For example, the Catholic Church most actively lobbies against abortion globally (Noonan, 1967), but their arguments often vary by country and the Catholic Church did not begin explicitly arguing against abortion of all embryos and fetuses until the middle of the nineteenth century (Dillon, 1996; Maienschein, 2016). Christian Orthodox Church does not view abortion as a permissible form of contraception either (Kapor-stanulovic & Beric, 1983). Islam views abortion as permissible only if the pregnancy endangers a woman's life (Albar, 2001; Al-Matary & Ali, 2014). Judaism's view of abortion is similar to that of Islam, and some bioethicists even came up with a hierarchical list of various medical and social reasons that would make abortion permissible in individual cases in Judaism (Khorfan & Padela, 2010).

The prevalence of religion, especially various forms of Christianity, among lawmakers in the 1800s coincided with emergence of many abortion-limiting laws globally (Kapor-stanulovic & Beric, 1983; Khorfan & Padela, 2010; Szelewa, 2016). Interestingly, some of the earliest abortion-limiting laws date back to ancient Egypt and punished the woman seeking an abortion with death (Joffe, 2009). However, historians agree that such regulations were rarely enforced, as many women had abortions in secret and obtaining evidence of an abortion was difficult (Glenc, 1974; Dickison, 1973). Most countries had introduced highly specific abortion-restricting laws by the end of the nineteenth century; as of 2022, many countries in the world still do not allow abortion, at least in most cases (Singh et al., 2018).

While getting an illegal abortion is not punishable by death in most countries now, laws that limit abortion significantly undermine women's rights to their own bodies and can even put their health in danger. Illegal abortions, especially for low-income women, often happen in unsanitary and unsafe conditions, which leads to high rates of infection, and, sometimes, even death (Richards et al., 1985). Countries with total abortion bans have some of the highest maternal and infant mortality rates and countries that suddenly ban abortions often see a spike in those same mortalities in the years immediately after the ban (Popov, 1991; Miroshnichenko & Styazhkina, 2012; Singh et al., 2018). Women who cannot get an abortion are left with a life-long responsibility that they may not be financially, emotionally, or physically ready to handle. Another effect may be increased rate of infant mortality for various reasons, the most troubling of which is infanticide (Popov, 1991; Miroshnichenko & Styazhkina, 2012).

Many lawmakers globally openly speak about their intention to reduce the number of abortions in the populations they govern to preserve “unborn life” and promote population growth. The most common method they use for that is restricting legal access to abortion, for which success is often measured by the recorded abortion rate in a population, which is the number of abortions per year per 1,000 women of reproductive age. However, that only reduces the official abortion rate that a designated governmental agency records. Data on illegal abortions, and even abortions performed in private clinics, are often lacking completely or only partially available via independent surveys (Henshaw et al., 1999; Hodes, 2016).

Time and time again, researchers have showed that women seek out abortions regardless of whether abortion is legal, as it is the *only* form of birth control after the pregnancy has occurred (Sadvokasova, 1969; Richards et al., 1985; Henshaw et al., 1999; Avdeev & Troitskaya, 1999; Sakevich, 2001; Rossier, 2003; Hodes, 2016).

If lawmakers want to reduce the number of abortions in a specific population and researchers have shown that banning abortion does not reduce its prevalence in any population, the logical legislative focus should be on reducing the number of *unintended pregnancies*, as those are the leading cause of induced abortions.

The Biology of Unintended Pregnancy

For an unintended pregnancy to happen, several factors with small probabilities must line up perfectly one after another. Specifically:

1. A woman must be in the reproductive age range (usually 15-49 years old)
2. A woman must be ovulating and have a healthy menstrual cycle
3. A woman must have vaginal intercourse with a man
4. Intercourse must be unprotected, or contraception must fail

Given the logic above, a woman who meets criteria 1 and 2 has two primary options to prevent an unwanted pregnancy:

1. Be abstinent and not have sex
2. Use highly effective contraception

While abstinence is by far the most effective way of preventing unwanted pregnancies, it is highly unrealistic to expect all women who do not wish to get pregnant to never have sex in any one country in the world. Therefore, the solutions worldwide must focus on promoting high prevalence of effective contraception. Contraception can be of two types – traditional and modern.

Traditional contraception includes methods like fertility tracking and withdrawal. Both of those methods are some of the least effective ways of preventing pregnancy, as their effectiveness rates are below 80% (Singh et al., 2018). The upside of traditional contraception is that it is free and can be used at any time, as long as the person knows about the existence of those methods and the required technique.

Modern contraceptives are more effective, especially when used correctly. Some modern contraceptives like oral pills must be taken daily; others like condoms must be used every time a woman has intercourse; and still others such as patches, injections, IUDs, or implants are long-term solutions that women can "get and forget" for various periods of time between a month and ten years (Singh et al., 2018).

Using highly effective contraception decreases the number of unintended pregnancies, but it also reduces the total fertility rate in a population. Total fertility rate is the average number of children a woman in a given country has throughout her reproductive years given prevailing age-specific birth rates (United Nations, 2022; Vishnevskiĭ, 2006). Most countries in the world observed a change from high fertility rates to low fertility rates in the twentieth century due to increased use of modern contraception, which is called a demographic transition (Vishnevskiĭ, 2006).

There was only one country in the world that completed this kind of demographic transition through the use of induced abortion instead of modern contraception – Union of Soviet Socialist Republics, hereafter USSR. During its existence (1922-1991), USSR was the largest country in the world by land, and according to the 1989 Census, it was the third most populous country in the world that accounted for over 286 million people, which was 9% of the world population at the time (US Bureau of the Census, 1991). USSR consisted of fifteen republics (figure 0.1).

Figure 0.1. Map of the USSR with labeled republics (source and credit: Wikimedia Commons)

Abortion and Society

USSR was the first country in the world to legalize abortion upon request of a woman in 1920[1]. For context, most European countries did not allow abortion upon request until the 1960s. Shortly after 1920, abortion became the primary method of birth control in USSR (Avdeev et al., 1995). Abortions were free, and there were many trained physicians and lots of hospital beds but very few available modern contraceptives. Furthermore, since it was taboo to discuss sex, knowledge about traditional contraception was generally low. (Avdeev et al., 1995; Jacobson, 1990; Esther, 1991).

[1] USSR was officially formed and got its name in 1922. In 1920, the law only really applied to Russia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. Belarus, Ukraine, Moldova, Armenia, Azerbaijan, and Georgia joined in 1922 (thus the formation of USSR), but Estonia, Latvia, and Lithuania did not until 1940.

While there were several changes in the general abortion legislation for the USSR throughout its existence, the Union dissolved into fifteen separate countries with the same abortion law in 1991. At that time, the initially shared law allowed abortion upon request until 12 weeks, in social circumstances until 28 weeks, and at any time during pregnancy for medical reasons (USSR Ministry of Healthcare, 1987).

After the dissolution of the USSR, the governments in each of the newly independent countries had to make a choice of whether to keep or change the Soviet legislation for every issue, including abortion. Notably, most of them kept the existing legislation for abortion, with some small changes. The main difference in abortion legislation in these countries is number of special circumstances, with which abortion can be performed after 12 weeks. Different countries define special circumstances differently, but medical conditions, pregnancy as a result of rape, being incarcerated, or having an incarcerated partner are the most common special circumstances.

The fifteen post-Soviet countries fall into four distinct geographic regions (figure 0.2). Those regions are vastly different from one another ethnically, culturally, and economically. Even the countries in each of those regions have evolved in unique ways since the dissolution of USSR. This means that the fifteen post-Soviet countries can be used as case studies on abortion, as they emerged from almost seventy years of shared history and law on abortion but have since changed their approach to fertility control.

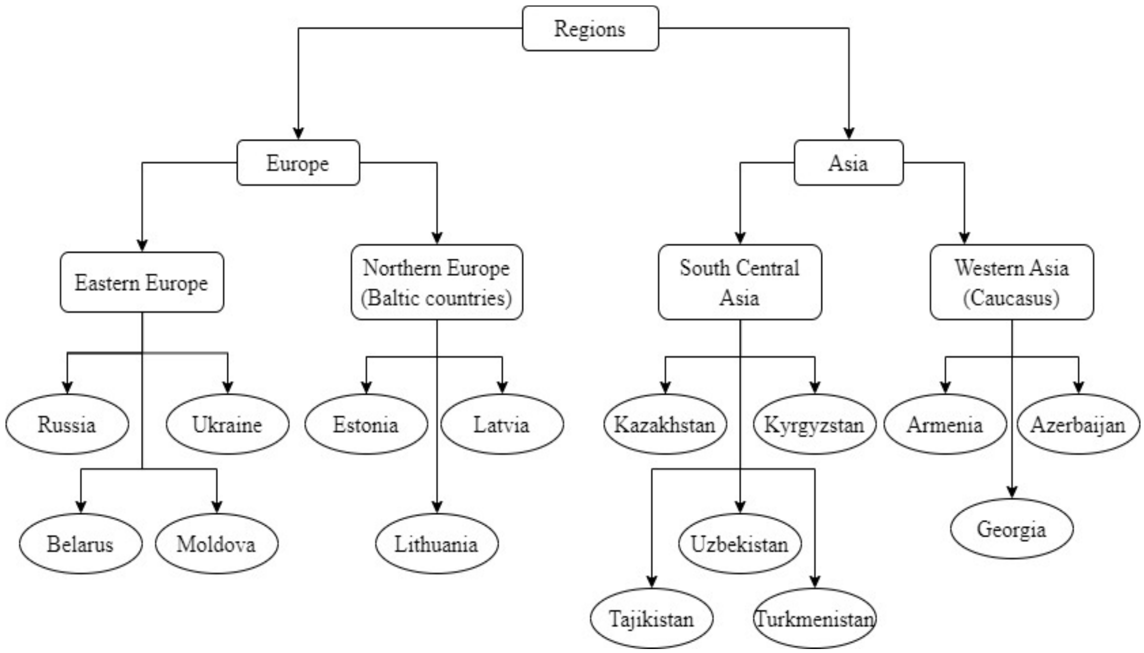

Figure 0.2. Post-Soviet countries and their respective geographic regions

Given the similarity in legislation on abortion, we might expect similar abortion rates in all post-Soviet countries. Yet this is not true. Although each of those countries has seen a dramatic decline in abortion rate and increase in contraceptive use since the dissolution of the USSR, Russia maintains the highest abortion rate for most years since 1991 (figure 0.3) and researchers insist that abortion is still a prevalent form of birth control in Russia without explaining why that is the case (Denisov et al., 2012; Sakevich & Denisov, 2014). The United Nations, hereafter the UN, reports reveal that abortion rates vary significantly among post-Soviet countries, with the highest being 37.4 per 1,000 women of reproductive age in Russia and lowest being 5.6 in Uzbekistan (United Nations, 2022). Russia has the highest abortion rate among all post-Soviet countries for most years between 1991 and 2018 and has one of the highest abortion rates in the world.

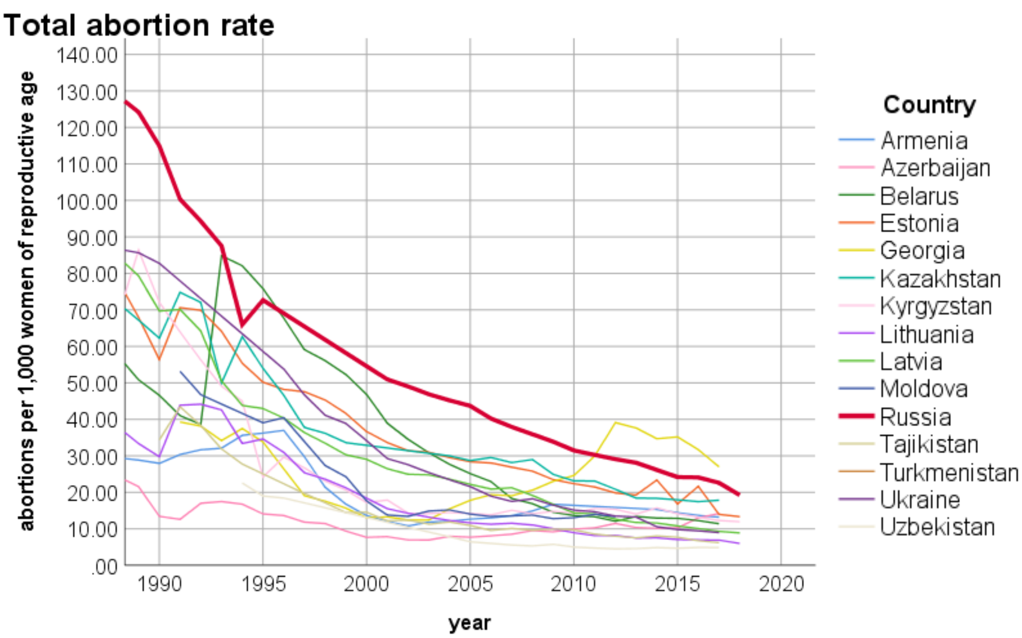

Figure 0.3. Total abortion rate in post-Soviet countries over time before and after dissolution of the USSR (Data source: UN *Demographic Yearbooks* 1992–2018).

The formerly Soviet countries have clearly documented different abortion rates.

The Driving Questions

This is our question: **<u>Given the common origin of national policies on abortion in all post-Soviet countries, why does Russia have the highest abortion rate for most years between 1991 and 2018, compared with the other 14 post-Soviet countries?</u>**

As most induced abortions are results of unintended pregnancies and the UN and the World Health Organization, hereafter the WHO, consider access to abortion a fundamental reproductive health right (United Nations, 1995; World Health Organization, 2014), a larger, and more important question for the global community emerges – **<u>How is it possible to reduce the abortion rate of a population without restricting access to abortion?</u>**

Abortion is a personal choice that a woman can make during her pregnancy. When a certain number of individual women in a country make that choice in a calendar year, the collective number of those abortions becomes a regularly reported statistic – abortion rate of that year for that country. Therefore, my first question has two levels: the micro-level of individual decision to get an abortion and a macro-level of reported abortion rate in the population. Additionally, abortion as a practice exists within the scopes of the healthcare and the legal systems of any given country, so an analysis of the healthcare system and abortion law in each country is relevant. The second question builds on the information I learn from answering the first one, as data show that all post-Soviet countries reduced their abortion rates without completely banning abortion.

Dissertation Roadmap

Below is the outline of the rest of this dissertation. In chapter 1, I discuss my methods: systematic and general literature review, data collection and analysis, and agent-based modeling. Together, literature review and data analysis helped me answer my first driving question and I used agent-based modeling as a thought experiment to answer my second driving question. In chapters 2, 3, and 4 I present the findings from the literature review as a historical narrative that describes the evolution of the healthcare system and abortion laws in USSR, and later in Russia and all other post-Soviet countries. Throughout these sections, I provide ample evidence that abortion laws in post-Soviet countries are not different enough to account for the differences in their abortion rates, so Russia's comparatively high abortion rate is not due to abortion being legal and widely available in state-sponsored and private clinics, as some politicians suggest (Krutov & Leonov, 2005).

Chapter 5 focuses on the comparison and analysis of official data on abortion and other key fertility indicators (marriage, fertility rates, and contraception) in post-Soviet countries as reported by the UN. These comparisons allow me to quantify the changes in marriage, contraception use, and live births in each post-Soviet country after the dissolution of the USSR to objectively describe and compare the evolving fertility behavior of women in each of the post-Soviet countries, while taking into consideration regional, cultural, and economic differences of those countries.

The analyses of changes in fertility indicators allow me to test a hypothesis for my first driving question: **Women in Russia have more abortions than women in other post-Soviet countries, as they primarily use less effective contraception than women in other post-Soviet countries. Why? I hypothesize that it is because women in Russia have lower fertility awareness and use unreliable contraception, as there is no sex education in schools, aspects of which most of the other post-Soviet countries have now integrated into their curriculum.**

Chapter 6 is about agent-based modeling of unintended pregnancies in a hypothetical artificial population. There I describe how I built an agent-based model, hereafter ABM, of a hypothetical society of women, all of whom wish to avoid a pregnancy and explore the initial results of the ABM as a thought experiment to answer the second driving question of this dissertation.

Finally, the conclusion to this dissertation summarizes all findings from all chapters and answers both driving questions of the dissertation.

Project Significance

Researchers have asserted many times that women in Russia use abortion as their main form of birth control even after the dissolution of the USSR, but they do not provide reasoning for why that happens (Karpov & Kääriäinen, 2005; Sakevich & Denisov, 2014). Additionally, no prior study has compared Russia to all other post-Soviet countries, some of which have very low abortion rates, to find systemic differences among them. Multiple statistical models have explored the biological probability of pregnancy in a diverse society, but no project has looked at abortion-related decision making yet and no ABMs on abortion or unintended pregnancies exist, to my knowledge.

This project provides the first comprehensive review of abortion law in USSR and all fifteen post-Soviet countries and the first adaptive ABM on abortion. Overall, my research shows that a high abortion rate of a population is not correlated with wide legal access to abortion and that there is much more that goes into the abortion rate reporting statistic. High abortion rates are due to high rates of unintended pregnancies, which in turn happen from high use of unreliable contraception or no use of contraception at all.

The ABM brings together standard fertility calculations, my own quantitative and qualitative findings about fertility in USSR and in post-Soviet countries, and network information diffusion (Stonedahl & Wilensky, 2008) to show how individual knowledge and decisions about one's own fertility and contraception, as well as various social norms and dynamics, may lead to high or low abortion rates. Modeling of abortion decisions in an artificial society is helpful, as it removes the emotionally charged debate about morality or ethics of abortion in real life.

My ABM shows that sex education and use of highly effective contraception reduce unwanted pregnancies and, thus, abortions, so they should be the focus of policy discussions on fertility control instead of abortion legality. The model is abstract enough that it can be applied to any population to test out policies related to reducing abortion rate of that population without restricting legal access to abortion.

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1: METHODS

In this chapter I outline most of the methods used for this dissertation. The methods fall under four broad categories – literature review, data collection, data interpretation, and agent-based modeling. In this chapter I discuss all methods except for the agent-based modeling, as those methods belong in chapter 6, where I discuss the model in detail, as it is the primary product of my dissertation. Agent-based modeling (ABM) is a way of connecting the assumptions about micro-level behaviors to macro-level outcomes (Smith & Conrey, 2007), which is why it is perfect for my project of connecting individual factors that lead to an unintended pregnancy to a resulting population-level abortion rate.

Literature review allowed me to find and analyze abortion laws in USSR and post-Soviet countries and understand the structure of their healthcare systems. Data collection and interpretation allowed me to make a series of graphs to visualize the differences and similarities in fertility behavior among these countries over time and make sense of all that data to compare the fertility behavior in post-Soviet countries quantitatively. Below are the specifics for each method.

Literature Review

I performed two forms of literature review – systematic (or structured) and general (or unstructured). Researchers most commonly use systematic review in medicine to compile the results of multiple studies on the same topic to provide a summary of the best clinical evidence for treatment of a specific condition (Gopalakrishnan & Ganeshkumar, 2013). Still, systematic reviews hold a lot of weight in every scientific field, as they summarize the findings on a certain topic and provide an analysis of reliability of published and unpublished work on that topic (Borrego et al., 2014).

The downside of systematic literature review is that it may not be appropriate for some studies and the systematic methodology may overlook the nuance in some documents (Boell & Cecez-Kecmanovic, 2015). This is where general literature review becomes important. General literature review is more common in disciplines like history and primarily relies on the researcher's familiarity with the field and use of appropriate search queries and databases (Knopf, 2006).

General literature review. I used general literature review to search for relevant peer-reviewed journal articles and news articles. I read items in both Russian and English to gain a balanced understanding of the issue. I used this method to learn about Soviet abortion laws, sex education, and contraceptive practices in post-Soviet countries. I also used this method to supplement and contextualize the findings from my other methods. For research articles, the databases I used were Google Scholar, Web of Science, PubMed, and eLIBRARY (Russian academic database). For news articles, I used Washington Post, The New York Times, Коммерсантъ [Kommersant], Комсомольская Правда [Komsomolskaya Pravda], and any other news article with a listed author and publication date on the first three pages of Google.

The approach to the general literature review was mainly exploratory, so the search strings were simple and broad. For example, below are two identical search strings for abortion motivators in English and Russian, which was one of many searches I performed.

For Google Scholar, PubMed, and Web of Science:

((“abort*”) OR (“pregnan* AND terminat*”) OR “induced abortion”) AND (“decision*” OR “reason*” OR “cause*” OR “motiv*”)

For eLIBRARY:

(“аборт*” OR “прерыв* беременност*”) AND (“причин*” OR “повод*” OR “фактор*” OR “мотив*”)

As there is no database of laws in USSR, general literature review was the best option to learn about abortion laws before 1991. Specifically, I first read news and encyclopedia articles about abortion in USSR, then read peer-reviewed academic articles and looked for titles of laws or acts that were relevant to abortion in those articles. I then searched the titles of those specific laws on Google. Most laws list a document that the existing law makes invalid. Conversely, when a law is no longer valid, it usually lists the name of the new law that made it invalid. I used that information to find as many relevant documents as I could to get the most complete idea of abortion legislation in USSR.

Systematic literature review. I used systematic review of literature for two main topics – healthcare systems comparison in post-Soviet countries and comparison of all abortion-related laws in post-Soviet countries. These reviews loosely follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, which are considered the gold-standard for systematic reviews (Page et al., 2021). I could not strictly follow the PRISMA guidelines as I systematically reviewed legal documents instead of clinical trials, which researchers created the PRISMA guidelines for initially (Gopalakrishnan & Ganeshkumar, 2013; Page et al., 2021). Given that all post-Soviet abortion laws originate from the same USSR law and that most of these countries have similar legal and healthcare systems, a detailed systematic review of the specifics of abortion law in each country is important to show the evolution and variability in these laws over time.

The review of healthcare systems was first. As I work with United Nations (UN) data later in the dissertation, I compared fifteen UN-sponsored reports on the status of the healthcare system in each post-Soviet country. All those reports came from the European Observatory on Health Systems and Policies, an organization under World Health Organization's (WHO) supervision[2], and were published in the journal *Health Systems in Transition*. I used the latest available report for each country, which ranged between 2012 and 2021. All reports were in English.

I started my systematic review of abortion laws in post-Soviet countries with this site: https://abortion-policies.srhr.org/, which the UN updates regularly for each country. There, I downloaded the full country profile of each of the fifteen post-Soviet countries, which included links to foundational laws on abortion as identified by the UN staff (*GAPD - The Global Abortion Policies Database*, 2022). I used the titles of those documents to find the digital archives for laws in most post-Soviet countries, except for Azerbaijan and Turkmenistan, as I could not find digital archives for those two countries.

While most countries have one national digital archive for legal documents that the government manages, some have several independent digital legal archives (table 1.1). From all digital archives I could find, I downloaded every available edition of every relevant law to see what changes to abortion legislation took place and when in each

[2] WHO is a part of the UN.

post-Soviet country from 1991 to 2020. This amounted to a total of 115 legal documents (table 1.1).

Table 1.1

Data Sources for Abortion Laws in Post-Soviet Countries

Country	Digital archive name	Hyperlink	Number of documents used
Armenia	Armenian legal information system	https://www.arlis.am	3
Azerbaijan	N/A (all documents from GAPD)	https://abortion-policies.srhr.org/documents/countries	3
Belarus	National legal internet portal of the Republic of Belarus	http://law.by/	1
	Normative legal acts of the Republic of Belarus	http://zakonby.net/	1
	Levinovsky	http://pravo.levonevsky.org/	5
	National Strike Committee of the Republic of Belarus	http://pravo.kulichki.com/index.htm	1
Estonia	Riigi Teataja [State Gazette]	https://www.riigiteataja.ee/index.html	15
Georgia	Ministry of Labor, Health and Social Protection of Georgia	https://www.moh.gov.ge/	2
	Legislative Herald of Georgia	https://matsne.gov.ge/	2
Kazakhstan	Information and legal system of normative legal acts of the Republic of Kazakhstan	https://adilet.zan.kz/	11
Kyrgyzstan	Centralized data bank of legal information of the Kyrgyz Republic	http://cbd.minjust.gov.kg/	8
Latvia	Legal acts of the Republic of Latvia	https://likumi.lv/	10
Lithuania	Register of legal entities	https://e-seimas.lrs.lt/portal/documentSearch/lt	5
	Register of legislation	https://www.e-tar.lt/portal/index.html	1

Moldova	State register of legal acts (2019–)	https://www.legis.md/	4
	State register of legal acts (until 2019)	http://lex.justice.md/	1
Russia	Consultant Plus	https://www.consultant.ru/	23
Tajikistan	Centralized bank of legal information of the Tajik Republic	http://www.adlia.tj/	1
Turkmenistan	N/A (all documents from GAPD)	https://abortion-policies.srhr.org/documents/countries	1
Ukraine	Official website of the Parliament of Ukraine	https://zakon.rada.gov.ua/laws	4
	Liga 360	https://ips.ligazakon.net/	3
Uzbekistan	National database of legislation of the Republic of Uzbekistan	https://lex.uz/	3
All other	GAPD - The Global Abortion Policies Database	https://abortion-policies.srhr.org/documents/countries	7

As evident in table 1.1, there is a large variability in the number of online publicly accessible legal documents on abortion in each post-Soviet country. Additionally, most documents from countries other than Russia were in their respective native languages, so I could not immediately read them. I downloaded all documents and translated the ones in languages other than Russian to English[3] with Google Translate.

For every country, I compared all available versions of abortion laws and recorded specific policies to structure the comparative historical narrative in chapters 3 and 4. The main points I compared for each of the 115 abortion law documents were:

1. Where in the hierarchy of laws does this law fall in this country?

[3] English translations of Google Translate are the most accurate, as that is the language it is tested on the most (Gomes, 2010).

2. When was this law signed? When did it go into effect? Did it make any preexisting law invalid?
3. Does the law mention legal term limits for abortion upon request, in social, and in medical circumstances? If so, what are they?
4. Does the law state the specific social and medical indications for abortion? If so, what are they and how many of them are there?
5. If the law changed, is the change to expand or restrict access to abortion?
6. Is there a mandatory waiting period for an abortion?
7. Is there a mandatory informed consent with specific language for abortion?
8. Does the document use any subjective terms like "unborn life" or any discussions of morality and ethics of abortion?

Answering these questions for each of the 115 legal documents I reviewed allowed me to extract enough quantitative data on term limits for abortion, the number of social and medical indications for second trimester abortion, and key years in which abortion access changed in each country. Those data are helpful when looking at fertility outcomes – do the drops in abortion rates correspond with years when abortion access got restricted? Is there enough abortion access restriction to justify the large decrease in abortion rates of all post-Soviet countries after the dissolution of USSR?

Data Collection

To better understand the reality of fertility behavior in each post-Soviet country, I collected population level data from several sources, but primarily focused on data from the various UN reports, predictive models, and raw data tables. Below is a summary table of the most relevant data sources and the indicators I extracted from them (table 1.2). Afterwards, I provide a brief explanation for the selection of each indicator extracted and each data source used.

Table 1.2

Data Sources for Fertility Behavior Comparison

Data source	Indicators extracted	Notes
UN *Demographic Yearbook* (1992, 2000-2018)	Population distribution by age and location (rural/urban)	Census, raw numbers
	Total and age-specific fertility rates	Vital registration, calculated rates
	Total and age-specific legal marriages	Vital registration, raw numbers
	Total and age-specific legally induced abortions	Government reported raw numbers[4]
UN *World Contraceptive Use Report* (2019)	Contraceptive use by method	National surveys, calculated % of all WRA[5]
UN *World Fertility Data* (2019)	Total and age-specific fertility rates	Vital registration, includes data from 1970-2020, calculated rates
	Mean age of childbearing	Vital registration, includes data from 1970-2020, calculated age
UN *Estimates and Projections of Women of Reproductive Age Who Are Married or in a Union* (2020)	Married women or women in a union	Estimations and projections in % of all WRA and in thousands
UN *Estimates and Projections of Family Planning Indicators* (2020)	% and thousands of women in each group using *any* method of contraception	Estimations and projections (upper and lower bounds of uncertainty and median) for 3 groups of women: all women of reproductive age, married women of
	% and thousands of women in each group using any *modern* methods of contraception	

[4] Abortion data recording guidelines vary by country, so there is no one source for abortion data in all countries

[5] WRA – Women of reproductive age, most commonly defined as 15-49 years-old (UNPD, 2020).

	% and thousands of women in each group using any *traditional* methods of contraception	reproductive age, and unmarried women of reproductive age
	% and thousands of women in each group whose family planning needs are not satisfied with modern methods of contraception	
	% and thousands of women in each group whose family planning needs are not satisfied with any method of contraception	
	% and thousands of women in each group, whose family planning needs are satisfied with modern methods of contraception	
UN Statistical Division National Accounts Statistics: Analysis of Main Aggregates database (2019)	Geographic region of each country	Standard geographic classification
	GDP per capita	Standard GDP calculation
	Healthcare spending as % of GDP	Standard GDP calculation
World Bank (2019)	GDP per capita	Standard GDP calculation
	Economic income classification (lower, middle, high)	Standard classification
Russian Federal State Statistic Service (ROSSTAT) *Здравоохранение в России: Статистический сборник [Healthcare in Russia: Statistical compendium]* (2019)	Total and age-specific legally abortions in Russia for 2012-2018	Raw numbers and calculated rate, includes miscarriages
International Planned Parenthood Federation *Abortion Legislation in Europe* (2012)	Cost of abortion	In USD (2012 conversion rate), no data on Azerbaijan, Belarus, and Turkmenistan
	Median personal monthly income	
Pew Institute *Table: Religious composition by country, in percentages (2012)*	Most practiced religion and % of residents affiliated with it	Aggregate data for most practiced religions in each country by % as of 2010

Relevant indicators. Abortion is one of the key fertility indicators, which means that it is one of the main factors that affects the changing size of the population, so demographers have studied it closely for decades (Tietze, 1975; Sedgh et al., 2016). According to John Bongaarts, who created a fertility model that many demographers refer to as the classic model of fertility, proportion of women married, proportion[6] of women using reliable contraception, abortion rate, and lactational infecundability are the only factors that mathematically affect the fertility rate of a population (Bongaarts, 1978, 1982). Lactational infecundability refers to the period of time that a woman is unable to become pregnant while she is breastfeeding her newborn infant. There is little to no reliable data on lactational infecundability, so I do not discuss it in this project. Instead, I focus on the other four key fertility indicators – abortion rate, fertility rate, proportion married, and proportion using reliable contraception.

Simply put, abortion rate is the prevalence of abortion in a population. More specifically, the total abortion rate is the number of abortions per 1,000 women of reproductive age in one country in one calendar year. It is the best metric to compare abortion data among different countries, as it allows for a comparison of abortion prevalence among countries with populations of different sizes.

Globally, abortion data are hard to compare among different countries. This is mainly because requirements for abortion data reporting are different in each country. For example, some countries, like Russia, report miscarriages in the same statistic as elective abortions (Lipman & Sakevich, 2019). Some countries, such as Moldova, only report

[6] Both instances of the word "proportion" refer to the proportion of women of reproductive age (15-49) specifically.

abortions performed at state clinics and not private clinics (Turcanu et al., 2012). Others only report surgical abortions but no medication abortions (Sedgh et al., 2016). Also, all official data on abortions only include legal abortions, so no illegal abortions are counted, but they still occur in most countries of the world, even where abortion is legal (Chae et al., 2017; Sedgh et al., 2016; Tietze & Lehfeldt, 1961). Finally, raw number of abortions in a calendar year is a standard indicator that a governmental statistical agency collects every year and due to the political arguments about abortion, some governments underreport the number of abortions (Dreweke, 2015; Remennick, 1991).

All these factors contribute to unreliability of abortion data even from gold standard sources like the UN. However, general trends can still be observed over time and post-Soviet countries are easiest to compare due to their shared political history, and, thus, organization of governmental reporting agencies (Avdeev et al., 1995).

Abortion falls within the scope of reproductive healthcare and many post-Soviet countries received various types of international aid for reproductive healthcare specifically in 1990s and early 2000s (Westoff, 2000; (Ahmedov et al., 2014; Ibraimova et al., 2011; Rechel et al., 2012; World Health Organization. Regional Office for Europe et al., 2016). A lot of that aid came from the USAID or the UN and included funding for sex education and contraception with the specific goal of decreasing abortion rates in the targeted post-Soviet countries. Because of that, there was a lot of collaboration between the governments of most post-Soviet countries and the UN, so abortion data from post-Soviet countries may be more reliable than the global standard (Dreweke, 2015; Rechel et al., 2012; Sedgh et al., 2016; Shah & Åhman, 2010).

The UN defines total fertility rate, hereafter TFR, as "the number of children a woman would have by age 50 if she survived to age 50 and were subject, throughout her life, to the age-specific fertility rates observed in a given year" (UNPD, 2020). Simply put, the TFR is the average number of children a woman has in her lifetime according to data from all women in any given year. Age specific fertility rate, or ASFR, is the number of infants born per 1,000 women in a standard 5-year age group each year (15–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49 years old). Age specific fertility rates also allow for calculation of the mean age of childbearing, or the average age at which women in a population have their first successful pregnancy.

Proportion married is an important indicator to consider, as women who are married or live with a heterosexual partner are statistically more likely to get pregnant, whether intentionally or not, simply because they are more likely to have sexual intercourse than single women (Edwards & Booth, 1976). It is important to consider both legal marriages and women who live in a civil union, so I used multiple data sources, including Census data for legal marriages and estimations based on survey data for civil unions and marriages.

Proportion of women using reliable contraception is important to investigate, as a pregnancy can only happen if no contraception is used or if contraception fails. There are two broad types of contraception – modern and traditional, and there are many methods that fall under each category, so a breakdown of contraception use by method is ideal to investigate the detailed differences in use of contraception in post-Soviet countries. Modern contraception is much more effective than traditional, but it may not be accessible to some people due to its cost, while traditional contraception is free but unreliable. Because of that, two additional important metrics to consider are unmet need for contraception and demand satisfied by modern contraception, as those show broadly the contraceptive prevalence of a population.

Women between ages 15 and 49 are referred to as women of reproductive age (WRA) as that is when most pregnancies occur, and all four previously mentioned indicators (abortion rate, TFR, proportion married or in a civil union, and proportion using reliable contraception) are calculated by using the total number of women of reproductive age in a country. Therefore, the total number of women of reproductive age is also an important indicator to collect.

There are other relevant indicators to consider that are not directly tied to fertility. I recorded the most prevalent religion, geographic region, the total population and the distribution of that population by age, gender, and location (urban/rural) of each country to get a better idea of how people live in every post-Soviet country and see if there are any similarities among countries in the same region. For every country, I also recorded its GDP, the World Bank classification of economic development, median monthly income, and average cost of abortion to better understand how much of a financial burden abortions place on women.

United Nations. The UN is an international non-governmental organization that was formed in 1945, right after the end of World War II, and the UN Statistics Division has collected demographic data worldwide since 1948 (United Nations, 2022). The UN has formal relationships with governments of most countries in the world. As of 2022, 193 countries,[7] including all fifteen post-Soviet countries, are Member States of the UN, which means that they assume the responsibility of diplomatic relationships with other Member States and abide by the obligations of the UN Charter, one of which is providing accurate vital registration data for global statistical purposes (*About UN Membership*, 2022; *International Law Commission*, 2022). Designated statistical agencies in every UN Member State (country) regularly report their recorded demographic data to the UN (Powers, 2003).

I primarily relied on the UN data for three reasons – open availability, reliability, and comprehensiveness of the datasets. All UN data are openly available online to everyone globally via https://data.un.org/ and are organized as a series of spreadsheets and summary reports, which get updated regularly and can be freely downloaded by anyone at any time (UNData, 2022). All datasets also have metadata that explain the data sources for all indicators and many datasets are formatted similarly, so they are easy to work with and merge. Since the UN has been compiling data globally since 1948, there is enough historical data to allow the UN researchers to build predictive models about fertility behavior with very high accuracy (Alkema et al., 2013; Kantorová et al., 2021).

The data from the UN predictive models is helpful to fill in the gaps in recorded data on contraceptive use and other metrics that vital registration cannot capture. Many demographers consider vital registration data (data on births and deaths) and Census data the gold quality standard of demographic data, as it is purely based in fact and easy to record in most countries worldwide (Hassan, 1975; Phillips et al., 2018). The UN

[7] Out of 195 total. Holy Sea and the State of Palestine are the only countries that are observing non-members of the UN.

compiles vital registration data, Census data, and data from various other national surveys for all Member States on the same website (Powers, 2003), so it provides a comprehensive collection of high-quality data for all countries relevant to this project.

The first source I worked with was the UN *Demographic Yearbook.* It is the most comprehensive collection of demographic information worldwide (Harvard T.H. Chan School of Public Health, 2012; Powers, 2003). The *Demographic Yearbook* has separate tables available for downloading as Excel files for every year since 2000. All issues of the *Demographic Yearbook* prior to 2000 are only available as PDFs and most are special issues on various topics, with the 1992 issue being dedicated to fertility, reproductive health, and mortality (United Nations, 1992). I collected data from each of the Excel-downloadable *Demographic Yearbooks* (2000-2018) and the PDF of the 1992 special issue on fertility. This gave me a robust set of data for years 1991-2018 for most[8] post-Soviet countries. This time period is perfect for my project, as the USSR dissolved in 1991, so all data from that point on relates directly to the first driving question.

I used other UN data sources, as well. I found survey data on contraceptive use by method in the 2019 UN *World Contraceptive Use* report. This report provides recorded data for the percent of women of reproductive age who use specific types of modern and traditional contraception. These data are survey-based, and most countries do not perform annual surveys on contraceptive use, so there are only two to seven data points between 1995 and 2018 for each of the specific types of modern (IUD, male and female condoms, oral birth control pill, injection, implant, patch) and traditional (rhythm and withdrawal)

[8] UN *Demographic Yearbooks* had no data on abortions in Turkmenistan at all, so it is largely excluded from my work.

contraception for each country. I also extracted vital registration data on total and age specific fertility rates and mean age of childbearing for most years between 1970 and 2020 for all countries from the 2019 UN *World Fertility Data* report.

UN uses its *Demographic Yearbooks, World Contraceptive Use* and *World Fertility Data* reports to make *Estimates and Projections of Family Planning Indicators* and *Estimates and Projections of Women of Reproductive Age Who Are Married or in a Union*. I used the latter two databases with estimations and projections to extract more general data on marriage and contraceptive use over time. This is the type of data demographers use to calculate the proportion married and proportion using reliable contraception, which are key fertility indicators in Bongaarts's classic model.

The UN *Estimates and Projections of Family Planning Indicators* report has data for married women from 1970 to 2030 (projections) and from 1990 to 2030 for unmarried and all women. Additionally, as the UN staff estimate these data points, they report each indicator for each group of women with a median estimate, as well as four levels of uncertainty – lower bound of 80% uncertainty, lower bound of 95% uncertainty, upper bound of 80% uncertainty, and upper bound of 95% uncertainty.

These levels of uncertainty are especially useful in determining whether the median estimate is close to the real situation in the countries. The narrow range between lower and upper bounds of 95% uncertainty indicates high confidence in data reliability and the wide range between those bounds of uncertainty indicates low confidence in data reliability (Alkema et al., 2013; Kantorová et al., 2021). The range is small for all years prior to 2020 and gets progressively bigger from 2020 to 2030, as those are projections of the data and there is much more uncertainty in projections than in estimates. This signals that the estimates for all previous years are very close to the actual data in each country.

As only the data until 2020 are relevant to this project, the large gap between lower and upper bounds of uncertainty for projections between 2020 and 2030 is largely irrelevant. Therefore, I use the median estimate in percentages to compare contraceptive use metrics among women in post-Soviet countries between 1970 and 2020 for married women and 1990 and 2020 for unmarried and all women.

Other data sources. While I relied on the UN data primarily, I also used other data sources to cross-check some data or add missing but relevant data. First, I downloaded data from the UN Statistical Division on GDP. I cross-checked the GDP data with World Bank (WB), which is an independent international agency that records economic information about each country. I also got the economic income classification (lower, middle, high) for all years between 1991 and 2019 from WB. I used the 2012 International Planned Parenthood Federation *Abortion Legislation in Europe* report to record the average cost of abortion and the median monthly income in each country. All of this helped me better understand the financial aspect of abortion access in post-Soviet countries.

Finally, I needed to supplement abortion data for Russia for all years after 2012, as, unfortunately, much of the data reporting for Russia in the UN *Demographic Yearbook* stopped that year. It is unclear why that happened, but the UN typically has a delay of two years in publishing the *Demographic Yearbooks*, as the latest available *Demographic Yearbook* at the time of data collection was from 2018 and it was published in 2020. In 2014, the Crimea crisis happened and many Member States of the UN condemned Russia for that and implemented sanctions against Russia (Sasse, 2017). This may not be related to the lack of data for Russia beyond 2012, but it is worth noting the historical coincidence of these two events.

Because of the lack of data for Russia after 2012, I supplemented the UN data with data from the official Russian Federal State Statistic Service, hereafter ROSSTAT. This is a comparable source to the UN data on abortion, as ROSSAT is the official agency that reports all demographic statistics, including abortions, in Russia to the UN. ROSSTAT notes that the number of abortions it records includes miscarriages as well, which is not a standard practice for most countries and is a large limitation of this work.

Data Interpretation

After data collection, I formatted all data the same way and built a database in SPSS with all indicators and their metadata, citing which source I got the information from. This resulted in a spreadsheet with 731 columns and 1065 rows. I chose SPSS due to its merging functionality and overall user-friendly interface.

After formatting the data, I needed to do some calculations and analyses to be able to compare fertility data among various countries. The number of abortions in post-Soviet countries is not comparable if we do not have a reference point of how large the population of each country is, as, statistically, women in a country with a larger population would have more abortions than women in a country with a smaller population regardless of any other factors. I performed each of the following calculations for each country for each year that the data were available.

Calculations. First, I calculated the number of women of reproductive age (NWRA), as that is the target population that all other indicators refer to and the UN did not directly report NWRA for any country in any year in any database. To calculate NWRA, I used data from UN *Demographic Yearbook* table 7, which had the recorded number of men and women in each of the standard five-year age groups. As women of reproductive age are women between the ages of 15 and 49, the relevant female age groups are 15–19-year-olds (N1519), 20–24-year-olds (N2024), 25–29-year-olds (N2529), 30–34-year-olds (N3034), 35–39-year-olds (N3539), 40–44-year-olds (N4044), and 45–49-year-olds (N4549). I simply added the number of women in each relevant age group as:

$$NWRA = N1519 + N2024 + N2429 + N3034 + N3539 + N4044 + N4549 \quad (1)$$

This calculation gave me a baseline for the number of women of reproductive age in each country in each year that the UN recorded based on Census and vital registration data from UN Member States. As those are recorded data points, they are the closest to the reality in each country.

However, the UN *Demographic Yearbook* table 7 only includes data for the latest year available and most countries did not report age specific population distribution for every year. Also, my other indicators have data points that start in 1970, so I had to come up with a way to calculate the number of women of reproductive age for all years I have other data for. To do this, I used the data from *Estimates and Projections of Women of Reproductive Age Who Are Married or in a Union* (United Nations Population Division, 2020). That database includes an estimated or projected percentage (%NRWA) and number in thousands (kNRWA) of women married or in a union that made up that percentage of all women of reproductive age. With this information, I calculated NWRA for each year between 1970 and 2030 for each post-Soviet country as:

$$NWRA = \left({}^{kNRWA \times 1000}/_{\%NRWA}\right) \times 100\% \qquad (2)$$

As this calculation was based on estimated and projected data instead of recorded data, I had to test the validity of my results. I did this by comparing the NWRA from Equation 1 to NWRA from equation 2. I visualized the results with a simple scatter plot and a regression fit line (Figure 1.1). As seen in figure 1.1 below, the linear fit is perfect at R=1 with very few outliers that are still very close to the fit line. This means that I can confidently use the NWRA from equation 2 as an estimate of target population of women of reproductive age for all my other calculations. I also used equation 2 to calculate the number of women in each of the relevant 5-year interval age groups. The results of that calculation followed the same linear trend as the total number of women of reproductive age, as the data points came from the same databases.

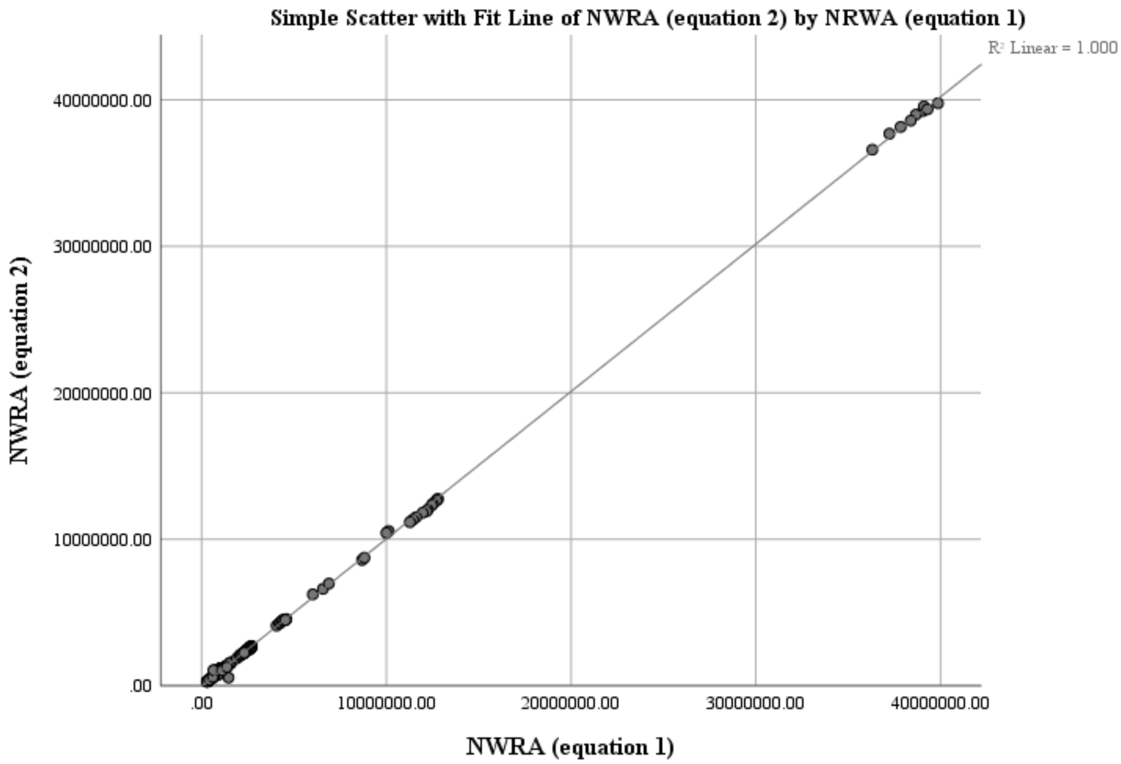

Figure 1.1. Correlation between results for number of women of reproductive age (NWRA) from Equations 1 and 2.

To compare abortion data among all fifteen post-Soviet countries, I calculated total and age specific abortion rates, as all these countries vary greatly in population size, so a simple comparison of raw number of abortions would be useless. As mentioned earlier in this chapter, abortion rate is the number of abortions per 1,000 women of reproductive age. I used the estimates from equation 2 for the number of women of reproductive age (NRWA) in each country. I calculated abortion rate (AR) for every country for all available years as:

$$AR = \left({}^{total\ number\ of\ abortions}/_{NWRA}\right) \times 1000 \qquad (3)$$

Data analysis. After performing the calculations above, I had comparable fertility data for each post-Soviet country, so I used SPSS and Pivot tables in Microsoft Excel to build time series graphs that illustrate the emerging differences in fertility behavior among post-Soviet countries since the dissolution of USSR. I also made separate graphs for key fertility indicators for each of the four geographic regions, so it is easier to see similarities and differences among the countries in the same region.

To make sense of the data I collected and visualized, I performed several simple correlations and built simple linear regression plots between abortion rates and other indicators. As I have longitudinal data for multiple countries, a more sophisticated analysis like a mixed and random effects model would be most appropriate for this work, but some simple statistical analyses are still helpful, especially to compare data for specific years among all countries. I built scatter plots with trendlines for abortion rate and each of the key fertility indicators in 1990 and 2017. 1990 is the year before the dissolution of USSR, while 2017 is the latest year for which I have abortion data for most countries. The trendlines on the graphs and simple correlation analysis allowed me to make conclusions about the relationships of multiple indicators with abortion rate.

Correlation coefficients range from -1 to 1, but are arbitrary and inconsistent depending on the field of research, the type of data, and their quality (Schober et al., 2018). In medicine and other sciences with precise high-quality data, any correlation coefficient below $|0.1|$ is negligible, $|0.1–0.39|$ is weak, $|0.4–0.69|$ is moderate, $|0.7–0.89|$ is strong, and $|0.9–1|$ is very strong, while those parameters are more relaxed in social sciences, especially when data are about human behavior and collected via surveys (Schober et al., 2018).

As data on specific contraceptive method usage is scarce, I cannot statistically compare use of specific methods of contraception for the same year for any post-Soviet countries. Because of that, I used data on specific methods for the latest year available for each country and the corresponding abortion rate for that same year (table 1.3 below). Latvia is the only country that only reported contraceptive use by method once to the UN and that was in 1995 (United Nations Population Division, 2019). As abortion rates were drastically higher in 1990s than in 2000 and 2010s in all post-Soviet countries and I used the latest year available for all countries, I performed the correlation analysis both with and without Latvia to see if that makes a difference in correlation of method used.

Table 1.3

Percentages of Women of Reproductive Age in Post-Soviet Countries who Use Oral Pills, Male Condoms, IUDs, Withdrawal, or Rhythm Method as Main Contraception. Data for Latest Year Available and Corresponding Abortion Rate for the Same Year

Year	Country	% use pills	% use male condoms	% use IUD	% use withdrawal	% use rhythm	Abortion rate
2016	Armenia	2.6	14.7	8.9	25	3.8	13.69
2011	Azerbaijan	1.2	2.6	7.7	36.6	3.9	10.27
2012	Belarus	10.3	22.3	15.1	7.7	3	12.09
2005	Estonia	19	13.4	21.5	2.16	3.33	28.40
2009	Georgia	6.2	7.06	8.1	1.03	7.73	23.03
2015	Kazakhstan	6.1	12.5	31.9	1.1	0.6	17.95
2014	Kyrgyzstan	4.1	10.4	22.4	1.1	0.7	15.76
2006	Lithuania	18.0	19.3	9.6	7.3	5.2	11.28
1995	Latvia	11.3	13.6	28	4.5	7.1	42.97
2012	Moldova	5.3	11.9	19.8	13.4	3	13.34
2004	Russia	15	28.5	24	15.3	18	45.20
2005	Tajikistan	2.1	1.4	26.3	1.4	0.3	10.91
2012	Ukraine	6.4	24.2	13.9	14.6	3	13.50
2006	Uzbekistan	2.3	2.1	49.7	1.1	1.7	6.00

Visualization of data on historical trends in fertility behavior together with the findings from my literature review allowed me to form hypotheses about Russia's high abortion rate mentioned in the introduction, while data analysis allowed me to quantify my findings and test my hypothesis. Based on all this, I built an agent-based model as a thought experiment to answer the second driving question of this dissertation. Please see the ABM chapter on details about the agent-based modeling methodology.

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2: ABORTION AND FAMILY PLANNING WITHIN THE SCOPE OF THE LEGAL AND THE HEALTHCARE SYSTEMS IN USSR

Introduction

Women navigate their fertility within the constraints of abortion and family planning law as well as the healthcare system in their country of residence. Abortion laws in all post-Soviet countries originated from the abortion law of the USSR but have evolved since the collapse of the USSR in 1991. Most post-Soviet countries have also maintained a version of the USSR healthcare system. Scholars often describe Russia and the USSR as countries with an "abortion culture" (Karpov & Kääriäinen, 2005) so the main goal of this chapter is to trace the historical roots of that "abortion culture."

There are six main components in this chapter. First, I describe the transition from the Russian Empire to the USSR to set the stage for the first law in the world that allowed abortion upon request. Next, I describe the world's first law (1920) that allowed abortions upon request and the architecture of the Soviet healthcare system to show how the new organizational structure made wide use of abortion as the primary birth control method possible. Then, I discuss the chronological changes in abortion law in the USSR in two parts, each of which corresponds to a policy shift in 1936 and 1955 and shows the effects of those changes on demographic data. I also present some additional relevant policy documents to contextualize women's access to abortion in the USSR. Lastly, I discuss unavailability of contraception in the USSR to further show how abortion was the only choice many Soviet women had to regulate their fertility and summarize all my findings in the conclusion.

Life in the Russian Empire and Formation of the USSR

Until 1917, the Russian Empire was an absolute monarchy and one of the largest empires in the world. It was predominantly an agrarian society, as over 86% of the public lived in rural areas and over 74% of the population received their primary income through agriculture (Wood, 2016). At the time, the Russian Empire was underdeveloped compared to many Western European countries, which were heavily investing in machinery and industrialization (Trockij, 1992). According to the 1897 Census, only 21% of the Russian population above age 9 could read, but that number rose to over 40% by 1905 (Cherkasov, 2011). Many modern-day countries were part of the Russian Empire and it spanned over one-sixth of the Earth's land.

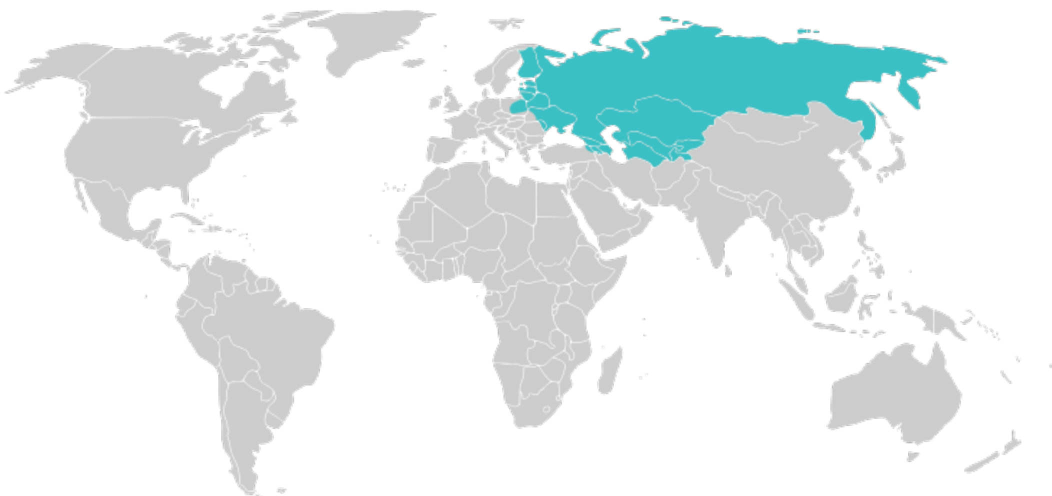

Figure 2.1. Land of the Russian Empire in 1914 with modern-day borders. All republics of USSR and some other modern-day countries, such as Finland and Poland, were parts of the Russian Empire (source and credit: Wikimedia Commons).

Abortion was illegal in the Russian Empire. It was not mentioned in the *Domostroy*, the collection of household rules the citizens followed, but women who had abortions and illegal abortion providers could still get a harsh punishment (Avdeev et al., 1995). The Russian Empire was heavily religious, with over 69% of the population practicing Orthodox Christianity (Wood, 2016). The Orthodox Church considered abortion a sin and disallowed it (Sakevich, 2001). Before Peter the Great (1682–1725), abortion was punished by death, but he abolished that practice (Avdeev et al., 1995). Instead, women who had abortions could be subject to being stripped of civil rights, exiled, and forced to do hard labor (although this was rarely enforced), and women kept their abortions secret.

There are few data points on abortion statistics in the Russian Empire, but it is known that many women received abortions from midwives who often had no official medical training, just vast experience in the field. At the decline of the Russian Empire, between 1910 and 1916 only 230 cases of abortion were prosecuted in the country of 174 million people (Avdeev et al., 1995). At that time, people in the Russian Empire did not have many options for contraception, as male condoms were expensive and inaccessible for most. The combination of lack of contraception and legal and religious ban on abortion led to a high birth rate in the Russian Empire at about 7-9 births per woman (Sakevich, 2001; Denisov & Sakevich, 2014).

The absolute monarchy of the Russian Empire was failing in the 1910s (Wade, 2017). In the early twentieth century, the country suffered several war-related losses, and experienced widespread famine and infectious diseases. There was no healthcare system or any standard of care (Bullock, 2012; Reshetnikov et al., 2019). Tsar Nikolas II was very unpopular with the public, as seen by numerous protests and assassination attempts (Wade, 2017). Overall, the dissatisfaction with the government was rising in most parts of the country, which allowed for new and often radically different ideologies to become popular. One such ideology was Marxism, about which Vladimir Lenin wrote many polarizing articles (Lenin, 1913, 1917; Bullock, 2012; Wade, 2017). The Tsarist government banned those works and labeled Lenin the enemy of the state, but many people passed around those articles, especially in big cities (Wade, 2017) because they held attractive alternatives to the dire situation.

Lenin demanded the rule of the proletariat, or the working class. At the time, only about 14% of the Russian population lived in cities and fit Lenin's description of the working class (Cherkasov, 2011; Wood, 2016). In 1917, Lenin and his supporters organized a coup and seized control of the Russian government. Due to the prevalence of the working class in cities of the Russian Empire, Lenin gained many loyal supporters who facilitated his ascent to power in key locations like Moscow and Saint Petersburg (Trockij, 1992). Lenin's coup was successful. He aimed to restructure the Russian government and to give the working class the power to select their representatives to the government (Lenin, 1917). The new Bolshevik government with Lenin in charge renamed the Russian Empire to the Russian Soviet Federative Socialist Republic, hereafter RSFSR.

The revolution of 1917 led to a Civil War that lasted until 1922, as many people opposed the new Bolshevik government (Bullock, 2012). Lenin and the Bolsheviks were against religion, but over 95% of the population in the Russian Empire was heavily religious, with 69% being Orthodox Christian (Wood, 2016; Cadiot, 2005). Local leaders of remote regions took this opportunity to fight for their independence from the Russian Empire and freedom to practice religion (Bullock, 2012; Trockij, 1992). Lenin's Red Army ultimately won, but lost lots of land in Europe, such as Latvia, Lithuania, Estonia, Finland and Poland. The main outcome of the Russian Civil War was the Declaration and treaty on the formation of the Union of Soviet Socialist Republics in 1922 (Declaration on the USSR foundation, 1922).

The 1922 Declaration formalized the political union of Russia, Ukraine, Belarus, and Transcaucasian countries – Armenia, Azerbaijan, and Georgia – thus forming the Union of Soviet Socialist Republics, or Soviet Union, hereafter USSR under the Bolshevik rule. According to the Declaration, the countries were equal republics of the USSR, but Moscow maintained its status as the capital and center of all political activity. The leaders of South-Central Asian countries such as Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan did not sign the declaration, as they could not come to an agreement with the Bolshevik government about their borders but were still under the rule of the USSR (Trockij, 1992). In the following 3 years, Bolsheviks installed Russian-speaking leaders in each of the South-Central Asian countries, and by 1925 each one was a republic of the USSR.

The Bolsheviks took control of a very large country with many social and economic problems. Their ideology was radical and idealistic and they sought to fix the problems with the power of collectivism (Lenin, 1917; Trockij*,* 1992). The first RSFSR Constitution of 1918 allowed women to have the same rights as men, including voting rights. The following legalization of abortion was another way in which Bolsheviks increased the rights of women in the RSFSR and later in the USSR.

First Legal Abortion in the World

The RSFSR legalized abortion upon request for the first time on November 18, 1920, and Lenin personally endorsed this resolution (People's Commissariat of Health and Justice, 1920). This law came before the official formation of the USSR in 1922, so it first only applied to the RSFSR, but starting in 1922, all other Soviet republics inherited that law as well. At that time, the RSFSR was the first country in the world to legalize abortion upon request of the pregnant woman. For comparison, the next country to legalize abortion upon request was Hungary in 1955 and by 1959, most countries in Eastern Europe allowed that practice as well (Tietze & Lehfeldt, 1961). The United States only legalized abortion upon request in 1973 (*Roe v. Wade*, 1973), and in the twenty-first century there are still many countries that do not allow abortion in any circumstance, such as Iraq, Malta, Dominican Republic, Angolla, and others (Singh et al., 2017).

The Soviet legalization of abortion upon request in 1920 was not as unexpected as it might seem. Several Russian scientific societies held meetings in the 1910s where they discussed the need for safe and legal abortion due to high maternal and neonatal mortality, as well as prevalence of illegal abortion (Grin, 1913; Iukina, 2019). Abortion was a scientific and medical point of discussion, not a social one (Miroshnichenko & Styazhkina, 2012). Lenin's publications and ideologies influenced many policies of early USSR, including the allowance of abortion upon request. In 1913 Lenin wrote that legal prohibition of abortion only served the rich, as they could still get abortions, while the working-class women were forced to carry out the unwanted pregnancies and stay in poverty (Lenin, 1913). Additionally, Lenin and the Bolshevik government aimed to make a "perfect" society, where each man and woman were equal, so providing a safe and legal abortion was a reasonable step in their plan (Miroshnichenko & Styazhkina, 2012).

Semashko healthcare system.

People's Commissar of Healthcare, Nikolai Semashko, and People's Commissar of Justice, Dmitri Kurskiy, signed the *"Постановление… об охране здоровья женщин."* [Resolution… on the protection of women's health], hereafter 1920 Resolution, on November 18, 1920. Many scholars credit Semashko to be the founder of the Soviet healthcare system, which Russia and the rest of the post-Soviet countries inherited (Sheiman, Shishkin, & Shevsky, 2018). There was no centralized healthcare system in Tsarist Russia before 1917 and many physicians had their own private clinics (Reshetnikov et al., 2019). After WWI, the state of healthcare was especially poor and many people were dying from preventable and curable infectious diseases simply due to lack of medication or access to healthcare (Reshetnikov et al., 2019).

The Semashko system aimed to make free healthcare accessible to all citizens through centralization of the healthcare system under the Bolshevik government. The foundational principles of the Semashko system were:

- Centralized hierarchical control of all medical universities, hospitals, clinics, and other health-related facilities, which made all employees of those facilities state employees,
- Free higher medical education for everyone,
- Mandatory medical service after graduation from a medical university,
- Right to free healthcare for all funded by the local and state government,

- Regular preventative screening of wage earners – special emphasis was on early treatment and preventative services.

Semashko began this work in 1918. The newly implemented infrastructure allowed the 1920 Resolution to provide free abortions in all state-sponsored hospitals and clinics. The concept of free medical care for all citizens was novel at the time and no other country had a centralized free healthcare system yet (Reshetnikov et al., 2019).

Description of the law that made abortion legal in 1920. The 1920 Resolution has ten short paragraphs, each with one to two sentences, and was published in the 259th issue of *Известия Всероссийского Центрального Исполнительного Комитета Советов* [*News of the All-Russian Central Executive Committee of Councils*], which was the official government press publication in RSFSR, and later in the USSR. The first six paragraphs discuss the existing status of abortion and the reasoning for the legalization, while the last four paragraphs specify what the 1920 Resolution allows and disallows in terms of abortion.

The 1920 Resolution states that illegality of abortion forces women to get unsafe illegal abortions from "self-serving and ignorant" abortionists and that up to 50% of those women get infections and 4% die after the procedure (People's Commissariat of Health and Justice, 1920). There is no indication as to where these statistics come from or how they were acquired. The document also specifies that abortion is an "evil" but "necessary" practice due to the current economic situation of the RSFSR, and the "moral remnants of the past." These statements can be viewed as justification for the following paragraphs, which specify how and where a woman can get a legal abortion. The 1920

Resolution specifies that its goal in legalizing abortion is to protect the health and safety of women and punish providers of illegal and unsafe abortions.

The seventh paragraph is a single sentence that allows free surgical abortion in any state hospital for any woman upon her request. It does not provide any specification of women's age or pregnancy gestational limits. The last three paragraphs outline the legal repercussions for illegal abortion providers. Those paragraphs specify that only a physician is allowed to perform an abortion and that any other provider performing abortion will face the "Jury of the People," including physicians performing abortions outside of a state hospital (People's Commissariat of Health and Justice, 1920).

Legal allowance of abortion was the easiest way for the Bolshevik government to deal with fertility at the start of their rule. Through the Semaskho healthcare system, the government invested in centralized preventative healthcare and medical education. Legal abortion allowed the government to disregard other fertility-related issues, such as production of contraception (Sakevich, 2001).

Consequences of the 1920 allowance of abortion. The 1920 Resolution clearly shows that its authors understood the danger of unsafe illegal abortions. At the time, that was a very progressive thought, as the World Health Organization only acknowledged that unsafe abortion is a serious public health concern for the first time in 1967 (Van Look & Cottingham, 2013).

Like many Soviet policies, allowance of free abortion upon request for all in state-sponsored clinics was idealistic in nature and hard to implement in most regions (Miroshnichenko & Styazhkina, 2012). At the time, the only modern contraceptive was the male condom and it was not easily accessible for most people in the USSR. Inaccessibility of contraception and sudden allowance of free and safe abortions led to a major surge in demand for abortion. Following the adoption of the 1920 Resolution, more women sought abortions than the medical professionals could provide. That led to creation of wait lists for abortion, as well as a hierarchy of women who could get abortions faster. By 1924, many hospitals had special commissions of physicians, which regulated who was allowed to get an abortion (Sakevich, 2001; Denisov & Sakevich, 2014). The hierarchy of candidates for abortion was:

1. Unemployed single women,
2. Employed single women, who already had one child,
3. Women who had many children
4. Women who were married to a working-class man,
5. Women with health insurance (state provided to all wage earners)
6. All other women.

The above hierarchy (Gens, 1929; Denisov & Sakevich, 2014) clearly favors abortion for single women and, overall, only includes social reasons for abortion. It is interesting that while members of professional Russian medical societies and Soviet lawmakers discussed abortion only as a medical issue, not a single medical reason exists in this hierarchy. It could be the case that abortions for medical reasons were above the hierarchy, but I could not find any such evidence.

Additionally, some scholars refer to a phenomenon they called “industry of abortion” in USSR in 1920s and early 1930s. There was a lot of corruption in healthcare settings and, while healthcare was supposed to be free, many patients brought gifts or cash for their physicians in return for treatment (Popov, 1991; Sigerist, 2017). Seeing that abortion was in high demand and a time sensitive issue for most women, they often paid the physicians to get an abortion faster (Popov, 1991; Sakevich, 2001; Denisov & Sakevich, 2014). Some scholars claim that in 1930 abortion officially became a paid medical procedure (Sadvokasova, 1969; Sakevich, 2001; Denisov & Sakevich, 2014; Lebina, 2014; Vishnevsky et al., 2016; Mirovich, 2019; Pivovarov & Spirin, 2020). However, I could not find an official government document that made abortion a paid procedure. It could be that abortion was a paid procedure only for women who did not fall under the categories in the hierarchy above, but that is just speculation.

Natalia Lebina, a Russian historian, provides records of abortion payment protocol and justification from Saint Petersburg (then, Leningrad) Archive in 1935. The document specifies that the demand for abortion is very high in Leningrad and that abortion can cause adverse effects on women's health even in professional healthcare settings (Lebina, 2014). It sets a scale of payment for abortion in Leningrad based on how much the household of the woman earns each month. The lowest abortion cost in that scale is 25 rubles, while the highest is 300 rubles. For comparison, in 1935 in the USSR, 25 rubles could buy of 1.5 kilograms of meat, while 300 rubles could buy a silk dress (Wollenberg, 1936). It is unknown if other regions used the same payment scale for abortion or whether they charged for abortion at all.

Regardless of whether abortion was free or paid, its demand was increasing every year between 1920 and 1929, which the Central Statistical Agency of the USSR recorded in two publications – *Abortion in 1925* and *Abortion in 1926*.[9] The publications included a number of abortions recorded in the USSR, as well as the characteristics of women who sought them and the reasons they gave for wanting an abortion (Denisov & Sakevich, 2014). Interestingly, women who got abortions in urban areas were often young and single, while those in rural areas were older, married, and have had several children already (Gens, 1929). Many women cited economic concerns as reasons for their abortions. However, some scholars found that on the population scale, the richest women were the ones seeking abortions most commonly, while the poorest women had the most live births (Sadvokasova, 1969).

The allowance of abortion in 1920 was controversial and some Bolsheviks spoke out against it. They saw allowance of abortion as a moral decline of Soviet women and prevalence of individualism over collectivism (Gens, 1929). After Lenin's death in 1924, more Bolsheviks spoke out against abortion, citing the decline in population and moral obligations of women as "creators of life," thus erasing the equality that the Bolsheviks promised to Soviet citizens in the 1918 Constitution (Lebina, 2014).

Population growth was a concern for the Bolshevik government and one of the main reasons some of them spoke out against legal abortion. Total fertility rate in the USSR went down between 1928 and 1935 by only 5%. Legal abortion was a convenient scapegoat for that decline. However, demographers point to the fact that in those years women who were born during World War I entered their reproductive years (Sadvosakova, 1969). WWI caused country-wide hunger and many other problems, so

[9] I could not locate the original texts of these publications, as they likely only exist in a print form in a Russian National Archive. Therefore, all discussion about those documents is based on peer-reviewed journal articles about them.

fewer children were born at that time, which means that fewer women than before entered their reproductive years between 1928 and 1935.

Abortion Ban of 1936

The 1920 Resolution was in effect until June 27, 1936. On that day, the Central Executive Committee of USSR and the Council of People's Commissars of the USSR published the decree "*О запрещении абортов, увеличении материальной помощи роженицам, установлении государственной помощи многосемейным, расширении сети родильных домов, детских яслей и детских садов, усилении уголовного наказания за неплатеж алиментов и о некоторых изменениях в законодательстве о разводах*" [On the prohibition of abortions, increasing material assistance to women in childbirth, establishing state aid for multi-children families, expanding the network of maternity hospitals, nurseries and kindergartens, increasing criminal punishment for non-payment of alimony and on some changes in the legislation on divorce], hereafter 1936 Decree. The 1936 Decree effectively banned abortion upon request and only allowed it in specific medical circumstances.

Three men signed the 1936 Decree - Mikhail Kalinin, the Chairman of the Central Executive Committee of the USSR, Vyacheslav Molotov, the Chairman of the Council of People's Commissars of the USSR, and Joseph Unshlikht, the acting Secretary of the Central Executive Committee of the USSR (Central Executive Committee of the USSR, & Council of People's Commissars of the USSR, 1936). In May 1936, the proposed 1936 Decree appeared in most newspapers, which allowed citizens about a month to prepare for the new law.

Description of the 1936 abortion ban. The 1936 Decree is much longer than the 1920 Resolution, but it uses similar language about the idealistic Soviet society and moral status of Soviet citizens. It has eight numbered parts and an unnamed introduction. The introduction of the 1936 Decree begins with exclamations about many freedoms that women in the USSR have compared to women in other countries and the financial and political development of Soviet citizens since 1922. The 1936 Decree cites those developments as reasons for abolition of abortion.

The first numbered part of the 1936 Decree is a list of four provisions that disallow abortion in all cases unless it is to save a woman's life or health and cite specific punishments for providers and seekers of abortion, including "public condemnation" for women seeking abortion. The second part of the 1936 Decree discusses the increase in financial aid to mothers and large families and orders an increase in length of paid maternal leave. The third part orders the creation of additional hospital beds for pregnant women in cities and rural areas. The fourth and fifth parts order an increase in day care and kindergarten services, respectively, while the sixth part orders a change in leadership of some kindergartens. The seventh part of the 1936 Decree specifies the budget for all previously stated changes, while the eighth and ninth parts order an increase in criminal punishment for non-payment of alimony and a change in the legal process of divorce.

The introduction of the 1936 Decree begins by stating that the Russian Revolution "laid the foundation for the complete and final emancipation of women." The word "emancipation" in this case is used as a derogatory term, similar to moral decline. The following paragraphs describes childbirth and upbringing of citizens of the USSR as an important duty of the women in USSR. There are several quotes from Vladimir Lenin that present abortion and contraception as morally ambiguous practices. Lenin died in 1924 and originally pushed for abortion to be legalized in 1920.

The quotes were from Lenin's 1913 article titled "Working class and neo-Malthusianism" and while they are accurate quotes, the 1936 Decree misrepresents Lenin's intent with those words. The 1936 Decree states that Lenin was a "rebel against abortion as a social evil," but none of those words actually appear in Lenin's original work (Lenin, 1913). Lenin's 1913 article was focused on the juxtaposition of the classes in capitalistic societies, and he argued that laws banning abortions only helped the ruling class, so it made sense to legalize abortions for all (Lenin, 1913). Lenin's quotes were likely included to provide more credibility to the logic of the 1936 Decree.

The first section of the 1936 Decree titled "On the prohibition of abortion" consists of four paragraphs. The first paragraph prohibits performing abortions unless it is to save a woman's life or health. There is no elaboration on what counts as a qualified medical condition under which abortion is permissible. Some scholars say that many physicians who treated pregnant women seeking abortion used the ambiguity of this wording to continue performing abortions (Avdeev et al., 1995; Denisov & Sakevich, 2014). I could not find any official documents from the USSR Ministry of Healthcare or any other governmental agency that made the list of conditions that would allow a woman to receive an abortion. The rest of the 1936 Decree lists additional pronatalist policies described above.

Consequences of the 1936 abortion ban. The 1936 Decree faced a lot of public critique as well as praise. Many journals and newspapers opened the discussion on the topic of illegal abortions and other provisions from the 1936 Decree after its initial publication in May. Some women submitted articles to those newspapers praising the prohibition of abortions. Interestingly, many of those articles included similar logic and even similar language to the 1936 Decree (Artyukhina, 1936; Central Executive Committee of the USSR, & Council of People's Commissars of the USSR, 1936). Political leaders of the USSR commonly spoke and wrote in favor of prohibition of abortion, which shows the pronatalist approach to fertility in the USSR in 1930s (Sadvokasova, 1969). Many women in urban cities of Russia spoke out against the abortion ban and commonly cited financial concerns and career development as their main reasons (Evans, 1981).

Immediately after the implementation of the 1936 Decree, the number of abortions went down significantly, while the number of births went up. However, this effect was short-lived and by 1937, the number of abortions was increasing every year again (Sadvokasova, 1969). Some scholars estimated that in 1939 the USSR had a similar abortion rate to that of the 1990s – 36 abortions per 1,000 women of reproductive age (Avdeev et al., 1995). Additionally, many women got admitted to hospitals with infections or complications from a suspected illegal abortion. Those women made up to 92% of total registered abortions in late 1930s, which means that only 8% of recorded abortions were medically necessary and legal that year (Sadvokasova, 1969). There were two other notable unintended consequences of abortion prohibition – maternal mortality and infanticide rates rose (figure 2.2, taken directly from Sakevich, 2005).

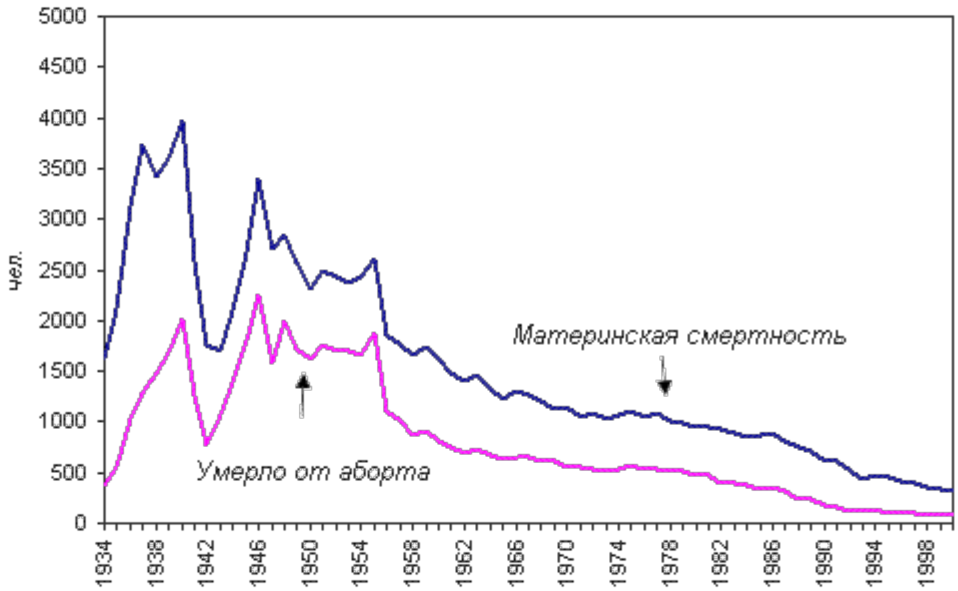

Figure 2.2. Total maternal mortality (top blue line) and deaths from abortion (bottom pink line) in the USSR between 1934 and 1998 (taken directly from: Sakevich, 2001).

Shortly after the 1936 abortion ban, physicians (all of whom are state employees due to the Semashko model of healthcare) no longer had to talk about contraception as part of their job with their patients (Sakevich, 2001). The Central Statistical Agency stopped publishing reports on abortion, so most data from that time are based on surveys and death records. Sterilization for the sake of family planning became illegal in 1939 (Vishnevsky et al., 2017). However, this is right before World War II began, so an argument can be made that the Soviet government made specific efforts to increase population growth in preparation for the War.

Through involvement in WWII, the government's focus was on defense and fertility was not a concern. In 1945, at the end of WWII, Latvia, Lithuania, Estonia, and Moldova became parts of the USSR. Recall that the Bolsheviks lost those countries during the Russian Civil War (1917–1922). At the time, abortion was illegal in all four of those countries, so that part of their legislation did not change immediately. After WWII, the USSR entered the Cold War with the USA. The Cold War intensified the separation of the USSR from the rest of the world, which made it impossible to import contraception from other countries (Jacobson, 1990). After WWII, Soviet scholars expressed concern over increasing infanticide and maternal mortality rates and concluded that the abortion ban was ineffective and harmful to the Soviet population (Sadvokasova, 1969; Popov, 1991; Miroshnichenko & Styazhkina, 2012).

In 1950, the USSR Ministry of Justice published its resolution “On the results of the study of judicial practice in cases of abortion." The current Minister of Justice of the USSR at the time, Konstantin Gorshenin, signed the document. It outlines the increase in cases of illegal abortion in several Soviet Republics, as well as the increase in the number of people who received a criminal punishment, but it does not state what kind, due to an illegal abortion (USSR Ministry of Justice, 1950). The resolution provides a distinction between prosecution of “self-abortion” and abortion providers, showing that women who receive abortions account for 80% or more of criminal cases related to abortion in the USSR. The document also provides specific statistics from Soviet Republics to show the discrepancy in prosecution. For example, in 1949, in Turkmen Republic (now Turkmenistan) 281 “self-abortions” were prosecuted, while only ten abortion providers were prosecuted. Some other Soviet Republics that had criminal cases against “self-abortion” did not have any criminal cases open against abortion providers at all (USSR Ministry of Justice, 1950).

The document states that the discrepancy is due to local health and investigative authorities’ violation of rules set forth by People's Commissariat for Health of the USSR, Prosecutor of the USSR and the People's Commissariat of Justice of the USSR in the 1940 instruction “On the fight against criminal abortion” (USSR Ministry of Justice, 1950). The resolution lists the names of specific Ministers of Justice in Soviet Republics and lawmakers of some specific cities who must take a closer look at how courts in their assigned locations work on cases of abortion. It ends with provisions to inform the USSR Minister of Healthcare and the Attorney General about the shortcomings in their work on prosecution of illegal abortion.

The main theme of the resolution is that abortion providers often escape prosecution for their crimes, which is harmful to the “fight against abortion” (USSR Ministry of Justice, 1950). The term “fight against abortion” appears thirteen times in this three-page document. That points to the pronatalist and anti-abortion rhetoric of the Soviet government at the time.

Overall, the 1936 Decree did not stop abortion from happening in the USSR, but it led to increased rates of maternal mortality, infanticide, and wide prosecution of women who received abortions instead of abortion providers.

Abortion is Legal, Again

The 1936 Decree was in effect until 23 November 1955. On that day, the Chairman of the Presidium of the Supreme Council of the USSR, Kliment Voroshilov, and Secretary of the same council, Nikolai Pegov, signed the “Decree of the Presidium of the Supreme Council of the USSR on abolition of abortion prohibition,” hereafter 1955 Decree (Supreme Council of USSR, 1955). The document allowed abortion upon request once again. Within a week, the USSR Ministry of Healthcare published an order with an instruction on abortion procedure and revised it in 1962 based on evolving safety procedures (USSR Ministry of Healthcare, 1962).

Description of the 1955 Decree. The 1955 Decree is a one-page document with seven total paragraphs. The first four paragraphs explain why abortion can be legal again. The last three paragraphs are specific provisions that regulate abortion legality. Compared to the 1920 Resolution and the 1936 Decree, the 1955 Decree has the least amount of evaluative language about the moral standing of women in the Soviet society.

The 1955 Decree begins with claims of advancements in support of motherhood and children in USSR as justification for abortion to be legal again. Ironically, that is the same as the justification for abortion prohibition in 1936 (Central Executive Committee of the USSR, & Council of People's Commissars of the USSR, 1936; Supreme Council of USSR, 1955). The second paragraph of the document states that the government must make additional incentives to support motherhood, including "educational and explanatory measures," to lower the country's abortion rate. There are no specifications about any of these incentives. The third and fourth paragraphs state that legalizing abortion helps prevent "great harm" from illegal abortions that "ignorant people" perform outside of healthcare facilities and allows the woman to make independent decisions about motherhood (Supreme Council of USSR, 1955). A much more evaluative and emotionally charged form of this paragraph with the same reasons for abortion legalization also appears in the 1920 Resolution that first allowed abortion (People's Commissariat of Health and Justice, 1920).

The document ends with three numbered provisions. The first provision abolishes the 1936 Decree, which made abortion illegal for nineteen years. The second provision states that abortion can only be performed in hospitals and other healthcare facilities, as approved by the Ministry of Healthcare. It does not specify a gestational time limit, medical or social indications for abortion. It also does not state that abortion is free at state-sponsored hospitals, as the 1920 Resolution did. The third provision maintains the existing criminal punishment for providers of illegal abortions. The Supreme Council of the USSR removed the third provision from the 1955 Decree in 1959, as they made a new criminal code (Supreme Council of USSR, 1959).

Consequences of the second abortion legalization. Abortion rates went up immediately. Women in the USSR were having more abortions than women in any other country in the world (Avdeev et al., 1995). Every country goes through a demographic transition, which means it shifts from high birth rates to low birth rates. Some countries accomplished this through introducing contraception and sex education. The USSR, on the other hand, is the only country in the world to complete the demographic transition almost exclusively through abortion (Sadvokasova, 1969; Sakevich, 2001; Karpov & Kääriäinen, 2005). In 1959, an average woman in the USSR had four abortions in her lifetime (Sadvosakova, 1969).

There were no official publicly accessible data on abortion until 1988. However, scholars estimate that the highest abortion rate in the history of the USSR was in 1964 at 169 abortions per 1,000 women of reproductive age (Sadvosakova, 1969). After that, the abortion rate steadily went down, which also coincides with higher access to contraception in some parts of the USSR, specifically big cities in Russia (Sadvosakova, 1969; Avdeev et al., 1995).

The USSR Ministry of Healthcare expressed concern about high abortion rates and published protocols for programs against abortion and in favor of increased contraceptive literacy (Vishnesky, 2006). However, that did not come to fruition, as the Ministry of Health published a very similar Order in 1979, acknowledging that very little progress happened between 1962 and 1979. Another order, titled “On the unsatisfactory work in prevention and decrease in numbers of abortion in RSFSR” came out in 1985 (Vishnevsky, 2006). These documents still used the term “fight against abortion” and cited administrative oversight as the main reason for consistently high abortion rates.

Other Relevant Documents on Abortion in the USSR

While the laws outlined above changed the binary concept of abortion legality as legal or illegal, other documents provided specific guidance on the abortion procedure, such as the gestational limit, as well as lists of medical and social indications for abortion. In the USSR, those documents came from the Ministry of Healthcare, which is another sign that after legalizing abortion for the second time, the Soviet government approached it as primarily a medical issue and let the medical professionals decide when an abortion was appropriate.

Abortion and disability. One notable document by the Ministry of Healthcare was the 1962 order "On streamlining the payment of benefits for temporary disability and the issuance of sick leave to workers," hereafter 1962 Order. While the title does not indicate that the document deals with abortion, one of its last provisions states that the 1955 instruction for abortion procedure is no longer valid and that the third appendix to the 1962 order replaces it (USSR Ministry of Healthcare, 1962). This was likely[10] the first Soviet government document that included gestational limits for abortion and allowed women to have disability benefits after undergoing abortion.

The instruction for abortion procedure has seventeen numbered provisions. The first provision establishes that all women may request an abortion due to the 1955 decree and the third provision states that all abortions must take place in inpatient medical facilities. The second provision specifies the instances in which an abortion is not allowed (USSR Ministry of Healthcare, 1962). Those instances are:

- acute and subacute gonorrhea;
- acute and subacute inflammatory processes of the genital organs;
- the presence of purulent foci, regardless of their location;
- less than 6 months after the previous abortion operation;
- the presence of acute infectious diseases;
- the presence of a gestational age of more than 12 weeks (but the following line states that after 12 weeks, abortion is possible if the pregnancy or delivery would hurt the woman's health).

Provisions four through seven specify the process the woman must undergo to get an abortion. She must first see her primary care physician to receive an evaluation and a referral to an inpatient facility. At the inpatient facility, there are more evaluations and

[10] Purely speculation based on the publicly available digital copies of the Soviet documents.

the physicians fill out the “history of disease” for the patient. The “history of disease” is a Russian term for the complete patient file with all medical records. The woman stays at the inpatient facility as long as needed based on her intake evaluation and the physicians must use anesthesia during the abortion (USSR Ministry of Healthcare, 1962).

Provisions ten through seventeen deal with disability benefits and cost of abortion. “Women-workers and employees” may receive disability pay from the first day of their stay at the inpatient facility if abortion was for a medical reason or a miscarriage, and if a woman earns less than 60 rubles per month (USSR Ministry of Healthcare, 1962). Women who earn more than 60 rubles per month receive a note on exemption from work, but do not get a payment. The physician sets a date for the woman’s return to work based on the condition of her health after the procedure. Only “women-workers and employees” may receive an abortion for free. All other women must pay 5 rubles in cities and 2.5 rubles in rural areas. The last provision states that physicians in outpatient clinics and inpatient birthing homes determine the presence of medical indications for abortion (USSR Ministry of Healthcare, 1962).

The 1962 Order provided the legal structure for abortion procedure and documentation. Addition of abortion to the list of procedures that qualified the patient for disability shows additional acceptance of the abortion as a medical procedure. Some scholars state that abortion in USSR often resulted in complications and infections, even in professional healthcare facilities (Denisov & Sakevich, 2014). That could be another reason for allowance of disability benefits after an abortion.

Additionally, in 1962, the World Health Organization (WHO) published a report on maternal and child health services in the USSR (World Health Organization, 1962). A committee of nineteen doctors who specialized in maternal and child health came to various Republics of the USSR in 1960 to assess the state of medical care in those areas. Each of the committee members was from a different country, such as Japan, Afghanistan, India, Nigeria, Chile, Argentina, and Pakistan. The committee reviewed relevant laws and policies, visited antenatal and other healthcare facilities, and analyzed the available demographic data (World Health Organization, 1962). They noted several pronatalist policies that encouraged motherhood and praised the progress in availability of maternal and child health services in Soviet Republics, especially in Uzbekistan (World Health Organization, 1962). The authors note that they were “impressed by the concept and its methodical application” of the USSR healthcare system as it related to maternal and child health (World Health Organization, 1962).

The 1962 WHO report mentions abortion briefly and discusses it in a subjective manner, as it refers to it as the “abortion problem in the USSR.” The report specifies that any abortion beyond 12 weeks of gestation is illegal in USSR (World Health Organization, 1962), but I could not find proof of this claim anywhere else. The authors of the WHO report state that while each woman has a right to request abortion, the healthcare providers explain the risks of abortion and try to talk women out of abortions before allowing the procedure. The report also states that abortion that does not have social or medical reasons associated with it is a paid medical procedure in the USSR and costs 50 rubles (World Health Organization, 1962). Finally, the report mentions that no abortion statistics are available for any of the Soviet republic and that Georgia in particular has a lot of anti-abortion propaganda (World Health Organization, 1962).

Medical indications for abortion. It is unclear when a specific list of medical indications for abortion first appeared. The 1962 WHO report on maternal and child health cites specific conditions like tuberculosis and cardiac insufficiency as reasons for a medical abortion following the 1936 abortion ban (World Health Organization, 1962), but I could not find an official document from that time to support this claim. Based on the documents I found, the USSR Ministry of Healthcare had a list of medical indications for abortion in 1951, revised that list in 1976, and then again in 1982. I only had access to the 1982 document.

The 1982 order of the USSR Ministry of Healthcare "On the approval of the instruction on the procedure for carrying out artificial termination of pregnancy," hereafter 1982 Instruction, has instructions for the official abortion procedure in appendix 1 and a list of medical indications for abortion in appendix 2 (USSR Ministry of Healthcare, 1982). The abortion procedure in appendix 1 is the same as the one in the 1962 order (USSR Ministry of Healthcare, 1962; USSR Ministry of Healthcare, 1982).

The 1982 Instruction includes fifteen categories of medical indication for abortion and states that abortion due to these conditions is allowed until 28 weeks of gestation (USSR Ministry of Healthcare, 1982). Within the fifteen categories of medical indications for abortion are fourteen categories of major organ system diseases and one category of physiological conditions. The physiological conditions refer to the patient's age. The 1982 Instruction deems the reproductive system of patients under 16 years old as "underdeveloped," and the reproductive system of patients over the age of 45 as "dying/extinct" (USSR Ministry of Healthcare, 1982). Therefore, patients under the age of 16 and over the age of 45 qualify for an abortion until 28 weeks of gestation without any additional medical conditions. The fourteen categories of diseases are:

1. Infectious diseases
2. Cancer
3. Endocrine disorders
4. Blood disorders
5. Mental disorders
6. Sensory and nervous system disorders
7. Cardiovascular disorders
8. Respiratory disorders
9. Digestive disorders
10. Genitourinary disorders
11. Pregnancy, labor, and postpartum complications
12. Skin disorders
13. Musculoskeletal and connective tissue disorders
14. Congenital anomalies

Notably, the disorders listed under each of these categories are severe and potentially life-threatening. For example, the only condition under the category of skin disorders is pemphigus vulgaris, which is a rare condition that causes large blisters on the skin. Tuberculosis and cardiac insufficiency, which are the specific conditions that the authors of the 1962 WHO report cite, are present in this list. Given that the international authors of that document reported being impressed with planning and implementation of policies in USSR, we can argue that this comprehensive list of severe disorders first appeared following the 1936 abortion ban and was the list that the WHO committee reviewed in 1962. The list of medical indications for abortion ends with a note that if a woman has any life-threatening condition not listed in that document, a physician may consider abortion on a case-by-case basis.

Social indications for abortion. It is also unclear when social indications for abortion first appeared in the USSR. The only document on them that I was able to find was from 1987. It is possible that abortion for social reasons was allowed before that time, especially as the 1962 WHO report mentions that abortions for social reasons are free (World Health Organization, 1962). However, every document that amends another legal document usually includes the name of the previous document regulating the matter and a note that it is no longer in effect. The 1987 order of the USSR Ministry of Healthcare "On the approval of the instruction on the procedure for authorizing the operation of artificial termination of pregnancy for non-medical indications" does not reference any previous policies on the matter (USSR Ministry of Healthcare, 1987). The list of social indications for abortion appears as appendix 1 of the order.

The 1987 list has seven social indications for abortion that allow a woman to receive an abortion until 28 weeks of gestation (USSR Ministry of Healthcare, 1987). Notably, most of these social indications only apply to married women. That is a striking contrast with the 1924 hierarchy of women qualifying for priority access to free abortion, which favored single women. The social indications in the 1987 order are:

1. death of husband during pregnancy
2. the stay of a woman or her husband in places of deprivation of liberty

3. deprivation of maternity rights
4. having many children (over 5)
5. divorce during pregnancy
6. pregnancy after rape
7. disability of an existing child

These indications are serious social circumstances that would affect the wellbeing of both the mother and the infant, if the pregnancy were to continue. Indications 1, 2, and 5 mention the husband of the pregnant woman, which means they only apply to married women. Indications 3, 4, and 7 only apply to women who have given birth in the past. From this list, only indications 2 and 6 apply for unmarried women at their first pregnancy.

Contraception in the USSR

As USSR had such a high prevalence of abortion, it is likely that there was very little contraception available. However, there are no official data on contraceptive use in the USSR, so all discussion in this section is based on information from peer-reviewed journal articles and news articles.

The Soviet government made few efforts to increase the contraceptive practices of the Soviet population between 1936 and 1955, when abortion was illegal (Miroshnichenko & Styazhkina, 2012). Only one condom factory was built in Bakovka village near Moscow in 1930, but there are reports of other and smaller factories in Ukraine and other parts of the USSR (Semenido, 2016). The condoms from that factory were packed in a small paper bag, and each bag contained two condoms (figure 2.3).

Figure 2.3. Images of male condoms in the USSR (source: osssr.ru)

The condoms were made of low-quality rubber and broke easily during intercourse and, sometimes, even before use (Vishnevsky et al., 2017; Semenido, 2016). The fact that two condoms were packed in one bag gave the users the choice of using them both in a short span of time or risking the second condom to dry and become “rough, brittle, and prickly” (Semenido, 2016). The paper bag that contained the condoms was also very easy to tear, which caused many condoms to get dry before the Soviet people could use them (Semenido, 2016; Povolzhskaya, 2019). As with all factories in the USSR, the condom factory had a specific government number printed on every condom pack. That number meant that the condom followed a government standard for condoms. That standard got updated only in 1981 (Semenido, 2016).

Before 1960s, pharmacies mainly sold condoms, but the supply was very inconsistent, as with most products in the USSR, so people who could afford to buy large quantities at the same time often bought the entire stock, leaving nothing for the rest of the population (Semenido, 2016; Povolzhskaya, 2019).

Soviet condoms cost 43 kopeeks before the 1961 money reform and 4 kopeeks after it. At both times that was quite cheap, as one could buy a glass of juice or a bus ticket for the same price (Povolzhskaya, 2019). There were Italian condoms imported through East Germany or India, but most people could not afford them and there were fewer of those available at pharmacies (Semenido, 2016).

Semenido states that pharmacies in large cities of Russia, like Moscow, often had condoms in stock, but many people were too afraid to buy them due to sex being a taboo topic in the USSR (Semenido, 2016). Additionally, he states that by the end of 1980s, all condom factories in USSR together made 200 million condoms every year, but most of the production came from the Bakovka factory near Moscow, so the supply was primarily directed there (Semenido, 2016). Note that at the same time, there were about 280 million people in the USSR, so even if everyone in the USSR had equal access to condoms, that supply allowed most people in the country to use one condom once a year (Kono, 1990).

In 1960s, the first oral contraceptive appeared on the market in Western Europe and USA. That advancement did not reach the USSR as fast. The USSR Ministry of Health was skeptical towards oral contraception and published several open letters in 1970s and 1980s that exaggerated the dangers of oral contraceptives and downplayed their usefulness in preventing pregnancy (Karpov & Kääriäinen, 2005; Denisov & Sakevich, 2014; Vishnevsky et al., 2017).

Still, a symposium on contraception took place in 1970 in Moscow and the resulting documents clearly state that oral contraception is a useful tool in controlling fertility, yet the general public did not have immediate access to this information, only the aforementioned letters about the dangers of the oral pill. In the following years, USSR began importing hormonal oral pills from Yugoslavia, Hungary, and East Germany (Tikhomirov, 2012; Vishnevsky et al., 2017). The imported routine oral pills were Bisecurin, Non-Ovlon, Rigevidon, Ovidon, and the emergency oral pills was Postinor (Baranova & Manuilova, 1988). The USSR Ministry of Healthcare made plans to build domestic factories for oral contraceptives in late 1980s but that never came to fruition.

Conclusion

The "abortion culture" in USSR was primarily due to three factors – high availability of (mostly) free abortions, low availability of modern contraception, and sex being a taboo topic to discuss, which led to a lack of sex education of any kind. Availability of abortion was high due to the large size of the Semashko healthcare system with many highly trained physicians and lots of hospital beds available for routine abortions upon request, especially in large population centers, like Moscow. Even with lacking data on contraception in the USSR, there was not enough supply for all residents, which is why the USSR completed its demographic transition via abortion instead of modern contraception.

While abortion statistics were unavailable for most of the USSR existence, it was clear to international and Soviet experts that women in the USSR had more abortions than women in any other country in the world, which is another reason for the term "abortion culture" in USSR and, inherently, in Russia (World Health Organization, 1962; Sadvosakova, 1969; Karpov & Kääriäinen, 2005). As mentioned before, a Soviet woman in 1959 had an average of four abortions in her lifetime, but it is unclear whether that statistic included only women in Russia or women across all Republics of the USSR (Sadvosakova, 1959).

Below is a visual summary of the changes in abortion law in the USSR throughout its existence (figure 2.4). The 1920 law was short and did not mention any gestational term limits but set the precedent for abortion being legal in the USSR and all resulting post-Soviet countries. The 1936 abortion ban resulted in a list of medical indications for abortion to save a woman's life, a version of which all post-Soviet countries still use in their laws as of 2022. The 1955 law introduced gestational term limits and social indications for abortion, which, once again, persisted in the resulting post-Soviet countries.

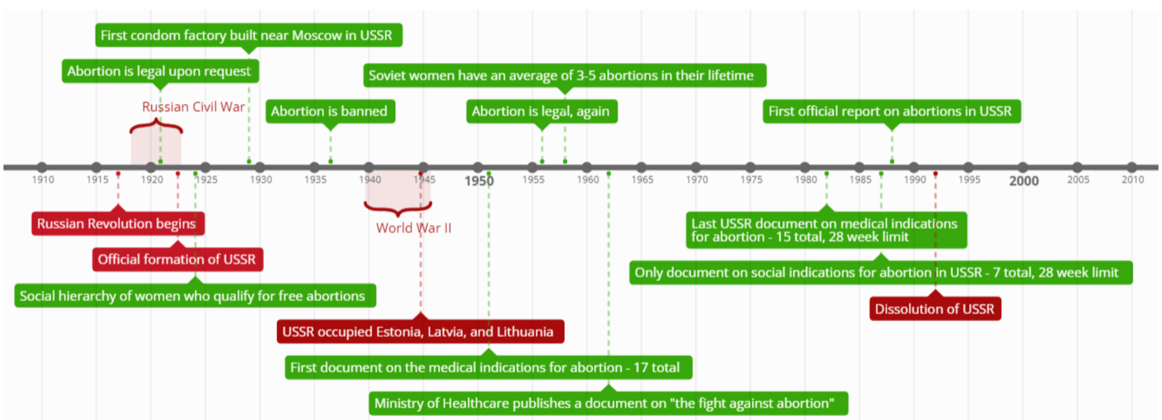

Figure 2.4. Timeline of relevant events in the USSR https://time.graphics/line/633593

What happened to abortion law after the dissolution of the USSR in 1991? Find out in the next two chapters.

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3: DISSOLUTION OF THE USSR, HEALTHCARE SYSTEM TRANSITION IN POST-SOVIET COUNTRIES AND CHANGES IN RUSSIAN ABORTION LAW

Introduction

As stated before, abortion functions within the scope of the healthcare system of a country. In the previous chapter, I described the highly centralized and hierarchical healthcare system of the USSR, which had the largest density of physicians in the population, as well as the largest number of hospital beds per capita among all European counties. The high number of qualified physicians, high availability of hospital beds, low availability of contraceptives, and lack of sex education made abortion the most common birth control method in all post-Soviet countries before and immediately after dissolution of USSR (Westoff, 2000; Hovhannisyan, 2004).

However, the dissolution left all fifteen newly independent countries in four geographic regions with oversized fully state-owned and funded healthcare systems that were unsustainable for them, as many of these countries experienced political, social, and economic distress in early 1990s (Hovhannisyan, 2004). Many of the new governments simply could not afford to maintain the existing healthcare systems with their new budgets, so they all made some changes to the existing healthcare systems. Mainly, those changes decentralized healthcare, allowed privatization of facilities for healthcare professionals, and significantly increased official out-of-pocket payments for patients.

This chapter has two main parts. The first part is a comparative summary of the changes in healthcare systems of post-Soviet countries and how they affected access to abortion. In this comparison I show that abortion became a paid, and often quite expensive, procedure for most people in most post-Soviet countries, so it became financially inaccessible for many people. I discuss these changes by separating the countries in four geographic regions, as discussed in the Introduction to this dissertation. This chapter shows how neighboring countries in the same geographic region often made similar changes in their laws on abortion in quick succession one after the other, which points to their ideological and political similarities.

In the second part of the chapter, I discuss specifics of abortion law in Russia to set the scene for the next chapter – abortion laws in post-Soviet countries. I took special interest in Russia, as about 50% of the USSR population in 1991 was in Russia (figure 3.1), many scholars discuss Russia and the USSR interchangeably, and I was born in Russia, so it is easier for me to find and read legal and other documents in Russian.

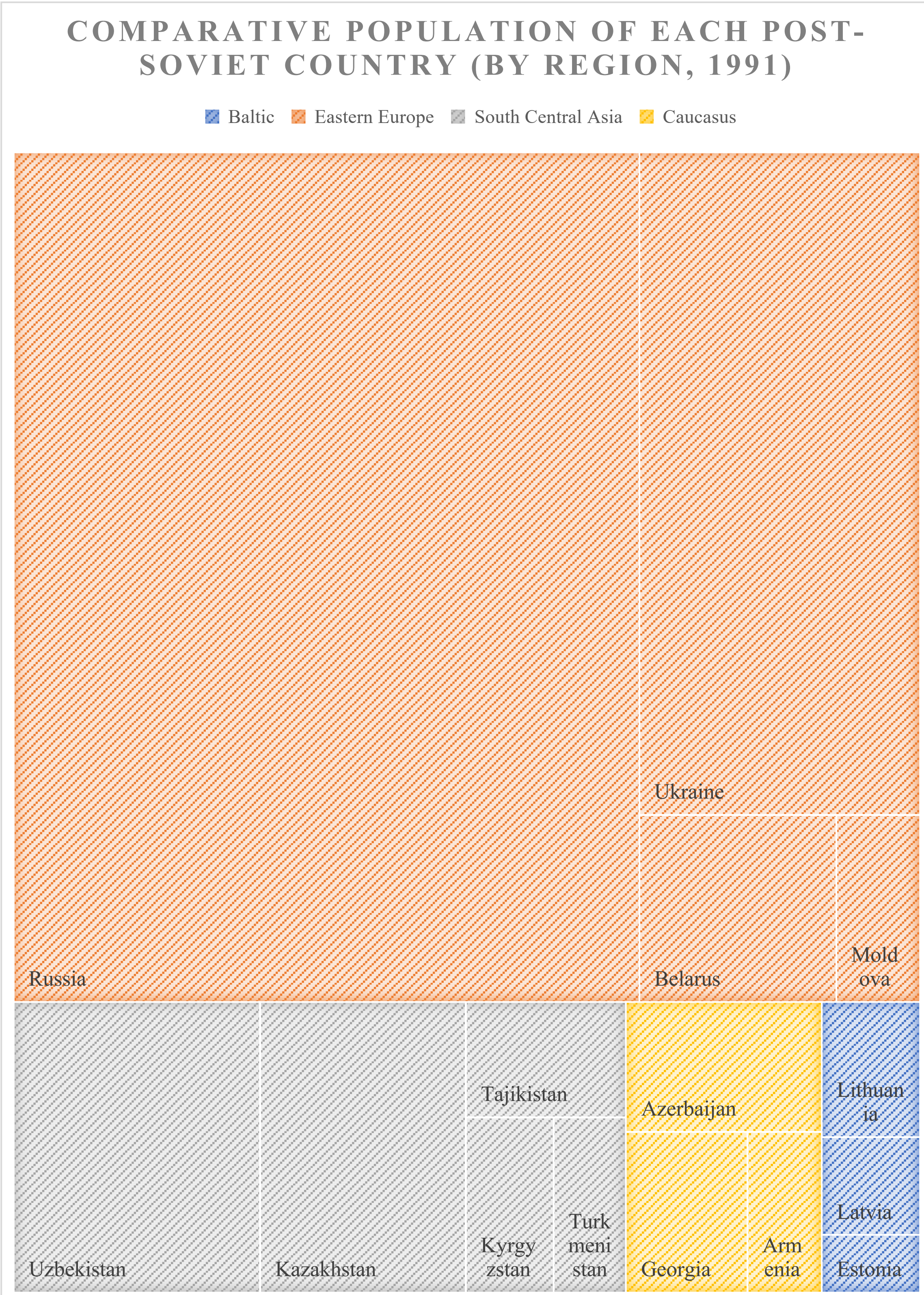

Figure 3.1. Proportional distribution of population in post-Soviet countries by region, 1991.

Overview of Post-Soviet Healthcare Systems

All post-Soviet countries inherited the same Soviet model of healthcare with universal healthcare coverage for all citizens via tax revenues. While Eastern European countries (Russia, Ukraine, Belarus, and Moldova) were able to maintain this system with minor changes, most other post-Soviet countries made changes to the structure of their healthcare systems to adapt to their new economies (European Observatory on Healthcare Systems, 2000; Verulava & Kalandadze, 2001; Hovhannisyan, 2004; Ibraimova et al., 2011; Katsagaet al., 2012; Ahmedov et al., 2014; Khodjamurodov et al., 2016; Verulava & Maglakelidze, 2017; Dominis et al., 2018). Fundamentally, each of the post-Soviet countries introduced a mix of health financing to split the cost of healthcare between the government and the patients and allowed healthcare professionals to open private facilities and clinics.

The national government maintains some control over healthcare in all post-Soviet countries. The most relevant governing body in each of the 15 post-Soviet countries is the Ministry of Healthcare (or a similar entity like the Ministry of Health and/or Social Affairs), which is the agency that produces all documents related to the abortion procedure and the medical indications for abortion. The Ministry of Healthcare together with the national government and the President of each country decide which medical procedures are free and which are paid. Additional relevant governing bodies are Parliaments, Councils of Ministers, Supreme Councils, National Assemblies, or other legislative commissions. Those governing bodies decide on the most important laws that allow or disallow abortion (Supreme Council of Kyrgyzstan, 1992; Parliament of Moldova, 1995; Cabinet of Ministers of Uzbekistan, 1996; National Assembly of

Armenia, 1996; Government of Kazakhstan, 2009). Below is a summary table of healthcare systems in each post-Soviet country and the average cost of abortion in the context of average monthly income in 2012 (table 3.1). Universal healthcare status and out-of-pocket expenses are from the systematic review of the UN-sponsored healthcare systems reports on each post-Soviet country (Habicht et al., 2018; Khodjamurodov et al., 2016; Murauskiene et al., 2013; Richardson et al., 2013; Turcanu et al., 2012; European Observatory on healthcare systems, 2000; Ibraimova et al., 2011; Katsaga et al, 2012; Ahmedov et al., 2014; Rechel & Lessof, 2021; Eriksen et al., 2022; Gamkrelidze et al., 2002). The data on appearance of the misoprostol and mifepristone on the Essential Drug List are from the World Health Organization (World Health Organization, 2021c). The data on average cost of abortion and the average monthly income are from the IPPF (International Planned Parenthood Federation, 2012).

Table 3.1

Comparison of Healthcare Systems and Financial Access to Abortion in Post-Soviet Countries (organized by region)

Country	Universal healthcare?	Are misoprostol and mifepristone on the Essential Drug List?	How much $ comes from patients? (2012 or closest year)	Average abortion cost in USD (2012)	Average monthly income in USD (2012)
USSR (1987)	Yes	Yes	0% [c]	Free	Unknown
Russia	Yes	Yes	35.6%	Free[a], $19–$200	$1,603
Belarus	Yes	Yes	26.7%	Free until 2009, $92–$615	$436

Moldova	Yes	Yes	45%	Free [a], $8–$32	$280
Ukraine	Yes	Yes	42.3%	Free [a], $20–$300	$552
Estonia	No	Yes	22.7%	$45–$50	$1,650
Latvia	No	Yes	42%	$92–$508	$1,365
Lithuania	No	Yes	26%	$456+	$1,505
Kazakhstan	No	Yes	33.9%	Free [a], $200+	$897
Kyrgyzstan	Yes	Yes	53.8%	$6–$500	$172
Tajikistan	No	Yes	63%	Free [a], $5–$100	$178
Turkmenistan	Yes	Yes	78.6%	Unknown	Unknown
Uzbekistan	No	Yes	50%	Free [b], $8–$16	$259
Armenia	No	Yes	85.5%	$30–$500	$471
Azerbaijan	No	Yes	62%	$20–$30	$400
Georgia	Yes	Yes	87%	$15–$153	$416

[a] Free abortions in state clinics for social and medical indications.

[b] Free abortions upon request in regional clinics.

[c] While all healthcare services were officially free, informal payments were very common.

Eastern Europe. Russia, Belarus, Ukraine, and Moldova are the Eastern European post-Soviet countries that are neighbors to each other (figure 3.2). They are similar in several ways. First, they maintained the same structure for their healthcare systems. Next, the structure of abortion legislation is very similar to the Russian structure. Finally, many policy documents from these countries, but not all, are in Russian, so I am able to understand them fully.

Figure 3.2. Map of Eastern Europe, MD stands for Moldova (source and credit: Wikimedia Commons).

All Eastern European post-Soviet countries maintain a primarily state-sponsored healthcare system (Richardson et al., 2013; Press Service of the President of Republic Belarus, 2021; Verkhovna Rada of Ukraine, 1992; Parliament of Moldova, 1995). This means that most medical services are paid for by the government through the mandatory health insurance and out-of-pocket patient payments are generally low (Popovich et al., 2011; Turcanu et al., 2012; Richardson et al., 2013; Lekhan et al., 2015).

However, the average out-of-pocket spending in all Eastern European countries is higher than the WHO EU average of 26% (Khodjamurodov et al., 2016), which signals possible disparities in access based on socioeconomic status. Additionally, as seen in table 3.1, the price of abortion varies greatly among Eastern European post-Soviet countries and each of them still reserves a right for some people to have free abortions, specifically in cases of abortions for social or medial reasons.

In Russia and Ukraine, abortion is free for social and medical reasons at state-sponsored facilities. Both countries also have a small out-of-pocket payment for abortions upon request, but as informal payments are common, even the out-of-pocket payment may impose a significant financial hardship on a woman. Also, state-sponsored facilities often have a long waiting list, which, in 2018, was estimated at around one month (Frolova, 2018). Because of the long waiting period at state-sponsored facilities, many women turn to private clinics, where they can get a surgical abortion for or a medication abortion much faster, but often for a much higher price than the out-of-pocket payment in state-sponsored facilities (table 3.1).

The Ministry of Healthcare in state-sponsored healthcare systems determines which procedures are free and which the patients must pay for out-of-pocket. The Belarussian Ministry of Healthcare published the first such document in 1996. That document reserved the right to a free abortion for all women seeking abortions for medical reasons, underage women seeking abortions and women seeking abortions upon request at their local clinics (Ministry of Healthcare of Republic Belarus, 1996). From 1996 to 2009, the only women who had to pay for an abortion were those who sought an abortion at a healthcare facility far away from their registered home (Ministry of Healthcare of Republic Belarus, 1996).

In late 2009, a striking policy change reduced access to abortion of many women in Belarus. That year, the Council of Ministers of Republic Belarus published a resolution that revised the 1996 list of paid medical services. That document made any abortion before 12 weeks (so any abortion upon request) a paid procedure (Council of Ministers of Republic Belarus, 2009). The only people who still qualified for a free abortion in Belarus according to the 2009 resolution were those who were getting an abortion for a social or a medical reason (like in Russia and Ukraine at the time) and underage girls. It is notable that most abortions in Belarus happen before 12 weeks of gestation (Richardson et al., 2013), so most pregnant women seeking abortions had to pay for them starting in 2009, which means that this change reduced access to abortion in Belarus. The 2009 resolution does not specify the actual cost for any paid medical procedure and it is still in effect in Belarus as of 2022. The ambiguity of the 2009 resolution is likely the reason for such a large difference between the cheapest and most expensive abortion in Belarus (table 3.1).

All abortions are paid medical procedures in Moldova. To further establish the point that abortions are not free in Moldova, the 2020 "Standard on pregnancy termination in safe conditions" states that all facilities that provide abortions must post their rates in an accessible way to inform all potential patients of the cost of the procedure (Ministry of Healthcare, Labor, and Social Security of Republic Moldova, 2020). In 2005, an estimated cost of abortion in state-sponsored clinics was 170-270 lei ($5) and 300-900 lei in private clinics (Comendant, 2005).

Northern Europe (Baltic countries). Estonia, Latvia, and Lithuania are countries in Northern Europe. They are often called the Baltic states/countries due to their proximity to the Baltic Sea (figure 3.3). The Baltic countries are different from all other post-Soviet countries, as they only became parts of the USSR in 1945, over 20 years after the rest of the post-Soviet countries. As of 2022, all three Baltic countries are members of the European Union (EU), so they have developed some similar policies throughout the recent years modeled after the EU. Estonia, Latvia, and Lithuania are also the only post-Soviet countries that are full members of the EU at the time of writing this manuscript.

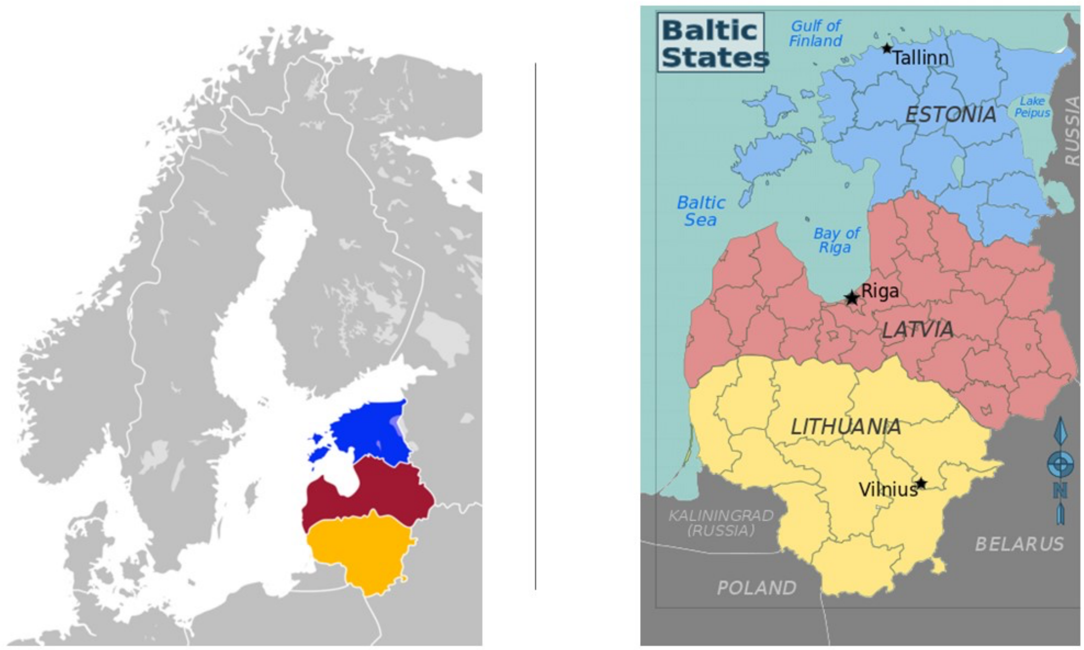

Figure 3.3. The general position of the Baltic countries in Europe (on the left) and a closer look at those countries (on the right) (source and credit: Wikimedia Commons).

All three Baltic post-Soviet countries have a mixed healthcare system that relies on a health insurance fund through mandatory tax contributions of working residents. Still, access to and quality of healthcare services stay relatively low, as all three healthcare systems are underfunded according to European standards (Murauskiene et al., 2013; European Commission, 2017; Habicht et al., 2018). While each Baltic country has a health insurance fund, access to and coverage of medical services varies widely among these countries. Estonian fund seems to be the most versatile, as it covers about 94% of the population and accounts for two thirds of total health expenditure in Estonia (Habicht et al., 2018). Still, most healthcare procedures, including abortion, require a co-payment from the patient in varying percent of their cost (table 3.1).

Notably, Latvia is the only Baltic country that has a higher out-of-pocket share of healthcare expenditure than the WHO EU average (European Commission, 2017). It also has worse health outcomes, such as higher maternal and infant mortality, than the other two Baltic post-Soviet countries for several reasons (Norkus, 2011; Gudžinskas, 2012; European Commission, 2017, 2021). Some scholars call the Latvian reforms of 1990s the "silent privatization," because the publicly funded benefits package through the tax revenue of National Health Service fund (NHS) was very narrow, the fund did not exist until 2011, and most primary care was and still remains private (Gudžinskas, 2012; European Commission, 2017, 2021).

Most Latvians have a designated private general practitioner, who serves as the first point of contact and a "gatekeeper" from specialist services. In turn, specialists may or may not have a contract with NHS, and even if they do, the patient may not receive free or reduced pricing on their treatment, as every healthcare provider has a quota of services they may provide via NSH funds every year (European Commission, 2021).

The private nature of primary care in Latvia provides a major barrier to healthcare access for people with low income, as they often cannot afford high medical fees for appointments (Norkus, 2011). In fact, Latvia has the highest unmet need for medical services and the highest rate of alcohol use, including during pregnancy, among all European countries (European Commission, 2021). Finally, Latvians on average have the lowest monthly income among their Baltic neighbors, but the official cost of abortion in some private clinics exceeds Lithuania's and Estonia's (table 3.1).

South-Central Asia. There are five post-Soviet countries in South-Central Asia. They are Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan (figure 3.4). Central Asia is geographically, culturally, historically, and demographically very different from post-Soviet Eastern and Northern Europe (Clifford et al., 2010). All five South-Central Asian post-Soviet countries have very young populations, high proportions of people living in hard-to-access mountainous rural areas, high fertility rates, high prevalence of Islam, and relatively low life expectancy, especially for women (European Observatory on healthcare systems, 2000; Ibraimova et al., 2011; Katsaga et al, 2012; Ahmedov et al., 2014; Khodjamurodov et al., 2016).

Figure 3.4. Map of the South Central Asian post-Soviet countries, Caucasus countries also pictured on the left (source and credit: Library of Congress).

In South-Central Asia, a difference in income and government healthcare spending emerged in 1990s and has affected population health since. That difference is primarily due to natural resources and their export. Kazakhstan and Turkmenistan have economies that rely heavily on natural resource extraction, so they are the richest, Uzbekistan rarely exports its minerals, while Kyrgyzstan and Tajikistan do not have natural resources to export, so they remain the poorest (Dominis et al., 2018). Most healthcare reforms took place in late 1990s and early 2000s, which is much later than when European post-Soviet countries started implementing reforms to their healthcare systems after USSR dissolution in 1991. A Civil War took place in Tajikistan after it became an independent country, while Turkmenistan was geographically and politically isolated and its President at the time was not open to many reforms until a different president was elected in 2007 (Rechel et al., 2012).

All South-Central Asian post-Soviet countries maintain some form of free medical care, though they do not all have universal health coverage. There is a state-guaranteed benefits package and an essential drug list in each country (table 3.1), but there are large gaps in coverage and none of the lists of guaranteed benefits include abortion upon request (Katsaga et al., 2012; Rechel & Lessof, 2021). Tajikistan's benefits package is the newest and, while having been formally introduced in 2007, was still in its pilot testing stage in 2016, which shows how slow reforms in healthcare can be (Khodjamurodov et al., 2016). All South-Central Asian countries have very high out-of-pocket expenditures for patients, the highest being in Turkmenistan and the lowest in Kazakhstan (table 3.1). Still, Kazakhstan's share of out-of-pocket payments for healthcare is above the EU average by almost 10% (Eriksen et al., 2022).

Although all South-Central Asian post-Soviet countries fall into the middle-income category, their healthcare spending in 1990s was well below the average for members of United Nations and population's reproductive health suffered in each South-Central Asian post-Soviet country after the dissolution of USSR, when abortions, maternal, and infant mortality spiked (Westoff, 2000; European Observatory on healthcare systems, 2000).

Because of that, each of those countries encouraged international aid and investment, especially into their reproductive healthcare systems, as they had no reliable sources for modern contraception and heavily relied on abortion (Rechel et al., 2012; Dominis et al., 2018). Governmental agencies of these countries published multiple reports about the state of their reproductive healthcare asking for international aid (United Nations Population Fund & Ministry of Health of the Republic of Tajikistan, 2000; World Health Organization, 2000; Committee on the Elimination of Discrimination against Women, 2011; Government of Turkmenistan, 2019; Government of Kyrgyzstan, & Ministry of Economics of Kyrgyzstan, 2020).

The main agencies that have provided financial aid for the development of reproductive healthcare in South-Central Asian post-Soviet countries are USAID, UNICEF, UNESCO, WHO, World Bank, and *Médecins Sans Frontières* [Doctors without Borders] (Olds & Westoff, 2004; Dominis et al., 2018). The collaborations between the governments of South-Central Asian post-Soviet countries and the international donors were well-coordinated, which resulted in massive influx of modern contraceptives, mainly the IUDs, into those countries (Olds & Westoff, 2004; Barrett & Buckley, 2007; Janevic et al., 2015; United Nations Population Fund, 2018).

Given the continued generous support of international donors, many new laws resulting from healthcare reforms in South-Central Asian post-Soviet countries specifically cite UN Conventions and, except for Turkmenistan, widely view abortion as a vital reproductive right. Some laws even state that if anything in the law goes against UN Conventions, the UN Convention must be upheld instead of the national law (Senate of Uzbekistan, 2019).

Several international reviews of reproductive health in early 2000s in South-Central Asian and Caucasus countries showed that abortion rates went down as much as contraceptive prevalence in married women went up, signaling the effectiveness of international aid for family planning in 1990s (Westoff, 2000; Olds & Westoff, 2004; Beishenbekkyzy & Najibullah, 2017). Additionally, these studies support the idea that most women who sought abortions in those countries were married, as the scholars did not provide any information on unmarried women.

Turkmenistan is the most problematic country for this project, as there is no public data on abortion in Turkmenistan and most legal documents are also not publicly accessible, at least online. This makes sense, as international researchers have had problems finding legal documents in Turkmenistan, even when working with the Turkmenistan government (Rechel et al., 2012) and there have been reports of the Turkmenistan Ministry of Health systematically manipulating and misrepresenting health data to the UN and other international agencies (Médecins Sans Frontières, 2010), which is why Médecins Sans Frontières left Turkmenistan in 2010 after almost 20 years of collaboration (Lancet, 2010).

Western Asia (Caucasus). Armenia, Azerbaijan, and Georgia are in the Caucasus region (figure 3.4). Similar to the previous region, healthcare reforms in Armenia, Azerbaijan, and Georgia were also slow due to economic and political instability in the region. The Nagorno-Karabakh conflict between Armenia and Azerbaijan that started in 1988 remains unresolved (World Health Organization, 1996; Verulava & Maglakelidze, 2017). Similarly, the numerous conflicts over the Abkhazia and South Ossetia regions resulted in Georgia having one of the steepest economic downfalls among all post-Soviet countries after dissolution of the USSR due to the large numbers of refugees and influx of immigrants (Verulava & Kalandadze, 2001).

Georgia and Armenia have the highest percentage of out-of-pocket healthcare expenditures among all post-Soviet countries (table 3.1). Georgia created a health insurance fund in 1995 (Gamkrelidze et al., 2002), replaced it with mandatory general taxes in 2006 and attempted to create a universal health program in 2013 (Verulava & Maglakelidze, 2017).

Still, the out-of-pocket payments of patients in Georgia accounted for 87% of all healthcare spending in 2018 (Gamkrelidze et al., 2002; Verulava & Kalandadze, 2001), which is the highest among all post-Soviet countries, so it is clear that none of these programs provided efficient funneling of funds into healthcare. As a result, all healthcare is paid and only some people who fall within the category of “vulnerable population” can get a voucher for specific healthcare services for free (Verulava & Maglakelidze, 2017).

Armenian government introduced a very limited in scope package of basic benefits for specific groups of population (disabled, children, pensioners) in 1997 and made all other treatments paid via official fess, which significantly raised out-of-pocket payments for all patients without increasing the quality of service (World Health Organization, 1996; Hovhannisyan, 2004; Verulava & Maglakelidze, 2017; Karapetyan, 2021).

Azerbaijan is the only country in the Caucasus region that made very few changes to the Soviet healthcare system it inherited. Afterall, it is the richest country among its neighbors and has lots of natural resources for export, which remain central to Azerbaijan's economy, so it can afford a mostly state-funded healthcare system for a young population, even with the economic challenges that the USSR dissolution brought (Holley et al., 2004).

Azerbaijan's approach to healthcare reform has been incremental, allowing some private ownership of healthcare facilities and introducing official fees for some healthcare services in early 2000s (Ibrahimov et al., 2010). In 2017, the government of Azerbaijan introduced a mandatory health insurance as a pilot program (World Bank, 2021). As of 2021, the mandatory health insurance operates nationally and covers primary care, emergency care, specialized outpatient and inpatient care, and other services free of charge for the whole population (Delegation of the European Union to the Republic of Azerbaijan, 2019; Aiypkhanova, 2021).

Overall, every post-Soviet country made some changes to their healthcare systems, but most of them, except for the Baltic healthcare systems, work somewhat similarly, especially among countries in the same geographic region. The biggest changes involved international financing of reproductive healthcare and contraceptive supply in South-Central Asian and Caucasus countries, a dramatic shift towards private healthcare in Baltic countries and Moldova, and a gradual increase in privatization of some healthcare facilities in Eastern European post-Soviet countries.

Specific Abortion Laws in Russia

After dissolution of the USSR, the Russian government adopted the new Constitution on 12 December 1993, which became the legal foundation for all other laws and policies in Russia. Article 41 of the Constitution is the most relevant to this project, as it maintains the right of each Russian citizen to "protection of health" and free healthcare in state-sponsored facilities. It states that the funding for healthcare comes from "corresponding budgets, insurance premiums, and other sources" (Constitution of the Russian Federation, 1993).

In accordance with the new Constitution, the Supreme Council of Russian Federation passed the Law on Fundamentals of the Legislation of the Russian Federation on the Protection of the Health of Citizens, hereafter law on protection of health, on 22 July 1993, which solidified abortion as a pregnant woman's legal right (Supreme Council of Russian Federation, 1993). Russia's and many other post-Soviet countries' Law on Protection of Health originates from the similarly named Soviet law of 1969. Notably, even the last edition of the Soviet Law on Protection of Health does not include any information on abortion (Supreme Council of the USSR, 1969, ed. 1990).

As in every other post-Soviet country, the main healthcare law is not the only law that governs abortion. Many other smaller pieces of legislation control abortion access in Russia by deciding social and medical indications for abortion. Below is a summary of all changes to all documents relevant to abortion in USSR and Russia from 1920 to 2012 (table 3.2). As seen in table 3.2, while initial changes allowed for expansion of abortion access, the most recent changes restricted abortion access via different methods, such as installing a mandatory waiting period in the main healthcare law or reducing the number of social indications from thirteen to one.

Table 3.2

Timeline of Changes in Access to Abortion in USSR and Russia (1920–2012)

Change	Year	Did the change increase or restrict access to abortion?
Abortion first becomes legal	1920	Increase
Hierarchy of women for free abortion	1924	Decrease
Abortion may be a paid procedure	1930s	Decrease
Abortion is banned	1936	Decrease
Abortion is legal, again	1955	Increase
Abortion is a qualified short-term disability	1962	Increase
List of medical indications for abortion until 28 weeks	1982	N/A
List of social indications for abortion	1987	N/A
Abortion is in the "law on protection of health"	1993	Increase
Women have a right to free abortion upon 12 weeks upon request, in social circumstances until 22 weeks and at any time for medical reasons	1993	Increase
New list of medical indications (14 categories)	1993	Increase
New list of social indications (13 indications)	1996	Increase
New list of social indications (4 indications)	2003	Decrease
Addition of a mandatory waiting period	2011	Decrease
Addition of a specific informed consent	2011	Decrease
Addition of abortion for "legally incapacitated women"	2011	Increase, but likely unethical
Some medical indications only allow abortion up till 22 weeks now	2011	Decrease
Only 1 social indication left	2012	Decrease

Changes in the Law on Protection of Health. The Russian Law on Protection of Health has 12 chapters with 69 total articles. Boris Yeltsin, the president of Russia at the time, signed the document. This law was the foundation for all regulations on healthcare in Russia until 2011. The Supreme Council of Russia, and, later, the government of Russia made additions and other changes to the 1993 law annually. Most changes were minor phrases. In 2011, the State Duma of Russia approved the new edition of this law with more substantive changes, including changes to the legislation on abortion and more specification on free and paid medical procedures. As of 2023, the 2011 Law on Protection of Health has been revised over 70 times (Russian federal law no. 323-F3, 2011, latest revision).

1993 – 2011. Article 36 in Chapter 7 of the 1993 Law on Protection of Health establishes every woman's right to abortion in Russia. It only has 4 paragraphs. The first paragraph states that each woman has a right to "independently decide the issue of motherhood." It specifies that a woman may request an abortion until 12 weeks of gestation. She may also have an abortion until 22 weeks if there is a qualifying social reason for the abortion and she agrees to the abortion. The woman may also have an abortion at any time throughout pregnancy for medical reasons or to save her own life, as long as the woman agrees to it (Supreme Council of the Russian Federation, 1993).

The wording of this paragraph has not changed between 1993 and 2011. The second paragraph states that abortion falls within the framework of compulsory medical insurance and only trained physicians can perform abortion in facilities that have a license for medical practice. The third paragraph establishes that the government at large and the “authorized executive body” regulate the lists of medical and social indications for abortion. Finally, the fourth paragraph maintains criminal punishment for providers of illegal abortions but does not specify what that punishment is (Supreme Council of the Russian Federation, 1993; Russian federal law no. 323-F3, 2011).

Another relevant article of the Law on Protection of Health is Article 37.2, which further establishes abortion as a free medical procedure. Article 37.2 discusses national financial support for medical care. The Russian State Duma added this article to the Law on Protection of Health early in 2006 (State Duma of the Russian Federation, 2005). The Article references two funding sources – the “Basic program of compulsory health insurance,” hereafter Basic Program and the “Program of state guarantees of free healthcare” (State Duma of the Russian Federation, 2005).

The Basic Program includes a list of medical conditions that are covered through the compulsory health insurance fund, such as cancer, diseases of major organ systems, traumas, congenital abnormalities, pregnancy, labor and delivery, and abortion (State Duma of the Russian Federation, 2005). This means that all the mentioned conditions, including abortion, must be free at all state-sponsored facilities to everyone who has health insurance. Each citizen receives the compulsory health insurance upon birth. Those who are employed get a small wage deduction to the Compulsory Health Insurance Fund every paycheck.

Male members of the Russian Parliament made several attempts to change Article 36 of the Law on Protection of Health to restrict abortion access, but only one of them partially succeeded. In 2003, parliament member Alexander Chyuev proposed that only abortions for medical reasons should be covered by compulsory health insurance, but the

State Duma rejected his proposal (State Duma of the Russian Federation, 2005). Next, in 2005, two other male members of parliament, Alexander Krutov and Nikolai Leonov, suggested to change the wording of Article 36 to limit a married woman's ability to get an abortion without the permission of her husband (Krutov, Leonov, 2005). Russian State Duma rejected their proposal in 2007 (State Duma of the Russian Federation, 2007).

In April 2011, another male parliament member, Anton Belyakov, proposed adding informed consent to the Article 36 of the Law on Protection of Health and restrict advertisements of abortion. Belyakov included some horrifying statistics about abortion complications in his explanatory note and used them as supporting arguments for his proposal, but he did not cite the source for any of these statistics, so it is unclear whether any of them are true. Specifically, he stated that 10-15% of all abortions have complications, 25-60% of maternal mortality is due to abortion, 50% of women have chronic inflammation after an abortion, and 7-8% become infertile (State Duma of the Russian Federation, 2011). While the State Duma denied Belyakov's proposal, it was due to a change already planned for the new version of the Law on Protection of Health (State Duma of the Russian Federation, 2011; Russian federal law no. 323-F3, 2011).

2011 – 2021. The new Law on Protection of Health came out on 21 November 2011. The President of Russia at the time, Dmitry Medvedev signed the law (Russian federal law no. 323-F3, 2011). The new edition of the Law on Protection of Health has 14 chapters and 101 total articles, so it is longer and more comprehensive than the previous version of the same law. One of the main reasons for the new edition of the law was to specify exactly which procedures are free and which are not. The law maintained that abortion is a covered medical expense under the Basic Program.

The main article allowing abortion, which was Article 36 in Chapter 7 in the previous edition of the Law on Protection of Health, became Article 56 in Chapter 6 in the new 2011 edition. The new article on abortion is longer than the old one and has eight total parts. The new edition of the law does not change the fundamental right to abortion upon request or the previously established gestational limits for abortion. The biggest additions to the new article on abortion were informed consent of the pregnant woman, mandatory waiting period between the consultation for abortion and the procedure of abortion, and abortion for women who were "legally recognized as incapacitated."

The new requirement of informed consent appears in the first part of Article 56 and links directly to a form that the pregnant woman has to sign. This means that the 2011 Law on Protection of Health directly regulates the language of informed consent and does not leave that up to the individual healthcare providers to discuss with their patients on the case-by-case basis.

The informed consent form has seven total sections, the longest of which is section two, which discusses the potential side effects of abortion procedure and complications after abortion (Ministry of Healthcare of the Russian Federation, 2016). There are no statistics on the informed consent form that show how common or rare any of the mentioned complications and side effects are, which can make them seem very scary to patients and, thus, affect their decision to get an abortion. This means that the addition of the specific language of informed consent with vague information may restrict access to abortion. The side effects of abortion are anesthesiologic difficulties, trauma to the uterus and surrounding organs, and bleeding that may require removal of uterus and other surrounding organs. The listed possible complications after an abortion, in this order, are:

1. Infertility
2. Chronic uterus inflammation
3. Ovarian disorders and pain
4. Ectopic pregnancy
5. Various difficulties in future pregnancies, including premature labor and bleeding
6. Psychiatric disorders
7. Pooling of blood in uterus and remains of embryo in uterus, which would require additional surgery to remove

The new waiting period for abortion appears in the third part of Article 56 of the Law on Protection of Health. It states that all abortions of women at the gestations age between 4 and 7 weeks or 11 and 12 weeks must take place at least 48 hours after the initial consultation. Abortions of women at the gestations age between 8 and 10 weeks must take place at least 7 days after the initial consultation. Inclusion of a mandatory waiting period is a policy that restricts access to abortion, especially when there are gestational term limits for abortion in place.

The final change is the addition of part 7, which allows abortions for adult women who are “legally recognized as incapacitated.” That phrase mostly relates to women with severe mental health disorders that prevent them from being able to make their own decisions. Part 7 of Article 56 of the 2011 Law on Protection of Health allows those women to undergo abortions even if they do not or cannot consent to the procedure.

Specifically, their legal guardian must file a case with the court and the court may allow the abortion. This part of the law aims to expand the access to abortion, but due to absence of the woman's consent, some may consider this to be a eugenic and generally unethical policy.

Since 2011, Russian parliament members proposed some additional changes to the Article 56 of the Law on Protection of Health, all of which aimed to decrease the number of abortions in Russia. The first one was in 2015, when parliament member Alexei Lisyakov proposed to add a policy that would require the "father" to pay for abortion-related expenses and institute an administrative punishment for not abiding by that rule (State Duma of the Russian Federation, 2016). The Russian State Duma rejected this proposal, but it is notable because it is the only proposal (that I could find) that acknowledges the male role in an unplanned pregnancy. The other notable proposal was also in 2015, when seven parliament members, four of whom were female, proposed requiring the pregnant woman to undergo an ultrasound to visualize the fetus and its heartbeat before an abortion. The Russian State Duma rejected this proposal in 2017 and cited that the proposed requirement violates the existing law allowing a woman to get an abortion (State Duma of the Russian Federation, 2017).

Changes in medical indications for abortion. Both the 1993 and 2011 editions of the Law on Protection of Health state that abortion is legal at any time throughout pregnancy in the presence of medical indications, but neither law specifies what those medical indications are. Following the publication of the 1993 law, the Russian Ministry of Healthcare released an order (no. 302) that included an instruction on the abortion procedure and a list of medical indications for abortion (Ministry of Healthcare of the Russian Federation, 1993).

The instruction for abortion states that the specialized physicians must sign off on an abortion for medical reasons. The list of medical indications has fourteen numbered categories of diseases, which include diseases of most major organ systems, such as diseases of genitourinary system, diseases of endocrine system, diseases of musculoskeletal system, and others. It also includes congenital disorders, such as chromosomal abnormalities. Each of the categories has several specific diseases, the presence of which allows abortion at any time throughout pregnancy. The last unnumbered category is called "physiological conditions," which lists age below 18 and above 40 as physiologically incompatible with pregnancy (Ministry of Healthcare of the Russian Federation, 1993).

The 1993 Russian list of medical indications is very similar to the 1982 Soviet list, but it certainly expanded access to abortion for medical reasons. The main changes are additions of some severe conditions and expansion of age groups for the "physiological conditions." In the 1982 document, girls under 16 and women over 45 qualified for a medical indication for abortion, while in the 1993 document girls under 18 and women over 40 qualify for it (USSR Ministry of Healthcare, 1982; Ministry of Healthcare of the Russian Federation, 1993). The 1993 document added HIV/AIDS infection as a medical indication for abortion under the first category of medical indications – infectious diseases. It also added:

- 11 conditions to blood disorders,
- 6 conditions to mental disorders,

- 10 conditions to nervous system disorders,
- 3 conditions to respiratory disorders,
- 2 conditions to digestive disorders,
- 10 conditions to genitourinary disorders,
- 1 condition to skin disorders,

The Russian Ministry of Healthcare adjusted the list of medical indications in 2007 (Ministry of Healthcare of the Russian Federation, 2007). The new list of medical indications has the same number of disease categories as the previous one. The only major change is that it no longer includes skin disorders, which got replaced with vision disorders. The other changes are minor.

Some categories of diseases lacked some specific conditions. For example, HIV infection, which was a condition under the first category (infectious diseases), disappeared from the list of medical indications for abortion and so did alcoholic psychosis from the fifth category of psychological disorders. The result is not necessarily more restrictive, however, since each category that lost some specific conditions either has a note that allows a coalition of physicians to decide if an abortion is necessary due to specific conditions not mentioned by the Ministry of Healthcare, or it includes new, broader conditions that may cover the specific conditions that were removed (Ministry of Healthcare of the Russian Federation, 2007).

In 2011, the Ministry of Healthcare published another order that added a gestational limit to some conditions (Ministry of Healthcare of the Russian Federation, 2011). Until 2011, the presence of any condition from the list of medical indications allowed abortion at any time during pregnancy. The 2011 order, which came a month after the new Law on Protection of Health limited abortion due to congenital abnormalities and physiological conditions to 22 weeks, which is also the limit for social indications for abortion.

Changes in social indications for abortion. Both the 1993 and 2011 editions of the Law on Protection of Health allow abortion for social indications until 22 weeks of gestation. The first document that regulated social indications for abortion in Russia was the 1996 Decree of the Russian government “On the approval of the list of social indications for artificial termination of pregnancy” (Government of the Russian Federation, 1996). The 1996 list of social indications for abortion expanded access to abortion for social reasons compared to the 1987 USSR document, which included seven indications for abortion. **The new indications added in the 1996 list are the ones in green.** The 1996 decree lists thirteen social indications for abortion:

1. Husband having a group I or II disability
2. Death of the husband during pregnancy
3. Stay of a woman or her husband in places of deprivation of liberty (prison)
4. A woman or her husband recognized as unemployed in accordance with the established procedure
5. Court decision on deprivation or restriction of parental rights
6. The unmarried woman
7. Divorce during pregnancy
8. Pregnancy due to rape
9. Lack of housing, living in a hostel, or in a private apartment

10. Woman with refugee or forced migrant status
11. Large number of children (number of children 3 and more)
12. The presence of a disabled child in the family
13. Income per family member is less than the subsistence level established for the region

The new social indications for abortion address the increase in poverty and overall tumultuous social dynamics in 1990s Russia following the dissolution of the USSR. Of the six new social indications, three (indications 4, 9, and 13) deal with poverty. Indication 6 provides unmarried women access to free abortion, which is a massive expansion of access compared to the 1987 document. Indication 10, which also appears in many other post-Soviet countries' lists, is a direct link to the fact that many people got displaced during or after the collapse of the USSR and thus became refugees in one of the countries that used to be united (Avdeev & Troitskaia, 1999; Verulava, T., & Maglakelidze, 2017).

The Russian government significantly shortened the list of social indications for abortion in 2003, thus reducing access to abortion. The decree from that year only kept four of thirteen social indications (Government of the Russian Federation, 2003). They were disability or death of husband, rape, incarceration of the pregnant woman, and lack of parental rights. Finally, in 2012, President Vladimir Putin signed a new decree that kept only one social indication for abortion – rape (Putin, 2012). I could not find any relevant policy proposals that explained the reason for reducing the number of social indications for abortion so drastically. In a span of 20 years, Russia went from having 13 social indications for abortion to 1, which decreased access to abortion.

Potential Causes of Gradual Erosion of Access to Abortion in Russia

Overall, Russia is one of the only countries in the world that establishes abortion as a woman's right within the main law that governs all of healthcare, which makes restricting access to abortion very hard for policymakers. The only way to change the Law on Protection of Health is through an official proposal to the State Duma and several specialized hearings. After the approval of the State Duma and specialized committees, the President may sign the law change, and only then it can take effect. The Russian government maintains abortion as a woman's right, which causes some conservative politicians to continuously argue for restriction of access to abortion (State Duma of the Russian Federation, 2005, 2007, 2011, 2014, 2016, 2017).

Russian government made changes to abortion access between 1991 and 2021 in ways that aligned with the general economic situation in the country. Directly after the USSR dissolution, the economy was slow. Wages were low, money was losing its value, and many people lost their jobs (Eggers et al., 2006). There was still no infrastructure to import high-quality contraceptives in quantities that would meet the demand of Russian residents, but imports rapidly rose throughout 1990s (Troitskaya & Andersson, 2007).

The national healthcare system with compulsory health insurance allowed for abortion in social and medical circumstances to be fully covered by the state and thus allowed women who qualified for a social or medical indication to get an abortion for free. Specifically, the lists of social and medical indications became levers that the government could push or pull, depending on the economic needs of the residents to increase or decrease access to *free* abortion. After the economy started stabilizing in early 2000s, most changes to social and medical indications for abortion, as well as the wording of the Law on Protection of Health drastically reduced access to free abortion, especially beyond 12 weeks of gestation.

The 2011 edition of the Law on Protection of Health makes the Russian abortion law more restrictive than before by adding a mandatory waiting period and the exact language of informed consent that emphasizes the rare complications of abortion. Russian parliament members made several attempts to ban abortion before 2011, but the State Duma rejected all of them. I did not find any policy proposals from any parliament members available on Консультант Плюс (Russian database for legal documents, similar to Google Scholar Case Law) that proposed a waiting period and a specific informed consent. However, both informed consent and mandatory waiting period are common policy tools that lawmakers worldwide use to restrict access to abortion (Henshaw et al., 1999; Finer & Fine, 2013).

A waiting period between the initial consultation and the abortion procedure diminishes access to abortion in several ways. First, it requires a second visit to the healthcare facility. That second visit may be inconvenient for the pregnant woman if she has a job or lives far away from the inpatient facility that can perform abortions (Henshaw et al., 1999; Denisov & Sakevich, 2015). The waiting period for abortion is also costly to the healthcare facility, as it requires two visits for every patient seeking abortion, which means that the physician must spend double time with each patient and, thus, only see half the patients they may be able to see without a mandatory waiting period (Guttmacher, 2021).

Next, the mandatory waiting period increases the delay for the procedure, which may extend past the legal gestational limit for abortion and, thus, make some pregnant women ineligible for an abortion (Finer & Fine, 2013). Finally, the waiting period may increase doubt. Even if the doubt is temporary, the woman may progress past the legal gestational age at which she may legally have an abortion.

Most of the research on waiting periods for abortion is from the United States, but the general results are applicable to any country that has a mandatory waiting period for abortion. Researchers agree that there is usually no medical reason for a waiting period between the initial consultation and the abortion procedure (Guttmacher, 2021). The waiting period does not usually change the pregnant woman's mind about her decision to have an abortion, but it does limit her access to abortion (Henshaw et al., 1999; Fine & Finer, 2013; Denisov & Sakevich, 2015; Guttmacher, 2021).

The mandated language of the informed consent is another policy tool that limits access to abortion. The informed consent form that Russian women must sign exaggerates the risks of abortion as a medical procedure. It does not cite how often any of the complications occur, which makes it seem like those complications are very common. When complications take up more than half of the informed consent document or discussion with the healthcare provider, the woman may decide not to get an abortion based on considerations for her health and fertility in the future.

The informed consent does not say that abortion is usually a very safe procedure and the complications usually only happen in some cases of illegal abortions performed outside of licensed healthcare facilities in Russia (Avdeev et al., 1995; Parkhurst et al., 2005; Denisov & Sakevich, 2015). I could not find any data on prevalence of abortion complications in Russia. Based on data in the US and Worldwide, only 1-2% of abortions performed in certified healthcare facilities end in complications (Upadhyay et al., 2015; Doctors Without Borders, 2020).

The drastic decrease in the number of social indications that allow abortion restricts access to abortion, especially for women with low fertility awareness. A woman may not know she is pregnant in time to visit her primary care physician, get a referral to an inpatient gynecological facility, have the initial consultation at that facility, wait for the mandatory period, and, finally, get an abortion all before 12 weeks of gestation. At that point, having a social reason for abortion would allow the woman to have the abortion, but that is no longer possible, unless the woman can prove in court that the pregnancy was a result of rape. The initial list of 13 social indications covered a wide range of social and economic issues that would make it difficult for the woman to raise a child. Reduction of social indications for abortion is the most drastic step the Russian government took in restricting access to abortion.

While the change in medical indications for abortion was relatively minor, it still restricted access for some women. The 2011 order of the Ministry of Healthcare put a 22-week limit on abortions due to congenital and chromosomal abnormalities or physiological conditions (too young or too old). Some women may not be aware of the congenital abnormalities before 22 weeks. An adolescent or an older female may also not be aware of their pregnancy, as they do not have regular cycles. Some congenital abnormalities get worse as the pregnancy progresses and may eventually pose a risk to a woman's life.

So, why did all these restrictive changes happen, if the Russian government established back in 1993 that every woman has a legal right to abortion? The main reasons likely are resurgence of Orthodox Christianity among the Russian population (Pew Institute, 2019, 2020), and the increase of abortion restrictions in other countries, like Poland and the US.

The Soviet government was anti-religious and banned teaching religion in school and at home (Bociurkiw, 1965; Fraser, 2017). Bolsheviks believed in “scientific atheism” and destroyed many historical mosques and cathedrals (Bociurkiw, 1965). The anti-religious propaganda was especially prevalent during the Cold War, as posters of astronauts in space with the words “There is no god” appeared around the country. While many people could quietly practice their preferred religion, Soviet politicians could not express those beliefs publicly (Bociurkiw, 1965; Fraser, 2017).

The Russian government established in its Constitution that everyone has a right to religious freedom (Constitution of the Russian Federation, 1993). While that did not have immediate effects, Russians could begin expressing their religious beliefs freely. The largest religious affiliation in Russia is Orthodox Christianity, with over 73% of the population practicing that religion as of 2010 (Pew Institute, 2019). Christianity at large, and specifically Orthodox Christianity declare that life starts at conception and that abortion is, therefore, murder of a human being (Baclig, 2010). About 43% of Orthodox Christians globally agree that abortion should be illegal in all or at least some cases (Pew Institute, 2020).

Many Russian politicians are affiliated with the Orthodox Church, including current president Vladimir Putin, who is often filmed visiting churches and praying on Christian holidays. Vladimir Putin has been the President of Russia from 2000 to 2008 and then again from 2012 to the present day. In 2017, Putin said that an abortion ban would not change the population decline in Russia (Lenta, 2017), and in 2021, he stated that it is important to convince women not to have abortions by making motherhood more affordable and making additional policies for children in Russia (Dmitrieva, 2021).

While there are no official records of this, Russian scholars cite the increasing influence of the Orthodox Church on the Russian government from early 2000s (Erofeeva, 2013). The policy proposals to limit access to abortion in 2005, 2007, 2011, 2014, 2016, 2017 do not mention religion, but commonly use language like "murder," "unborn baby," "future child," "saving lives," and "glory of motherhood," which are all common terms religious people use to justify limiting access to abortion (Erofeeva, 2013; Dmitrieva, 2021). The latest policy proposals, all of which the State Duma denied, proposed for abortion to be removed from the list of procedures covered by the compulsory medical insurance and introduction of required ultrasound visualization of the fetus and its heartbeat. Those are common policies in some US states.

The US is one of the countries that allows some aspects of abortion legislation to be varied state-by-state. In recent years, many states made changes to their legislation to restrict access to abortion. Twenty-four US states have laws that require a waiting period before an abortion procedure. Thirteen states mandate that informed consent must include information on fetal pain and eight states mandate the inclusion of information on negative psychological effects of abortion (all from Guttmacher, 2021). The strictest abortion law in the US is now in Texas, which bans abortion after a fetal heartbeat can be detected. Additionally, in 2022, the US Supreme Court reversed *Roe v. Wade*, so many more states have since implemented abortion-limiting practices (*Dobbs v. Jackson*, 2022).

While Russia and the US are not usually political allies, the Cold War set a standard for constant comparison of these two countries. Even when controversial, each abortion policy change in the US is broadcasted around the world, including Russia (Golubeva, 2020; Atanesyan, 2021). Russian politicians often cite US laws when talking about abortion in interviews (Atanesyan, 2021). When one country (or state) makes a specific policy restriction, other countries may also follow suit or react in some ways (Erofeeva, 2013). While abortion restrictions in the US do not directly cause any restrictions in Russia, the wording and goals of specific policy proposals in Russia are borrowed from the existing American laws in some states.

Conclusion

After the dissolution of the USSR, each post-Soviet country took steps to change its healthcare systems to make them fit the new national budget, which resulted in drastically decreased funding, number of hospital beds, the density of physicians, low GDP investment in healthcare, and increased share of out-of-pocket payments from patients in all post-Soviet countries (Murauskiene et al., 2013; European Commission, 2017; Habicht et al., 2018).

In turn, this resulted in abortion becoming a paid procedure in most post-Soviet countries, long wait times for free abortions in state-sponsored clinics in Eastern Europe, decreased quality of abortion in Moldova and the Baltic countries, and even increased maternal and infant mortality in Caucasus and South-Central Asia related to abortion and childbirth (Gamkrelidze et al., 2002; Rechel & Lessof, 2021).

Generally, all post-Soviet countries adapted some form of a mixed healthcare system, where private clinics can operate and charge fees and the government still provides some healthcare to its residents for free or reduced charges. The Eastern European countries maintained the closest form of a state-funded healthcare system to that of the USSR, as they could afford to do so financially, so all policlinics and hospitals remain state-owned and so do many pharmacies. While all European post-Soviet countries have a health insurance fund, patient copayments in the Baltic countries are higher than those in Eastern European countries, especially for abortion.

The Baltic countries also have much more privatization in their healthcare system than Eastern European post-Soviet countries, which is consistent with neoliberal economic policies for healthcare in other European countries (Kennedy, 2001; Mishtal, 2010). This shows the ideological alliance of Baltic countries with the EU instead of the Commonwealth of Independent States (CIS), which is an alliance of some post-Soviet countries and includes Russia, Belarus, Armenia, Azerbaijan, and all South-Central Asian post-Soviet countries.

Healthcare and thus abortion quality is generally lower in Asian post-Soviet countries, as they were much poorer than European post-Soviet countries upon dissolution and received a lot of international aid for reproductive healthcare to reduce their fertility and abortion rates (Olds & Westoff, 2004; Barrett & Buckley, 2007; Janevic et al., 2012; Witte, 2015). Because of that, their focus was on redesigning the healthcare system to make modern contraceptive availability higher than availability of abortion. While that seems to have worked for South-Central Asian countries, countries in the Caucasus region still have low contraceptive prevalence. Generally, healthcare in

Caucasus remains the worst in quality and the most expensive for patients among all post-Soviet countries (Hovhannisyan & Haqverdi, 2011; Verulava & Maglakelidze, 2017).

Even though the price of abortion varies greatly among post-Soviet countries, one common feature among all of them is the culture of unofficial payments for healthcare, including abortion, so it is very hard to estimate the true financial burden of abortion on women in each post-Soviet country. This practice was common in USSR, and persisted in all post-Soviet countries (Popovich et al., 2011; International Planned Parenthood Federation, 2012; Turcanu, Domente, Buga, Richardson, & World Health Organization, 2012; Richardson, et al., 2013; Lekhanet al., 2015; Murauskiene et al., 2013; European Commission, 2017; Habicht et al., 2018; Dominis et al., 2018). The culture of unofficial payments coupled with low monthly income and high official price of abortion in several post-Soviet countries poses a major financial barrier to abortion access.

Overall, the differences in healthcare system reforms of post-Soviet countries upon their independence affected all aspects of healthcare, including abortion. The main change was that abortion became a paid procedure in most countries. However, it stayed free in Russian state-sponsored clinics (in some cases). Other changes related to abortion access happened via changes in general healthcare laws, specific abortion laws, and some orders of the Russian Ministry of Healthcare. While Russian government drastically reduced the number of social indications for abortion past 12 weeks, it still maintained the same fundamental legality of abortion upon request until 12 weeks, in social circumstances until 22 weeks, and at any point for medical reasons. How did the other post-Soviet countries change their abortion laws? Find out in the next chapter.

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4: ABORTION LAWS IN POST-SOVIET COUNTRIES

Introduction

This chapter provides an overview of abortion laws in post-Soviet countries grouped by geographic regions mentioned before. The purpose of this chapter is to show that even though many changes occurred at different levels of abortion legislation in most post-Soviet countries, those changes are not sufficient to account for the differences in abortion rates among these countries after the USSR dissolution. This further proves the point many demographers have raised in the past – abortion rates do not go down when abortion laws become more restrictive.

I first discuss the main healthcare law in each post-Soviet country when the law was first passed and the chronological changes to it that impacted abortion legality. Next, I dive into specific abortion laws in each post-Soviet country to show the evolution of abortion access governed by smaller pieces of legislation, as none of the main healthcare laws govern specific social and medical indications for abortion. For the specific abortion laws, I use a chronological narrative for Eastern European countries and the Caucasus countries but separate the legal information by country for the Baltic countries and South-Central Asian countries.

The chronological narrative works well for discussing specific abortion laws in Eastern Europe and the Caucasus. In Eastern Europe similar changes in abortion laws happened at similar times, so a chronological approach shows the timeline of those changes. In Caucasus, there were generally fewer documents than in other countries and there were only a few changes to the laws on abortion, so it made sense to group them chronologically as well.

I discuss each of the Baltic countries separately instead of using a chronological narrative for two reasons. First, each of the main abortion laws is quite different, though they all aim to meet European Union (EU) standards, as Estonia, Latvia, and Lithuania are the only post-Soviet countries that joined the EU. Secondly, Baltics are different from other post-Soviet countries in that the three aforementioned legal documents are the only ones that govern abortion, so a chronological narrative would require me to confusingly jump back and forth between three similarly named documents with very different content. While I mention some additional documents, they are all linked in the body of the main abortion laws in Baltic countries and specifically state that they are a part of that law.

Finally, I discuss each of the South-Central Asian countries separately, as there are five of them and it would be very hard for the readers to keep track of five sets of similarly named pieces of legislation in a chronological manner. Additionally, changes to specific abortion laws in South-Central Asia happened at different times, so a chronological approach would not add much value to the discussion.

Each section begins with summative tables for readers' convenience. Please see Chapter 1: Methods for my systematic methodology for finding these documents. I covered Russian laws in great detail in the previous chapter, but it is a country in the Eastern European region, so a comparison of Russia's laws to the laws of those countries appears in each section on Eastern Europe, which means that I repeat some information from the previous chapter.

Original Main Healthcare Laws in Post-Soviet Countries after the Dissolution of the USSR

Every post-Soviet country has one main healthcare law. That law usually describes how the healthcare system operates, how it is financed, what rights and responsibilities patients and physicians have. Most of these laws appeared in 1990s and they are all quite similar in many aspects, including abortion (table 4.1).

Table 4.1

Main Healthcare Laws of Post-Soviet Countries and their Relation to Abortion

Country	Law title	Mentions abortion?	Year law went into effect	Mentions term limits for abortion?	Specific social or medical indications?
Russia	Law on Protection of Health	Yes	1993	Yes	No
Belarus	Law on Healthcare	Yes	1993	Yes	No
Moldova	Law on Protection of Health	Yes	1995	Yes [a]	No
Ukraine	Ukraine Health Fundamentals	Yes	1992	Yes	No
Estonia	Population Health Development Plan	Yes	2008	No	-
Latvia	Medical Treatment Law	Yes	1997	No	-
Lithuania	Health System Law	No	1994	-	-
Kazakhstan	Code on the Health of the People and the System of Healthcare	Yes	2009	Yes	No
Kyrgyzstan	Law on Protection of Health	Yes	1992	Yes (2005)	No
Tajikistan	Law on Protection of Health	Yes	1997	No	No
Turkmenistan	Law on Protection of Health	Yes	2002 [b]	Yes	No

Uzbekistan	Law on Protection of Health	No	1996	-	-
Armenia	Law on Medical Assistance and Services to the Population	Yes	1996	No	No
Azerbaijan	Law on Protection of Public Health	Yes	1997	Yes	No
Georgia	Law on Healthcare	Yes	1997	Yes [a]	No

[a] Only specified term limit upon request – 12 weeks.

[b] I was not able to access the 2002 version, only the 2009 edition of the same law.

As seen in table 4.1, there are many similarities among the main healthcare laws of post-Soviet countries, and most of them are even named similarly. Not a single main healthcare law in any of the post-Soviet countries specifies the exact social or medical indications for abortion. The Ministry of Healthcare or other governmental agencies decide those in separate smaller legal documents. Only two countries do not include a woman's legal right to abortion in their main healthcare law – Lithuania and Uzbekistan (Saeimas of the Republic of Lithuania, 1994; Cabinet of Ministers of Uzbekistan, 1996). Also, all three Baltic countries, Uzbekistan, and Armenia do not list term limits for abortion in their main healthcare law (Saeimas of the Republic of Lithuania, 1994; Cabinet of Ministers of Uzbekistan, 1996; National Assembly of Armenia, 1996; Saeima of Latvia, 1997; Ministry of Social Affairs of Estonia, 2008). This means that smaller pieces of legislation govern term limits for abortion in Baltic countries, Uzbekistan, and Armenia. Those are easier to change and overturn than the country's main healthcare law.

Eastern Europe. In Eastern Europe, Ukraine was the first to publish its version of the main healthcare law in 1992, Belarus and Russia followed in 1993, and Moldova only published its first main law on healthcare in 1995. The only term limit for abortion in the Moldovan main law on healthcare is for abortion upon request – 12 weeks (Parliament of Moldova, 1995), while the main healthcare laws of the other three Eastern European post-Soviet countries also include gestational limits for abortion in social and medical circumstances.

The original Ukrainian main healthcare law allowed abortion in social and medical circumstances until 28 weeks, while the Russian and Belarussian laws set that limit at 22 weeks (Verkhovna Rada of Ukraine, 1992; Supreme Council of Republic of Belarus, 1993; Supreme Council of Russian Federation, 1993). Notably, 28 weeks was the original USSR term limit for abortions in social circumstances (USSR Ministry of Healthcare, 1987). In Ukraine, 28 weeks was also the limit for abortions in medical circumstances, while Belarus and Russian allowed abortion for medical reasons at any point during pregnancy, just like the 1987 USSR law.

Therefore, the original main healthcare law of Ukraine kept most of the same USSR legislation on abortion, but reduced the gestational limit in medical circumstances, while the same laws in Belarus and Russia also kept most the same legislation on abortion but reduced the term limit for abortion in social circumstances. Note that both policy changes technically restrict access to abortion, but for different groups of women, compared to the abortion law in the USSR. However, all four Eastern European post-Soviet countries added the right to abortion to their main healthcare law, which gives abortion much higher legal standing in those countries compared to its status in the USSR, when it could be overturned with one simple Act or Decree. Also, the language in all those documents is very similar, which points to a similarity in healthcare policy ideology of Eastern European countries in 1990s.

Baltic countries. Among Baltic countries, Estonia's and Latvia's main healthcare documents mention abortion, though in very different ways, while Lithuania's document does not mention abortion at all. Latvia's Medical Treatment Law discusses abortion briefly under the section titled "profession of doctor" with emotionally charged terms like "unborn life" when referring to an embryo or a fetus (Saeima of Latvia, 1997). The law states that it is a physician's duty to "protect the unborn life and dissuade a pregnant woman from terminating pregnancy" if the pregnancy is not dangerous for her health (Saeima of Latvia, 1997). The same law also allows physicians to refuse to perform an abortion if there are no medical indications for it. As of 2022, this wording has not changed since 1997 (Saeima of Latvia, 2022), which signals the persistent negative attitude of Latvian government towards abortion and a potential barrier for women seeking abortions upon request, as physicians can refuse to perform an abortion.

In contrast, Estonia's 2008 document briefly mentions high rates of induced and repeated abortions and notes that one of the crucial government-level goals is preventing unintended pregnancies and sexually transmitted diseases (Ministry of Social Affairs of Estonia, 2008). This wording signals the government's acceptance of abortion and understanding of its main cause – high prevalence of unplanned pregnancies due to poor understanding of fertility. Note that the Estonian main healthcare law is much more recent than the Latvian one, but the Latvian law has not changed its language on abortion since the law entering into force in 1997.

South-Central Asia. There are some notable things about the main healthcare laws in South-Central Asia. Kyrgyzstan was the first to create its own main healthcare law in 1992, Uzbekistan did the same in 1996, Tajikistan in 1997, Turkmenistan in 2002, and Kazakhstan in 2009. While Uzbekistan is the only country among the South-Central Asian post-Soviet countries where the main healthcare law does not mention abortion at all (Cabinet of Ministers of Uzbekistan, 1996), the WHO still links it as one of the foundational documents for abortion legislation in Uzbekistan (World Health Organization, 2022).

Also, Kyrgyzstan only explicitly mentioned abortion in the 2005 edition of its main healthcare law, while the original 1992 law was vague, but stated that a woman had a “right to decide the issue of motherhood herself” – very standard language that appears in most such laws when they allow abortion (Supreme Council of Kyrgyzstan, 1992; Supreme Council of Kyrgyzstan, 2005).

Tajikistan’s law on healthcare mentions abortion and that it is allowed upon request, in social, and medical circumstances. It does not mention any term limits but designates a specific law to regulate all reproductive health issues - Law of the Republic of Tajikistan on Reproductive Health and Reproductive Rights (Supreme Council of Tajikistan, 1997).

Both Kazakhstan’s and Turkmenistan’s main healthcare laws allows abortion upon request until 12 weeks, in social circumstances until 22 weeks, and at any point during pregnancy in medical circumstances (Parliament of Kazakhstan, 2009; President of Turkmenistan, 2009). The language of the Turkmenistan’s law is very similar to the laws in Eastern European post-Soviet countries, though it is worth noting that I was unable to locate the original 2002 version of Turkmenistan's main healthcare law, only the 2009 version.

One unique theme in Kazakhstan's main healthcare law is the focus on morality, ethics, and abortion prevention. It requires physicians to discuss "moral, ethical, and psychological negative consequences" of an abortion before and after the procedure (Parliament of Kazakhstan, 2009). This is an explicit ideological barrier to abortion, as the law states that the purpose of this counseling is to reduce the number of abortions in Kazakhstan. Such ideological barriers do not exist in the texts of any other main healthcare laws in Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

Caucasus. All three Caucasus countries include abortion in their main healthcare law. Notably, Azerbaijan's law includes legal term limits for abortion upon request, in social, and in medical indications, Georgia's law includes term limits for abortion upon request only, and Armenia's law does not mention any term limits at all (National Assembly of Armenia, 1996; Parliament of Georgia, 1997; Government of Azerbaijan, 1997).

Armenia's main healthcare law only briefly mentions abortion within the context of reproductive rights and does not explicitly state that a woman has a right to decide issues of motherhood on her own, which is standard language that appears in most such laws in most post-Soviet countries (National Assembly of Armenia, 1996). Georgia's law mentions the term limit for abortion upon request only, leaving abortions for social and medical indications up to the jurisdiction of the Ministry of Health, but explicitly states that reducing the number of abortions is a priority of the state (Parliament of Georgia, 1997). According to some scholars, the Georgian law was synchronized with the UN, WHO, European Council, and other international pacts and declarations, which allowed for a more European approach to healthcare policy in Georgia than in Armenia and Azerbaijan (Verulava & Kalandadze, 2001).

Chronological Changes to the Main Healthcare Laws Related to Abortion in Post-Soviet Countries

Some changes to the main laws on healthcare occurred in seven of fifteen post-Soviet countries from 1991 to 2022 (table 4.2). All changes relevant to abortion were in Eastern European countries, South-Central Asian countries and in Georgia. Most of the changes were about term limits, mandatory waiting periods before an abortion, physician's rights to decline an abortion, and abortion rights of legally incapacitated women and children. In short, most of these changes restricted access to abortion in some way at the highest legislative level (table 4.2).

Table 4.2

Changes Regarding Abortion in Main Healthcare Laws of Post-Soviet Countries

Country	Law title	Year law went into effect	Year(s) of most significant changes	Specific changes
Russia	Law on Protection of Health	1995	2011	New waiting period for abortion, specific informed consent, abortions for legally incompetent women
Belarus	Law on Healthcare	1993	2014	Abortions for legally incompetent women, psychological counselling

				before an abortion, and a physician's right to decline performing an abortion
Moldova	Law on Protection of Health	1995	-	-
Ukraine	Ukraine Health Fundamentals	1992	2007	Gestational limit for social and medical indications decreased from 28 to 22 weeks
Estonia	Population Health Development Plan	1995	-	-
Latvia	Medical Treatment Law	1997	-	-
Lithuania	Health System Law	1994	-	-
Kazakhstan	Code on the Health of the People and the System of Healthcare	2009	-	-
Kyrgyzstan	Law on Protection of Health	1992	2005	Explicitly mentions abortion and term limits
Tajikistan	Law on Protection of Health	1997	2017	Abortions for gender selection are illegal, medico-social pre- and post-abortion counseling is required
Turkmenistan	Law on Protection of Health	2002	2015	Term limit for abortion upon request reduced from 12 to 5 weeks
Uzbekistan	Law on Protection of Health	1996	-	-
Armenia	Law on Medical Assistance and Services to the Population	1996	-	-
Azerbaijan	Law on Protection of Public Health	1997	-	-

Georgia	Law on Healthcare	1997	2014	Article 139: Added a mandatory 5 day waiting period before an abortion Article 140: Prohibited advertisement of abortion

Eastern Europe. In Eastern Europe, Ukraine was the first to change its law on healthcare in 2006 by reducing the legal limit for social and medical abortions to 22 weeks (Council of Ministers of Ukraine, 2006). This made Ukraine's law more similar to Russia's and Belarus's law in terms of limits for social indications. However, the 2006 version of Ukraine's main healthcare law no longer had the terms "medical" and "social indications," as they got replaced with the new term "special circumstances." That can be seen as both a decrease and an increase in access to abortion, depending on who and when is interpreting and enforcing the law.

As I showed in the previous chapter, the biggest change to the main healthcare law in Russia that was in 2011, when the government added a required informed consent of the pregnant woman before an abortion, a mandatory 2-7-day waiting period between consultation and the procedure of abortion, and allowed legal abortion upon request of the legal representatives for women "legally recognized as incapacitated" (Russian federal law no. 323-F3, 2011).

The government of Belarus made a small change to their main law on healthcare in 2014. That year, there were three key additions related to abortion– abortions for legally incompetent women, psychological counselling before an abortion, and a physician's right to decline performing an abortion (Supreme Council of Belarus, 2014). The law maintains that since a woman has a right to abortion, the medical organization must redirect her to a physician willing to perform the procedure if a physician declines (Supreme Council of Belarus, 1993; Supreme Council of Belarus, 2014).

In 2019, the Ministry of Healthcare of Belarus started an open public discussion of potential changes to their main healthcare law and the first point of contention was the removal of the abortion article from the law altogether, which would make abortion illegal (Ministry of Healthcare of Republic Belarus, 2019). The online discussion lasted from 21 to 30 August 2019 and allowed all residents of Belarus to provide input on potential changes to the law on healthcare. After that, the Ministry of Healthcare posted a table with the results and their final decision on each topic. No changes to abortion legislation happened after that discussion. The Belarus Ministry of Healthcare maintained that abortion is a woman’s right and even brought evidence from countries where abortion is banned to show that illegal abortion does not reduce abortion rate or increase birth rate, but rather increases maternal mortality rate and brings an unnecessary burden on the women (Ministry of Healthcare of Republic Belarus, 2019).

Baltic countries. Notably, there were no significant changes in the main healthcare laws of Baltic countries related to abortion. Latvia’s and Lithuania’s laws remained exactly the same as the original laws discussed in the previous section of this chapter (tables 4.1 and 4.2), while the latest version of Estonia’s Population Health Development Plan makes “age-appropriate sex education for different target groups and increasing awareness of sexual and reproductive health, counseling programs for informed family planning, birth of healthy children, protection of maternal health and reduction of abortions” some of its main goals (Ministry of Social Affairs of Estonia, 2019). This signals that Estonian government is concerned about the high number of abortions and plans to make programs that would prevent unwanted pregnancies, which is the same logic from Estonia's original 2008 document (Ministry of Social Affairs of Estonia, 2008).

South-Central Asia. There were some changes in the main healthcare laws in South-Central Asian post-Soviet countries. As I mentioned before, the only change in Kyrgyzstan was the explicit addition of abortion and term limits to the main healthcare law in 2005, but no other changes occurred since then (Supreme Council of Kyrgyzstan, 2005; Supreme Council of Kyrgyzstan, 2021). The wording of this law is very similar to the main healthcare laws in Russia, Ukraine, and Belarus, which shows ideological similarities among governments of these countries on abortion.

The main change in abortion access at the highest legislative level in South-Central Asia happened in 2015 in Turkmenistan, when its President reduced the term limit for abortions upon request from 12 weeks to 5 (President of Turkmenistan, 2015). That move basically banned all abortions, as over 97% of abortions in Turkmenistan were done before 12 weeks based on a woman's request (International Planned Parenthood Federation, 2022; Yaylymova, 2022).

Interestingly, the 2015 reduction of the term limit for abortion upon request in Turkmenistan seems to have happened in secret, so it is unclear when the law actually entered into force or whether it was enforced at all until 2022 (International Planned Parenthood Federation, 2022; Yaylymova, 2022). The government of Turkmenistan explained their decision to reduce the term limit for abortion upon request in a larger

2018 letter to the UN about human rights in Turkmenistan (Government of Turkmenistan, 2018). That document states that a mini abortion is safer than any other abortion and has best results before 5 weeks of gestation. Therefore, to prevent complications during abortions and protect women's health, Turkmenistan's government is only allowing physicians to perform mini abortions before 5 weeks of gestation upon a woman's request and surgical abortions in social and medical circumstances until 22 weeks. It is unclear who read that document or whether someone presented it at a UN meeting at all.

Evidently, the global community did not know about Turkmenistan's term limit reduction for abortions upon request, as the 2019 report by the Organisation for Economic Co-operation and Development, which is an international organization, states that abortion is legal until 12 weeks upon request in Turkmenistan (Organisation for Economic Co-operation and Development, 2019). The first public news of the law reducing the term limit for abortion upon request came in May of 2022. The International Planned Parenthood Federation explicitly states that the law was passed in secret and hid from citizens (International Planned Parenthood Federation, 2022). Journalists spoke out about the dangers of such a low gestational limit for abortion upon request, as many women do not know that they are pregnant by the fifth week and, thus, would have to carry out a pregnancy to term unless they have a social or a medical reason for abortion (Yaylymova, 2022).

The 2017 Code of Health of Tajikistan, which is the descendant of the original 1997 main law on healthcare, still maintains most of the same language on abortion as the previous main healthcare law of Tajikistan. The 2017 version also adds that abortions for gender selection are illegal, and that medico-social pre- and post-abortion counseling is required (Supreme Council of Tajikistan, 2017). It is not clear what “medico-social counseling” involves exactly.

As of 2022, Kazakhstan and Uzbekistan have not made any changes to their main healthcare laws in related to abortion. Kazakhstan’s law maintains the same legislation on abortion as when the laws first entered into force – abortion is legal until 12 weeks upon request, until 22 weeks in social circumstances, and at any time during pregnancy for medical reasons (Parliament of Kazakhstan, 2009 Parliament of Kazakhstan, 2020). The latest version of Uzbekistan’s main healthcare law still does not explicitly mention a woman’s right to abortion. This means that Uzbekistan is the only South-Central Asian post-Soviet country where abortion has never been a part of the main healthcare law.

Caucasus. Among Caucasus countries, only Georgia made changes to its main healthcare law related to abortion (table 4.2). In 2014, Parliament of Georgia added a mandatory 5-day waiting period for abortion and outlawed any advertisement of abortion, just a couple years after Russia made the same legal changes (Russian federal law no. 323-F3, 2011; President of Georgia, 2014). The language on abortion in Armenia’s and Azerbaijan’s main healthcare laws remains the same as in the original documents as of 2022 (National Assembly of Armenia, 1996; Government of Azerbaijan, 1997).

Specific Abortion Laws in Post-Soviet Countries

Just like Russia, each post-Soviet country has a series of smaller pieces of legislation specifically related to abortion. Usually those are orders, declarations, proclamations, acts, and decisions of governing bodies like Cabinets of Ministers, Supreme Councils, or Ministry of Health (or a similar health-related agency). Ministries of Health (or similar health-related agencies) also published clinical practice guidelines on abortion in several countries.

These smaller pieces of legislation govern the specific social and medical indications for abortion. Most medical indications are the same among all post-Soviet countries, as they came from a list of dangerous medical conditions originally established in USSR (table 4.3). The biggest differences come from changes in social indications for abortions (table 4.4).

Table 4.3

Evolution of Medical Indications for Abortion in Post-Soviet Countries

Country	Legal at 22 weeks - medical	Legal at any time - medical	Number of medical indications in 1990s	Number of medical indications in 2000s	Number of medical indications in 2010s
USSR (1982)	Yes	Yes	16	-	-
Russia	Yes	Yes	15	15	15
Belarus	Yes	Yes	1[a]	15	12
Moldova	Yes	No	16[b]	16[b]	16[b]
Ukraine	Yes	No	14	14	14
Estonia	Yes	No	5	19	16
Latvia	Yes	No	16[b]	16[b]	16[b]
Lithuania	Yes	Yes, until 2023	16	16	16
Kazakhstan	Yes	Yes	16[b]	12	12
Kyrgyzstan	Yes	Yes	16[b]	16[b]	14
Tajikistan	Yes	Yes	16[b]	16[b]	16[b]
Turkmenistan	Yes	Unknown	16[b]	16[b]	16[b]
Uzbekistan	Yes	Unclear, varied guidance in the same document	16[b]	16[b]	15
Armenia	Yes	No	16[b]	14	16

Azerbaijan	Yes	Yes	16 [b]	16 [b]	9
Georgia	Yes	No	16 [b]	16 [b]	14

[a] Belarus had a list of four indications of fetal abnormalities that would all fall under one category in the USSR list.

[b] I could not find relevant documents for this time period for this country, so I used the number from the original number of indications from the USSR list or the latest document from that country.

Table 4.4

Evolution of Social Indications for Abortion in Post-Soviet Countries

Country	Legal at 22 weeks - social	Number of social indications in 1990s	Number of social indications in 2000s	Number of social indications in 2010s
USSR (1987)	Yes	7	-	-
Russia	Yes	13	5	1
Belarus	Yes	7	7	2
Moldova	Yes	7 [a]	9	9
Ukraine	Yes	9	8	8
Estonia	No	0	0	0
Latvia	No [b]	7 [a]	0	0
Lithuania	No	0	0	0
Kazakhstan	Yes	7 [a]	11	10
Kyrgyzstan	Yes	7 [a]	11	11
Tajikistan	Yes	13	13	13
Turkmenistan	Yes	7 [a]	7 [a]	5 [c]
Uzbekistan	Yes, until 2019	7 [a]	11	0
Armenia	Yes	7 [a]	5	4
Azerbaijan	Yes	12	12	12
Georgia	Yes	7 [a]	7 [a]	3

[a] I could not find relevant documents for this time period for this country, so I used the number from the original number of indications from the USSR list or the latest document from that country.

[b] Latvia considers rape (specifically a legally documented rape in a law enforcement agency) an indication for a medical abortion that can only be performed in a hospital and only until 12 weeks, so it is not technically a social indication, nor is it legal until 22 weeks.

[c] This number comes from a newspaper article (Turkmenportal, 2022), so it may be incorrect.

Eastern Europe and comparison to Russia. Shortly after the publication of the main law on healthcare, the governing bodies in each Eastern European country worked on specific guidance on abortion. Russia, Ukraine and Belarus released guidance documents on medical (table 4.5) and social (table 4.6) indications within a year of the release of their main law on healthcare. Notably, I could not find any similar Moldovan documents from 1990s. Because of that, I assume that the situation in Moldova regarding abortion for social and medical indications followed the original USSR guidance until early 2000s. Overall, the governments of Belarus and Ukraine used small pieces of legislation to reduce the number of social indications for abortion over time, like Russia, while Moldova did not change its legislation on abortion for over a decade after the dissolution of USSR.

Table 4.5

Medical Indications for Abortion in Eastern-European Post-Soviet Countries in 1990s and Comparison to the USSR

Conditions	USSR (1982)	Russia (1993)	Ukraine (1993)	Belarus (1994)
Infectious diseases	Yes	Yes	Yes	No
Cancer	Yes	Yes	Yes	No
Blood disorders	Yes	Yes	Yes	No
Endocrine disorders	Yes	Yes	Yes	No
Mental disorders	Yes	Yes	Yes	No
Nervous system disorders	Yes	Yes	Yes	No
Vision disorders	No	Yes	Yes	No
Cardiovascular disorders	Yes	Yes	Yes	No
Respiratory disorders	Yes	Yes	Yes	No
Digestive disorders	Yes	Yes	Yes	No
Genitourinary disorders	Yes	Yes	Yes	No
Pregnancy, labor and post labor period disorders	Yes	Yes	Yes	Yes*
Musculoskeletal and connective tissue disorders	Yes	Yes	No	No
Fetal anomalies, deformities and chromosomal disorders	Yes	Yes	Yes	Yes
Physiological disorders	Yes	Yes	Yes	No
Other reasons	Skin disorders	-	Skin disorders	-

Table 4.6

Social Indications for Abortion in Eastern-European Post-Soviet Countries in 1990s and Comparison to the USSR

Condition	USSR (1987)	Russia (1996)	Belarus (1994)	Ukraine (1993)
Rape	Yes	Yes	Yes	Yes
Husband's death	Yes	Yes	Yes	Yes
Husband in prison	Yes	Yes	Yes	Yes
Pregnant woman in prison (often grouped with husband in prison)	Yes	Yes	Yes	Yes
Divorce	Yes	Yes	Yes	Yes
Pregnant woman got maternal rights taken away	Yes	Yes	Yes	Yes
Paternal rights got taken away (usually grouped with maternal rights)	No	Yes	No	No
Disability of pregnant woman	No	No	No	No
Disability of husband	No	Yes	No	No
Presence of disabled child	Yes	Yes	Yes	Yes
Unmarried	No	Yes	No	No
Extramarital pregnancy	No	No	No	No
3 or more children	Yes	Yes	Yes	Yes
Woman is refuge	No	Yes	No	No
Unemployed woman	No	Yes	No	No
Unemployed husband (usually grouped with unemployed woman)	No	Yes	No	No
Lack of housing	No	Yes	No	No
Other	-	-	-	Severe injury or illness of husband

Russia was the first among these countries to publish a specific medical guidance on abortion with the list of medical indications for abortion in 1993. Within a month, the

Ukraine published its first original guidance on abortion and Belarus followed suit in 1994. Notably, this guidance came from the Ministry of Healthcare in Russia and Belarus, but from the Council of Ministers in Ukraine (Council of Ministers of Ukraine, 1993; Ministry of Healthcare of the Russian Federation, 1993; Ministry of Healthcare of the Republic of Belarus, 1994). This is interesting, as both the Ukrainian and Belarussian documents included lists of social and medical indications for abortion, but Ukrainian government did not delegate that to their Ministry of Healthcare. The list of medical indications in Russia and Ukraine was very similar to the original USSR list, but the Belarussian list was much shorter than the USSR list (table 4.5).

The Ukrainian document includes fifteen categories of medical conditions that allow the woman to qualify for abortion until 28 weeks (table 4.5). Fourteen of those categories are medical conditions and the last one is about age, just like in the preexisting USSR list and the Russian list published around the same time. All of these are serious and sometimes life-threatening conditions (Council of Ministers of Ukraine, 1993). This document also has eight social indications for abortion (table 4.6). The only difference between the Ukrainian list of social indications and the USSR list is the Ukrainian addition of the “severe injury or illness of husband” to the list (Council of Ministers of Ukraine, 1993).

Medical and social indications for abortion in Belarus appeared in 1994 via an order of the Ministry of Healthcare. That order contained, what it referred to as, medico-genetic indications for abortion, social indications for abortion, and an instruction on the abortion procedure (Ministry of Healthcare of Republic of Belarus, 1994). The seven social indications for abortion are exactly the same as the USSR indications from 1987. However, there were only four medico-genetic indications for abortion:

1. A defect incompatible with life or uncorrected at the current level of medical care;
2. Chromosomal disease or non-chromosomal syndromes, accompanied by mental retardation;
3. Hereditary metabolic disorders;
4. X-linked diseases in a male fetus.

The above list of medico-genetic indications for abortion is much shorter than the 1982 USSR list, which included 15 categories of diseases (USSR Ministry of Healthcare, 1982). That means that the creation of the above list decreased access to abortion in Belarus after the dissolution of the USSR. Specifically, all conditions in the above list would fit under only one category in the 1982 USSR list (table 4.5).

In 2000s, economy was beginning to stabilize in Eastern European post-Soviet countries. At that time, the governments of Belarus and Ukraine took steps to reduce access to abortion in various ways, which is similar to what Russia did at the same time (see previous chapter). Some scholars attribute this to the resurgence of the Orthodox Church and religion as a whole (Erofeeva, 2012; Frazer, 2017). Most of these changes occurred via specific decrees and orders by the Ministries of Healthcare. For example, in 2002, the Ministry of Healthcare of Belarus allowed physicians in private clinics perform abortions if they have a special license for it (Ministry of Healthcare of Republic of Belarus, 2002). Parliament of Moldova published its very first Law on the Protection of Reproductive Health in 2001 and updated it multiple times over the years, yet no version of that law includes any information on abortion (Parliament of Moldova, 2001; 2012).

In 2002, Belarus significantly expanded its list of social indications for abortion and standardized its list of medical indications with other Eastern European post-Soviet countries (Council of Ministers of Republic Belarus, 2002). There is a 2002 Moldovan document that likely establishes the social and medical indications for abortion, but I could not find it.

That same year, the Council of Ministers of Belarus published an order with a new list of social indications for abortion. This list included four new social indications and maintained all previously stated ones. The new social indications are listed below. While a new version of the list came out in 2008, it included all the same social indications as the 2002 list (National register of legal acts of Belarus, 2008). Notably, all new social indications were included in the 1996 list of Russian social indications:

1. parental rights being taken away (note that this does not say maternal, so it applies to both the pregnant woman and her male partner),
2. refugee status of the pregnant woman,
3. disability of the woman’s husband,
4. unemployment of the pregnant woman or her husband.

The Belarus Ministry of Healthcare also updated the medical indications for abortion in 2002. The new list of medical indications was almost exactly the same as the preexisting USSR list (Ministry of Healthcare of Republic Belarus, 2002). The 2002 iteration of the list of medical indications for abortion increased access to abortion compared to the 1994 list but did not change it compared to the original USSR list. In 2007, the Ministry of Healthcare of Belarus updated the list of medical indications again. This time the list no longer had fifteen categories of medical indications, instead, it included 63 specific diseases that used to fall into those categories. The chromosomal abnormalities disappeared from the list and the "physiological" age for abortion increased from 40 to 45 years old (Ministry of Healthcare of Republic Belarus, 2007).

In 2006, the Ukrainian Council of Ministers also updated their list of medical and social indications for abortion. The new list of medical indications was largely the same as before, but the list of social indications shrunk significantly. From the existing social conditions, only two were left – pregnancy due to rape and onset of disability during pregnancy (Council of Ministers of Ukraine, 2006). It is unclear if the second reason is in relation to the pregnant woman or her partner/husband. The new list merged the social and medical indications in one table, which was likely a preemptive step before the 2007 revision of the Ukrainian main law on healthcare, which no longer included the terms "social" and "medical indications." The Ukrainian government revised these documents several times in 2010s.

Ukrainian Ministry of Healthcare created the clinical practice guidelines on abortion in 2010 and updated them in 2013. The guidelines cite the WHO standards for abortion and stress the importance of access to abortion (Ministry of Healthcare of Ukraine, 2010). Similar clinical practice guidelines exist in Russia, Belarus, and Moldova. Overall, these documents are evidence-based and do not include any language that may defer a woman from receiving an abortion. The instructions state that the woman must make her choice whether to undergo an abortion freely and should only receive information relevant to her, without the medical provider trying to influence her decision in any way (Ministry of Healthcare of Ukraine, 2013).

In 2010, Ministry of Healthcare of Republic Moldova published a document on abortion that included sixteen categories of medical and nine social indications for abortion (Ministry of Healthcare of Republic Moldova, 2010). Unfortunately, that document is fully in Romanian and I could only find a scanned PDF version of it, which means I could not translate it. The Ministry of Healthcare updated this document in 2020 and published it is Russian. That version also included seventeen categories of medical and nine social indications, so I am moving forward assuming that there were no significant changes to abortion legislation in Moldova in 2010s.

The main change in abortion legislation in 2010s in Eastern European post-Soviet countries happened in Belarus in 2013. That year the Belarus Council of Ministers edited the list of social indications for abortion and abolished all but two of them. The only two acceptable social indications for abortion were pregnancy that resulted from rape and parental rights being taken away from the pregnant woman (Council of Ministers of Republic Belarus, 2013). Recall from the previous chapter that the Russian government abolished all but one (court-documented rape) social indication for abortion in 2012 (Putin, 2012). Therefore, it is likely that the government of Belarus followed Russia's lead in terms of abortion policy (Vasilevich, 2018). As of 2022, Belarus maintains those two as the only acceptable social indications for abortion.

In 2014, the Belarussian list of medical indications once again consisted of categories of conditions, but only included twelve of them. It removed the physiological conditions (too young or too old), musculoskeletal conditions, and vision disorders (Ministry of Healthcare of Republic Belarus, 2014). Vision disorders were not a separate category in any of the Belarus lists of medical indications, but they were usually included in the disorders of the nervous system. The final change in the 2014 list of medical indications for abortion was the separation of indications from the perspectives of the pregnant woman and the fetus, which brought back the possibility of abortion due to a fetal chromosomal abnormality. Based on my research, no other changes to the list of medical indications for abortion happened in Belarus as of 2022.

In 2020, Moldova Ministry of Healthcare published “Standard on pregnancy termination in safe conditions,” which is the first document (that I found and could read) that establishes 22 weeks as the legal limit for abortions in social and medical circumstances and provides other important guidance on abortion (Ministry of Healthcare, Labor, and Social Security of Republic Moldova, 2020). Specifically, it states that all women after an abortion must leave with a selected method of contraception and that pre- and post-abortion counseling is required for all abortions. Finally, it provides the informed consent form that all women must sign prior to receiving an abortion. Throughout the document, the themes of confidentiality and providing women with medically correct unbiased information appear several times. This document, like the Ukrainian clinical guidelines, cites WHO standards (Ministry of Healthcare, Labor, and Social Security of Republic Moldova, 2020).

Appendices 1 and 2 of the “Standard on pregnancy termination in safe conditions” list the medical and social indications for abortion in Moldova. It is unclear when these lists first appeared, as there is no reference to previous versions of this document. There are seventeen categories of medical indications and nine social indications. The medical indications include the fifteen standard indications (ones that appear in most other post-Soviet countries too), as well as hearing and skin disorders. Appendix 1 (medical indications) also explicitly states that any rare disorders or any disorders that may threaten the life of the pregnant woman warrant an abortion.

Appendix 2 provides the list of social indications for abortion. The social indications for abortion in Moldova as of 2020 are:

1. The age of the pregnant woman is under 18 and over 40;
2. Pregnancy resulting from rape, incest or human trafficking;
3. Divorce during pregnancy;
4. Death of a spouse during pregnancy;
5. Imprisonment or deprivation of parental rights of one or both spouses;
6. Pregnant women in the process of migration;
7. Pregnant women with 5 or more children;
8. Pregnant women caring for:
    1) a child under 2 years old;
    2) one or more family members with a severe degree of disability, in need of care, according to the conclusion of the Medical Examination viability.
9. A combination of at least 2 circumstances: lack of a place of residence, absence livelihood, alcohol abuse and/or drugs, family violence, vagrancy

The biggest changes in abortion legislation in Eastern European post-Soviet countries were gradual reduction of social indications for abortion and addition of specific informed consent for abortion. Both changes reduced access to abortion, but the language of informed consent in Belarus, Ukraine, and Moldova is highly scientific and likely does not sway the woman’s intention. The physician’s right to refuse an abortion in

Belarus may have decreased access to abortion slightly, but I could not find any relevant data to support this argument.

Changes in the Belarus legislation on abortion are mostly restrictive and are very similar to the changes in Russia. It is interesting to look at the full timeline and how close to each other the events in Russia and Belarus occurred. While Belarus does not have a mandatory waiting period for abortion, some Belarussian scholars advocate for its implementation citing the Russian law as an example (Vasilevich, 2018). Both countries accept abortion at the highest legislative level, but both have been using social and medical indications as levers to decrease access to abortion.

Ukraine has a very scientific approach to abortion and leaves the final decision on availability of abortion between 12 and 22 weeks to the physicians at the clinics where women may seek abortions. The Ministry of Healthcare documents also show the straightforward way in which the Ukrainian government keeps track of abortions in Ukraine, as it lists specific documents and registers that the abortion providers must use to input the pregnant woman's information for statistical purposes. The Ukrainian government reduced the legal timeframe for abortions in special circumstances from 28 to 22 weeks and significantly condensed the list of social indications for abortion between 1991 and 2021. However, it seems that abortion in Ukraine is easily accessible as both state and private clinics, as many people from Poland travel to Ukraine regularly to get abortions in private clinics (Mamo, 2021).

Moldova, like Ukraine, adopted a scientific approach to abortion. It maintains one of the highest numbers of social indications for abortion in 2022. However, the "Standard on pregnancy termination in safe conditions" only came out in 2020, while Ukraine had similar clinical practice guidelines in 2010. A study in 2005 concluded that the quality of abortions in Moldova was low compared to other countries (Comendant, 2005) and the government made a goal to increase the quality of reproductive healthcare afterwards. Additionally, my research on Moldova is likely lacking compared to the other countries in Eastern Europe, as there were many documents in Romanian that I could not read or translate.

Baltic countries. Each of the Baltic countries has a separate law that governs abortion, since the main healthcare laws do not, as I showed in the previous section of this chapter. Estonia's Termination of Pregnancy and Sterilization Act and Lithuania's Order on Termination of Pregnancy focus solely on abortion and sterilization, while Latvia's abortion law is inside of a more general law titled Sexual and Reproductive Health Law. Hereafter, I refer to these laws as the main abortion laws in Baltic countries. Overall, Baltic countries had a significant deterioration of access to abortion, as they got rid of all social indications for abortion as early as 1990s (table 4.4).

Lithuania. Ministry of Health Protection of the Republic of Lithuania signed the Order on Termination of Pregnancy into law in 1994. The first sentence immediately provides a reason for the law – to reduce the number of abortions and their associated complications (Ministry of Health Protection of the Republic of Lithuania, 1994). This law makes the previous USSR law invalid, while maintaining the same 12-week timeframe for abortion upon request. It also specifies that after 12 weeks, a physician can only terminate an abortion for medical reasons, regardless of gestational age and lists five locations for the whole country of Lithuania where medical commissions that allow abortions after 12 weeks operate (Ministry of Health Protection of the Republic of Lithuania, 1994). Those five locations are large regional hospitals, travelling to which can pose a large barrier to abortion access to many women, especially those in rural areas. However, the Order also states that medical abortions are free, while all other abortions are paid. The Order also has a list of sixteen categories of medical indications for abortion, including skin conditions, hereditary and congenital anomalies, woman's age under 13 or over 49.

Surprisingly, the Order on Termination of Pregnancy mentions that spousal consent is preferred for all abortions and that if a physician suspects an illegal abortion, they must immediately report the woman to the prosecutor's office (Ministry of Health Protection of the Republic of Lithuania, 1994). Preference for spousal consent and prosecution of pregnant women for illegal abortions make this law quite misogynistic and restrictive, which is not in line with the EU standards (Norkus, 2011).

The only update to Lithuania's Order on Termination of Pregnancy occurred in 2022 and will take effect in 2023. The new edition of the Order is completely reorganized and only allows abortions for medical reasons until 22 weeks, like the other Baltic countries. Another big change affected the list of medical indications. The new Order does not have most of the previously mentioned medical indications. Instead, it has two lists – one for the pregnant woman and one for the fetus. The list for the pregnant woman only has four reasons for a medical abortion – incest or sexual abuse (this is usually a social indication), age under 14, age over 49, failed legal abortion prior to 12 weeks of gestation (Ministry of Health Protection of the Republic of Lithuania, 2022). The list for the fetus is much longer and includes most known congenital and hereditary syndromes and abnormalities, all of which would have fallen under one medical indication in the original USSR list. Still, the Order mentions that a medical abortion can be performed if the pregnancy endangers the pregnant woman's life or health. That statement is not specific enough and leaves a lot of room for physician commissions in five regional hospitals to make decisions about second trimester abortions.

Overall, Lithuania got rid of all social indications for abortion and only allowed abortion for medical reasons until 22 weeks. Later, it also changed the list of medical indications for abortion and only allowed five large hospitals to have committees with doctors who can allow an abortion for a medical reason.

Estonia. Estonia's Parliament enacted the Termination of Pregnancy and Sterilization Act in 1998. It has four chapters – definitions, abortion, sterilization, and other relevant laws. The second chapter is the longest and most relevant for my work. The preparatory documents for this law cite the Patient's Rights Declaration of the World Health Organization (1994), the European Convention on Human Rights and Biomedicine (1997), and practice and laws in Sweden and Finland (Oja, 2017). It states that nobody can force a woman to get an abortion and that a woman has a right to an abortion upon request until the end of 11th week of pregnancy, which is another way of saying "until 12 weeks of gestation" (Parliament of Estonia, 1998). It also states that abortion after 11 weeks and before the end of 21 weeks are only allowed in five situations:

1. Pregnancy endangers the health of the pregnant woman

2. “Unborn child” has severe mental or physical impairments
3. Pregnant woman’s illness makes it impossible to raise a child
4. Pregnant woman is younger than 15 years of age
5. Pregnant woman is older than 45 years of age

The first three reasons require a coalition of three doctors to agree to an abortion (Parliament of Estonia, 1998). The Act also states that only a gynecologist in a licensed facility can perform an abortion, but every gynecologist has a right to refuse to perform an abortion. Abortions for medical reasons and treatment for miscarriage must always take place in a hospital. All physicians performing abortions must complete a set of diagnostic tests and explain the biological and medical nature of abortion, as well as potential risks to the patients (Parliament of Estonia, 1998). For two weeks after an abortion, the woman may see the same gynecologist who did her abortion without an appointment. All facilities that perform abortions must fill out specific abortion forms so the government for the government to calculate the total number of abortions in the country. However, the 1998 version of the Termination of Pregnancy and Sterilization Act specifically states that this information is sensitive and is not for data collection purposes (Parliament of Estonia, 1998; Ministry of Social Affairs of Estonia, 1999).

Seven total revisions of the Termination of Pregnancy and Sterilization Act occurred as of 2022. In 2002, the Parliament of Estonia added § 16, 17, and 18 to chapter 2 on abortion, all of which focused on data collection, specifying that collection of data on births, deaths, and abortions is a duty of Ministry of Social Affairs of Estonia, as a member of the WHO (Parliament of Estonia, 2002).

In 2006, the Parliament of Estonia added links to guidance documents that have previously existed for abortion but were not linked or mentioned in the Termination of Pregnancy and Sterilization Act directly (Parliament of Estonia, 2006). Specifically, the Act cited the list of medical indications, which the Ministry of Social Affairs first made in 2000, but it only entered into force in 2002. The list of medical indications included nineteen categories of health conditions of the pregnant woman or the fetus that would warrant an abortion between 12 and 22 weeks, including skin and ear disorders and poisoning of the fetus (Ministry of Social Affairs of Estonia, 2000).

The document specifies that all conditions mentioned in the list of medical indications for abortion are from the International Statistical Classification of Diseases and Related Health Problems Tenth Revision, which gives the list a lot of credibility and makes it very similar to such lists in other post-Soviet countries (Ministry of Social Affairs of Estonia, 2002). The official database of Estonian laws states that this specific list of medical indications for abortion is expired as of 2015, but I could not find a document that replaced it, so it is unclear what medical indications for abortion in the second trimester exist in Estonia as of 2022.

The other documents introduced in the the 2006 version of the Termination of Pregnancy and Sterilization Act were form requirements for pre- and post-abortion counseling, procedures for termination of pregnancy, and the procedure and rational for establishing an abortion database (Ministry of Social Affairs of Estonia, 1999; 2000; 2002). Notably, the document on establishing the abortion database states that all data entered into this database is public, unless otherwise noted by law and that both public and private facilities must submit all required data on abortion (Ministry of Social Affairs of Estonia, 2000). The document on abortion database and the form requirement for abortion counseling expired in 2015, while the document on abortion procedure is still in force.

Parliament of Estonia made some small changes to the Termination of Pregnancy and Sterilization Act between 2008 and 2010. In 2008, the Public Information Act got linked to the explanation about the establishment of the abortion database (Parliament of Estonia, 2008). In 2009, Parliament of Estonia ruled that if person with “limited legal capacity” disagrees with their legal guardian’s decision to abort a fetus, a court must decide whether abortion is needed (Parliament of Estonia, 2009). In 2010, a small wording change occurred where all instances of “Minister of Social Affairs” got replaced with “Minister responsible for the field,” which signals that the Ministry of Social Affairs may no longer be responsible for abortion regulation or that its name would change (Parliament of Estonia, 2010).

Some more changes to Estonian abortion law happened in 2015 and 2019. In 2015, the Parliament stated that women with “limited legal capacity” no longer need to get a court opinion if they disagree with their legal guardian about an abortion – the choice falls only on the pregnant woman. However, a physician must advise her to consult her legal guardian about important life decisions, like raising a child (Parliament of Estonia, 2015). The same year Estonia’s abortion law became more consistent with that of all other post-Soviet countries, as it replaced the confusing wording of “until the end of 11th week” to “until 12 weeks.” It also required a social worker to be part of the coalition of doctors deciding whether an abortion between 12 and 22 weeks is acceptable (Parliament of Estonia, 2015). While not specifically stated, the additional of a social worker adds a social component to the second trimester abortions, which, depending on the social worker's attitude towards abortion could either limit or expand a woman's access to an abortion in the second trimester. In 2019, Parliament of Estonia removed § 16, 17, and 18 in chapter 2, which were added in 2002 regarding abortion data collection (Parliament of Estonia, 2019).

Overall, Estonia restricted access to abortion in the same way Lithuania did – by deleting all social indications for abortion. The list of medical indications is comparable to the USSR list, but the general access to abortion for most people got reduced because of deletion of all social indications for second trimester abortions.

Latvia. Latvia's law on abortion exists inside the Sexual and Reproductive Health Law, which the Saeima (Parliament) of Latvia adopted in 2002. I could not find evidence of any earlier law on abortion or reproductive health, so the USSR law from 1987 likely stayed in place until 2002 in Latvia. The Sexual and Reproductive Health Law has six chapters – general provisions and definitions, assistance with deliveries, sexually transmitted diseases, infertility, birth control, and, finally, abortion (Saeima of Latvia, 2002). Of all legal documents on abortion in Baltic countries, this is the most biased, as it imposes the duty of discussing moral aspects of abortion on the physicians.

Chapter 6 of Latvia's Sexual and Reproductive Health Law states that an abortion upon request or in the case of rape documented by a law enforcement institution is legal until 12 weeks, while an abortion for medical reasons is legal until 22 weeks (Saeima of Latvia, 2002). Rape is hard to document and prosecute, so very few abortions due to rape actually take place in Latvia. A woman must read the information about the moral implications of abortion, possible complications, and the “possibility to preserve the life of the unborn child” approved by the Minister of Health prior to the abortion and the gynecologist must discuss this document with the woman as her pre-abortion counseling and continue telling her about possible complications on the day of abortion (Saeima of Latvia, 2002). The law states that if there is a dispute between a pregnant woman under 16 years of age and her legal guardians about abortion, an Orphan’s Court must make a decision regarding abortion.

Saeima of Latvia made several changes to the original Sexual and Reproductive Health Law related to abortion. First, in 2004, a mandatory waiting period of 72 hours got added to the Law, which imposes a large barrier to abortion access in Latvia (Saeima of Latvia, 2004). In 2005, termination of pregnancy was added to the definition of reproductive health in the first chapter of the Law (Saeima of Latvia, 2005). In 2007, Saeima allowed abortions for medical reasons to occur until 24th week, prolonging the previous limit by two weeks (Saeima of Latvia, 2007).

In 2018, a new article (article 28) appeared in chapter 6 of the Sexual and Reproductive Health Law, which required healthcare facilities to inform the abortion patients (in all cases under 22 weeks, whether it is an abortion upon request, a stillbirth, or an abortion for a medical reason) in writing about the possibility of receiving and burying fetal remains after an abortion (Saeima of Latvia, 2018). If the patient refuses to bury the remains, the healthcare facility must treat the remains with “human dignity.”

In 2019, a new part of informed consent on abortion appeared in the Sexual and Reproductive Health Law, specifying that the physicians should talk to patients about receiving benefits after “preserving the life of an unborn child,” but there is no link to any document or explanation of any possible benefits (Saeima of Latvia, 2019).

The only other document regarding abortion in Latvia that I could find was the 2003 Termination of Pregnancy Organizational Procedure Law, so it is unclear what the medical indications for abortion are or whether there are any other reasons for abortion. That law explains the procedure for abortion, needed diagnostics and analgesics, and mentions genital and extragenital diseases, but does not specify them anymore (Cabinet of Ministers of Latvia, 2003).

However, the official UN report on abortion in Latvia states that abortion is allowed for social and economic reasons, as well as in cases of any danger to the pregnant woman’s physical or mental health, so it is unclear what medical and/or social indications for abortion actually exist in Latvia as of 2022 (United Nations Department of Economic and Social Affairs, Population Division, 2014).

Overall, Latvia’s restriction of the abortion law is similar to Estonia’s and Lithuania’s approach. However, the addition of a mandatory waiting period before an abortion, the clause about burial of fetal remains after an abortion, and the mandatory informed consent focused on the morality of abortion and “possibility of saving an unborn life” make this law the most restrictive of the three Baltic laws. It is clear that the purpose of the Latvian law is to dissuade women from having abortions in general, which is against the EU and the UN standards (European Commission, 2017; 2021; United Nations, 1995).

While there was little to no resistance to abortion being legal in Estonia in the early 1990s, the sentiment against abortion legality started growing in 2000s, as the

Estonian Council of Churches questioned whether the abortion act was constitutional multiple times (Oja, 2017). There was strong opposition to abortion being legal in both Latvia and Lithuania, so the negative attitude towards abortion is especially apparent in their laws, as they often use emotionally charged terms like “unborn life” and Latvian main healthcare law states that it is a physician’s duty to “protect unborn life and dissuade a pregnant woman from [abortion]” (Saeima of Latvia, 1997).

Below is the list of main changes in abortion legislation in Estonia, Latvia, and Lithuania following the dissolution of USSR and my assessment of how each change affected access to abortion in those countries (table 4.7).

Table 4.7

Changes in Abortion Legality in Estonia, Latvia, and Lithuania (1991–2022)

Country	Change	Year	Did the change increase or restrict access to abortion?
Latvia	Abortion becomes a paid procedure in all healthcare facilities unless it is for a medical reason.	1993	Restrict
Lithuania	<u>First law on abortion</u>: legal until 12 weeks upon request, no limit for medical reasons, no social indications. Spouse consent for an abortion is preferred. Abortion is a paid procedure unless it is for medical reasons.	1994	Restrict
Latvia	Medical Treatment Law states that it is a physician’s duty to “protect unborn life and dissuade a woman from abortion] and that a physician has a right to refuse an abortion.	1997	Restrict
Estonia	<u>First law on abortion</u>: Abortion for medical indications is only allowed until the end of 21st week, no social indications for abortion, Estonian Health Insurance Fund subsidizes the price of an abortion upon request by 30%.	1998	Restrict

Latvia	First law on abortion: Women must read, sign, and discuss with the physician informed consent approved by Ministry of Health that focuses on moral aspects of abortion and the "possibility to preserve the life of the unborn" Only social indication is rape, and it still requires an abortion before 12 weeks.	2002	Restrict
Latvia	Mandatory 72 hours waiting period before an abortion.	2004	Restrict
Latvia	Abortions for medical indications becomes legal until 24th week.	2007	Increase
Estonia	People with "limited legal capacity" must consent to an abortion. If they do not consent, a court must determine if abortion is needed.	2009	Unclear
Estonia	People with "limited legal capacity" must consent to an abortion, no court order needed. "End of 11th week" is substituted with "until 12 weeks" and "end of 21 week" with "until 22nd week," a social worker must be a part of a physician commission that can allow an abortion in the second trimester.	2015	Increase
Latvia	After an abortion or a miscarriage under 22 weeks, a healthcare facility must inform the woman in writing about the possibility of burial of fetal remains. If she refuses, the hospital must treat the remains with human dignity.	2018	N/A, but relevant
Lithuania	Abortion for medical indications is only allowed until 22 weeks, new and reduced list of medical indications for abortion.	2022	Restrict

As seen in table 4.7, all changes in abortion legislation in Baltic countries after the dissolution of USSR focused on restricting access to abortion, primarily via deletion of social indications for abortion in the second trimester and making abortion a paid medical procedure. The addition of a mandatory waiting period in Latvia in 2004 is another barrier to abortion access. The 2018 addition of the requirement to notify a woman after an abortion or a miscarriage about possibility of burying the remains or treating them with human dignity does not immediately affect abortion access in Latvia, but can definitely be emotionally traumatic for women after an abortion, thus dissuading them from repeat abortions.

South Central Asia. An initial review of legal documents paints a bright picture of widely accessible abortion, modern contraception, and sex education in South-Central Asian post-Soviet countries, thanks to all the international aid those countries received for their reproductive healthcare (see the previous chapter for details). However, many researchers point to inconsistencies between the law and its application in each country, like the lack of sex education in schools of Kazakhstan (Ministry of Health of Kazakhstan, 2018; Kabatova & Marinin, 2018) despite the generous UNICEF and WHO funding for it (Olds & Westoff, 2004) and several mentions of the importance of sex education of adolescents in foundational UN documents (United Nations, 1995).

There are also reports of persistent violations of women's rights like forced sterilization in Uzbekistan (Antelava, 2013) and bride kidnapping in Kyrgyzstan (Government of Kyrgyzstan, & Ministry of Economics of Kyrgyzstan, 2020). As of 2022, the government of Tajikistan continues to promote the traditional role of women in the society (Henry & Juraqulova, 2020), while the government of Turkmenistan recently banned women from sitting in the front seat of a car or marrying a man without Turkmen citizenship (International Planned Parenthood Federation, 2022; Yaylymova, 2022).

While keeping the international aid for family planning in mind, it is important to consider the culture of South-Central Asian countries and the place of a woman in that culture. While each country pronounced itself a secular state after the USSR dissolution, over 80% of residents in each country are Muslim and thus traditional Islamic values affect women's everyday lives (Antelava, 2013; Henry & Juraqulova, 2020; Pew Institute, 2019). Because of that, it is not surprising that being unmarried is a social indication for abortion until 22 weeks in Tajikistan and in Kazakhstan (until 2020). Generally, South-Central Asian countries have some of the longest lists of social indications for abortion (table 4.8).

Table 4.8

Social Indications for Abortion in South-Central Asian Countries

Country	Kazakhstan		Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan	
Year	2001	2020	2009	1998	Unknown	2013	2019
Death of husband during wife's pregnancy	Yes	Yes	Yes	Yes	Yes	Yes	No
Stay of a woman or her husband in places of deprivation of liberty	Yes	Yes	Yes	Yes	Yes	Yes	No
The woman or her husband is recognized as unemployed in accordance with the established procedure	Yes	Yes	Yes	Yes	No	No	No
A court decision on deprivation or restriction of parental rights	Yes	Yes	Yes	Yes	No	Yes	No
Unmarried woman	Yes	No	No	Yes	No	No	No

Divorce during pregnancy	Yes	Yes	Yes	Yes	Yes	Yes	No
Pregnancy as a result of rape	Yes	Yes	Yes	Yes	No	Yes	No
Disability of husband	No	No	Yes	Yes	Yes	Yes	No
Presence of a disabled child in the family	Yes	Yes	Yes	Yes	Yes	Yes	No
Lack of housing (living in a hostel or shared apartment)	No	No	No	Yes	No	No	No
Woman has the status of a refugee or forced migrant	Yes	Yes	Yes	Yes	No	No	No
Having too many children	Yes, 4	Yes, 4	Yes, 3	Yes	No	Yes, 4	No
Income per family member is below the poverty threshold	No	No	Yes	Yes	No	Yes	No
Woman is too young	Yes, 2008	Yes	No	No	No	Yes (under 17)	No
Malformations of the fetus	No	No	No	No	No	Yes	No

Kyrgyzstan. In 2000, the Supreme Council of Kyrgyzstan adopted a Law on Reproductive Rights of Citizens, which covered many topics from abortion to surrogacy in detail in its 30 articles (Supreme Council of Kyrgyzstan, 2000). Article 20 of this law discusses surgical sterilization in the exact same words (surgical prevention of unwanted pregnancy) as the 1992 Law on Protection of Health of Citizens (Supreme Council of

Kyrgyzstan, 1992). That provides reason to argue that the 1992 law actually talked about sterilization instead of abortion, so the 2000 Law on Reproductive Rights of Citizens was actually the first *law* to regulate abortion specifically in Kyrgyzstan.

Article 21 of Kyrgyzstan's Law on Reproductive Rights of Citizens specifically deals with abortion, stating that it is legal until 12 weeks upon request, until 22 weeks in social circumstances, and at any point during pregnancy for medical reasons (Supreme Council of Kyrgyzstan, 2000). However, this law does not state what the social or medical indications for abortion are or where one can find them. Licensed physicians can perform abortions in both state and private healthcare facilities. This law also mandates free pre-and post-abortion counseling for family planning and that a minor needs parental consent for abortion. Article 22 deals with confidentiality, stating that all reproductive health matters discussed with a healthcare professional must be kept confidential (Supreme Council of Kyrgyzstan, 2000), which is quite progressive for South-Central Asia at the time.

The Supreme Council of Kyrgyzstan updated the Law on Reproductive Rights of Citizens several times. The first update was in 2003 and it restricted abortions for medical reasons to 22 weeks and declared that abortions can be performed in private healthcare facilities without mentioning public facilities at all (Supreme Council of Kyrgyzstan, 2003). The next change came in 2007, when the Supreme Council of Kyrgyzstan renamed and reorganized the Law on Reproductive Rights of Citizens. The new name was Law on the Reproductive Rights of Citizens and Guarantees for their Implementation (Supreme Council of Kyrgyzstan, 2007).

There are some logical inconsistencies in Kyrgyzstan's 2007 Law. It stresses the importance of the institute of family and preserving positive national traditions and values in article 4, while maintaining that national traditions and other psychological factors cannot limit the rights of citizens to protect their reproductive health in article 10 (Supreme Council of Kyrgyzstan, 2007).

The 2007 Law included three changes relevant to abortion. First. abortions for medical reasons were once again allowed at any point during pregnancy. Next, pre- and post-abortion counseling was no longer free as per the law. Lastly, if the pregnant woman seeking abortion was a minor, she needed to consent to an abortion as her parental consent was no longer enough, but if the woman was married, her husband had to consent to an abortion, as her own consent was also no longer enough (Supreme Council of Kyrgyzstan, 2007).

This directly contradicts the 2005 version of the Law on Protection of Health of Citizens, which states that every woman had a right to abortion and to decide on issues of motherhood by herself (Supreme Council of Kyrgyzstan, 2005). The latest relevant update to the Law on the Reproductive Rights of Citizens and Guarantees for their Implementation was in 2015, when the government stopped requiring husband's consent for abortion and outlined specific and neutral informed consent for abortion (Supreme Council of Kyrgyzstan, 2015). Further updates t the same law in 2016 and 2019 did not involve abortion.

It is quite difficult to pinpoint the timeline of changes in social and medical indications for abortion in Kyrgyzstan. I found a demo (first page only) version of the 2005 Order of the Ministry of Health on Approval of Instructions on the Procedure for

Performing Artificial Termination of Pregnancy, which makes the similarly named 1987 USSR Order invalid. This document contains the list of medical indications for abortion in Kyrgyzstan and was updated twice – in 2006 and 2009. However, I cannot access any of those documents, so I cannot provide adequate information about medical indications for abortion in Kyrgyzstan until 2017, when a clinical protocol on safe abortion came out.

The first official legal document on social indications for abortion in Kyrgyzstan I could find was from 2009. A Russian-language educational site called Studwood mentions the 1996 Orders no. 242 and 567 of the Ministry of Health of Kyrgyzstan and lists 13 social reasons for abortion that those Orders declared (Studwood, 2021). However, upon reading those orders, I learned that they were orders of the Russian government, not Kyrgyz Ministry of Health (Government of Russian Federation, 1996). It is unclear whether physicians used those thirteen social indications for abortion until 2009 in Kyrgyzstan.

The 2009 document does not mention any prior documents that it made invalid, so it is likely the first legal document to discuss social indications for abortion in Kyrgyzstan. It states that a woman needs her husband's consent for an abortion and lists eleven social indications (table 4.8) for abortion until 22 weeks (Government of Kyrgyzstan, 2009). The only two indications that did not appear in the 2009 list that existed in the 1996 [Russian] list were homelessness and being unmarried (Government of Russian Federation, 1996; Government of Kyrgyzstan, 2009).

The 2017 clinical protocol on safe abortions is the only document I could find that discusses both social and medical indications for abortion in Kyrgyzstan, as well as a detailed guide for physicians performing different types of abortions (Expert Council for

Quality Evaluation of Clinical Guidelines and Protocols, 2017). The clinical protocol lists twelve social indications, which include eleven indications from the 2009 list and adds being underage as a social indication for abortion until 22 weeks. It also lists fourteen categories of medical indications for abortion, including skin conditions like Pemphigus vulgaris (Expert Council for Quality Evaluation of Clinical Guidelines and Protocols, 2017).

The changes in abortion legislation in Kyrgyzstan showed the prevalence of traditional values in mid-2000s, which restricted access to abortion by requiring a husband's consent and only allowing medical abortions until 22 weeks. However, the changes in 2010s fixed that by basically reforming back to the original law that did not require a husband's consent and allowed abortions for medical reasons at any time. While there is some confusion around social indications for abortion, the 2017 list still remains in force and is quite comprehensive.

Kazakhstan. The first legal *document* on abortion in Kazakhstan that I could find was the 2001 Order of the Chairman of the Agency for Health Affairs. That document does not mention any previous document that it made invalid, so there is reason to assume that this was the first piece of legislation that governed abortion in Kazakhstan after the USSR dissolution. The Order lists social and medical indications for abortion, outlines the procedure and needed labs for each type of abortion at each gestational age (Ministry of Health of Kazakhstan, 2001).

The general tone of the document is neutral. There are ten social indications (table 4.8) for abortions until 22 weeks and eleven categories of medical indications for an abortion at any point during pregnancy. Notably, common medical indications for an abortion like pregnancy complications, congenital and chromosomal disorders of the fetus are missing from the list. The Order states that a woman needs a permission of a special medical commission for an abortion for social or medical reasons but does not specify how many people are needed (Ministry of Healthcare of Kazakhstan, 2001). A small change to the Order in 2002 allowed abortions to be performed at both private and public healthcare facilities if they were licensed to perform abortions (Ministry of Health of Kazakhstan, 2002).

The first *law* that governed abortion in Kazakhstan was the 2004 Law on the Reproductive Rights of Citizens and Guarantees for their Implementation[11] (Parliament of Kazakhstan, 2004). It has all the same wording as the 2009 Code on the Health of the People and the System of Healthcare, signaling that the 2004 law was the foundational abortion law in Kazakhstan. The 2009 Health Code made the 2004 law invalid, but it carried on the same legislation (Parliament of Kazakhstan, 2009).

Kazakhstan Ministry of Healthcare made some small changes to the Order on abortion in late 2000s and 2010s. In 2008, a new Order by the Minister of Healthcare came out. It added requirements for family planning consultations before and after an abortion, fetal genetic anomalies to medical indications for abortion, and an eleventh social indication for abortion until 22 weeks – being underage without additional specification (Ministry of Health of Kazakhstan, 2008). In 2009, the new version of the Order mentioned the new 2009 Health Code (main healthcare law of Kazakhstan) but did not change anything for abortion (Ministry of Health of Kazakhstan, 2009). In 2020, a

[11] Note the similarity of the name of this law to the similar law in Kyrgyzstan.

new Order mentioned the new 2020 Health Code, removed blood disorders (namely anemia) from the list of medical indications for abortion, and removed being single/unmarried from the list of social indications for abortion (Ministry of Health of Kazakhstan, 2020).

Overall, Kazakhstan only changed its abortion legislation from that of USSR ten years after its independence. As of 2022, Kazakhstan maintains comprehensive lists of social and medical indications for abortion, but the government made some minor tweaks in those indications over the last twenty years, mainly by deleting being unmarried form the list of social indications for abortion. Generally, it seems that abortion is legally accepted and widely practiced in Kazakhstan, especially in urban areas.

Tajikistan. Supreme Council of Tajikistan enacted the Law on Reproductive Health and Reproductive Rights in 2002 and edited it in 2015, but no relevant changes to abortion legislation occurred in that time, so, basically, there have been no changes in abortion law in Tajikistan since 2002. This is the law that the main healthcare law of Tajikistan cites as the primary and specific abortion legislation. However, this document does not include any term limits for abortion. It simply restates everything from the main healthcare law and adds that coercion to birth and abortion is prohibited (Supreme Council of Tajikistan, 2015). I could not find an official government document with a list of medical indications for abortion in Tajikistan.

According to the International Planned Parenthood Federation (IPPF), which is a non-profit that works with many countries to compile summative reports on abortion laws and access around the world, abortion in Tajikistan is legal upon request until 12 weeks, in social circumstances until 22 weeks, and at any point during pregnancy for medical reasons (International Planned Parenthood Federation, 2012). It lists the orders from Tajikistan Ministry of Health that I could not find (table 4.11). Presumably, those orders contain the list of medical indications for abortion.

IPPF maintains that as of 2012, Tajikistan still uses its list of social indications for abortion from 1998 (International Planned Parenthood Federation, 2012). In 1998, the government of Tajikistan published a decree on social indications for abortion, which features thirteen total indications, which are the same as the Russian 1996 indications (table 4.8; Government of Russian Federation, 1996; Government of Tajikistan, 1998). It is unclear what the status of social indications for abortion are as of 2022 in Tajikistan, but it is likely that all thirteen still remain in force, as I could not find any opposing evidence in legal, scholarly, or news articles.

Overall, there were not many reforms in Tajikistan regarding abortion, at least based on the documents I could find. It is unclear what pieces of legislation specifically discuss term limits for abortion in social and medical circumstances. If the 1998 list of social indications is still in force in 2022, that is the longest list of social indications for abortion in post-Soviet countries.

Turkmenistan. I was unable to find specific legal documents on abortion in Turkmenistan. IPPF does not have any information on Turkmenistan, but it has information on laws for all other post-Soviet countries (International Planned Parenthood Federation, 2009; 2012). It is also the only post-Soviet country the UN does not have abortion data for, so it is excluded from my analysis in the following chapter on fertility indicators. Below is all I could find on abortion law specifics in Turkmenistan.

A Committee on the Elimination of Discrimination against Women wrote a report about Turkmenistan in 2011. That report states that abortion for social reasons is available until 28 weeks, which is strange, considering that the 2009 Law on Protection of Health states that the legal limit for abortions due to social indications is 22 weeks (Committee on the Elimination of Discrimination against Women, 2011; President of Turkmenistan, 2009). This report also states that the Ministry of Health is actively working on clinical protocols for safe abortions and will soon begin drafting clinical protocols for drug-induced abortion.

This is important because I found a website of the Regional Reproductive Health and Rights Coalition, which posted links to multiple documents from Turkmenistan, Uzbekistan, Armenia, Kyrgyzstan, and Kazakhstan on abortion. The only documents linked for Turkmenistan are 2017 and 2020 clinical practice guidelines for performing abortions (Regional Reproductive Health and Rights Coalition, 2022). Those documents do not have any identifying information, like authors or an agency that made them. They also only cite Russian laws and studies, so I cannot be certain that those clinical practice guidelines belong to Turkmenistan. The only evidence that these documents are the clinical practice guidelines from Turkmenistan is that they all mention abortion upon request until 5 weeks. Regardless, those clinical practice guidelines do not mention social or medical indications for abortion.

The only mention of social indications for abortion I could find was in a Turkmenistan newspaper from 2022, when an article about restriction of abortion upon request from 12 to 5 weeks was first published. That article lists 5 social indications for abortion: imprisonment of husband or pregnant woman, disability of husband, existing child with disability, death of the husband during pregnancy, or divorce (Turkmenportal, 2022). Interestingly, it does not mention rape – the most common social indication for abortion, which is the last one some post-Soviet countries, like Russia, kept in practice.

It is also interesting that divorce is an indication for abortion in Turkmenistan, according ot that news article, but the Family Code of Turkmenistan forbids men from divorcing their wives during and one year after a pregnancy (Organisation for Economic Co-operation and Development, 2019). However, it is unclear if this is an accurate or a full list of social indications for abortions in Turkmenistan, as it is simply a news article and did not cite any legal or scholarly sources.

Overall, it is unclear what the legal status of abortion past 5 weeks is in Turkmenistan and what (if any) social or medical indications exist for second trimester abortions.

Uzbekistan. All abortion documents I could find for Uzbekistan were relatively recent. The first is the 2013 Order of the Ministry of Health, which is a long document with social and medical indications for abortion, as well as specific instructions for abortion procedure for physicians (Ministry of Health of Uzbekistan, 2013). This order mentions an unnamed Order of Ministry of Health from 1996, but I could not locate that document. The general tone of the document is neutral, and it does not mention morality or ethics of abortion.

The 2013 Order states that abortion is legal upon request until 12 weeks and until 22 weeks in social and medical circumstances. One unexplained bit in this document is that it states in bold letters that a woman is required to choose a method of abortion during her first visit with the gynecologist, but must have enough time to think, even if that involves a second visit (Ministry of Health of Uzbekistan, 2013). This Order also states that a woman must get signatures of three physicians – a specialist in the field of the disorder that makes her pregnancy dangerous, a gynecologist, and the head of the healthcare institution to get an abortion for medical reasons.

There were ten social indications (table 4.8) and fifteen categories of medical indications for abortion in Uzbekistan in 2013. Interestingly, genetic and other malformation of the fetus are social indications for abortion instead of medical ones. The list of medical indications includes MCB-10 codes for all disorders and is highly similar to all other lists of medical indications for abortion in post-Soviet countries. At the very end of appendix 6, which has all the medical indications for abortion, the Order states that if a pregnancy is threatening the health of the pregnant woman or the fetus, it can be terminated at any point during pregnancy, which is not consistent with the guidance at the beginning of the document that states that abortions for medical indications can only happen until 22 weeks (Ministry of Health of Uzbekistan, 2013).

In 2019, the Senate of Uzbekistan passed the Law on Protection of Reproductive Health of Citizens. This law does not mention any previous law that it made invalid, so it is likely the first law of its kind in Uzbekistan. This law establishes that a safe abortion is a right of Uzbeki citizens and that nobody can force a woman to have an abortion or use contraception (Senate of Uzbekistan, 2019). Unsurprisingly, it does not mention that nobody has a right to force a woman to continue the pregnancy. It also states that if anything in this law goes against UN law on reproduction (without specifying what law that is), then the UN law must be upheld instead of the existing Law on Protection of Reproductive Health of Citizens. It is unclear what happens in practice.

The biggest change in this law compared to the 2013 Order of the Ministry of Health is that it does not mention social indications for abortion at all, so it seems that second trimester abortions for social reasons were outlawed in Uzbekistan in 2019 without an explicit statement about it (Senate of Uzbekistan, 2019). The law still maintains women's right to an abortion upon request until 12 weeks and in medical circumstances beyond 12 weeks.

Following the 2019 Law on Protection of Reproductive Health of Citizens, the Ministry of Health of Uzbekistan published a new Order on abortion in 2020. Consequently, the 2020 Order does not mention social indications for abortion at all, which is another piece of evidence in favor of social indications for abortion being banned in Uzbekistan in 2019.

The Order by the Ministry of Health also has three other changes from its previous version. First, more people must sign off on an abortion after 12 weeks, specifically the head of the healthcare facility/hospital, an obstetrician-gynecologist, a general practitioner, a neonatologist, an ultrasound doctor, and as necessary, specialists and lawyers (Ministry of Health of Uzbekistan, 2020). Second, the new order includes specific language for informed consent for every type of abortion. All language in the informed consent is still objective and neutral, as it simply describes the procedure, risks and their probability, and post-operative treatment in the case of a surgical abortion.

Lastly, there is one interesting sentence that implies that a husband's consent is needed for an abortion if a woman is married, but "in the absence of a husband, the woman's own consent is sufficient" (Ministry of Health of Uzbekistan, 2020).

It seems that all changes in abortion legislation in Uzbekistan happened in the 2010s, so it is likely that the 1987 USSR law (or a similar version of it) was in effect until then. The biggest change was the abolition of abortion for social indications in 2019, which reduced abortion access for some women. Still, most abortion occur before 12 weeks of gestation, so it is likely that abortion is still widely available in Uzbekistan to most women.

Overall, the changes in abortion legislation in South-Central Asian countries show the importance of traditional values to most of these countries when it comes to women's rights and their reproductive healthcare. Kazakhstan's main law on healthcare talks about morality of abortion, Kyrgyzstan's law on abortion requires a mandatory waiting period, a moral consultation, and at some point in 2000s even required the consent of the husband. Uzbekistan outlawed all social indications for a second trimester abortion in 2019 and Turkmenistan reduced the legal term for abortions upon request to 5 weeks, practically banning all abortions upon request. Tajikistan is the only country that has not made many changes to its abortion legislation, but that may also be because I could not find any relevant documents from 2000s.

Caucasus countries. As mentioned before, all three countries in the Caucasus region mention a right to abortion in their main healthcare law and all have specific laws related to abortion. Interestingly, the governments of Armenia and Azerbaijan wrote most of the specific laws on abortion, while Ministry of Labor, Health, and Social Promotion wrote the abortion laws in Georgia. All three Caucasus countries maintain abortion upon request until 12 weeks of pregnancy, in social and medical circumstances until 22 weeks.

Based on the documents I could find, the lists of medical indications for abortion in Caucasus are similar to each other and all other post-Soviet countries (table 4.9), but the social indications vary significantly (table 4.10). There has been a decrease in the number of social indications for abortion in 2010s in Georgia and Armenia, while Azerbaijan maintained all twelve of its original social indications (table 4.10).

The first legal document about abortion in Caucasus that I could find was a 1999 order of the Cabinet of Ministers of Azerbaijan, which included social indications for abortion and a list of "publicly dangerous diseases" without specification of how the latter list relates to abortion (Cabinet of Ministers of Azerbaijan, 1999). There were twelve social indications for abortion in 1999 in Azerbaijan, including a pregnancy out of wedlock (table 4.10). The publicly dangerous diseases were mental illnesses, drug addiction, chronic alcoholism, AIDS, tuberculosis, syphilis, gonorrhea, and leprosy.

I could not find any other documents for Azerbaijan until 2014, which is when the Ministry of Health published the clinical practice guidelines for abortion. That document kept the same number of social indications (including a pregnancy out of wedlock) and listed sixteen specific disorders of the pregnant woman and three disorders of the fetus (table 4.9) that would warrant an abortion for medical reasons (Ministry of Health of Azerbaijan, 2014). Evidently, those same social and medical indications were still in practice as of 2019 (Mammadzamanli, 2019).

The next law pertaining to abortion in Caucasus was Armenia's 2002 Law on Reproductive Health and Reproductive Rights. This law was similar to the other laws on reproductive health in the other post-Soviet countries. Article 10 of that law specifically deals with abortion, declaring that every woman has a right to an abortion upon request before 12 weeks of pregnancy and until 22 weeks in "medico-social" circumstances, and that all women have a right to free pre- and post-abortion counseling (National Assembly of Armenia, 2002).

While this law does not specify what the "medico-social" circumstances are, the government of Armenia first published social and medical indications in 2004 and updated them in 2017 (Government of Armenia, 2004; 2017). Of the five existing social indications for abortion in 2004, denial of maternal rights disappeared from the list in 2017 (table 4.10) and the new document emphasized a mandatory 2-day waiting period for an abortion (Government of Armenia, 2017). The 2-day mandatory waiting period for abortion in Armenia first appeared in 2016, when the National Assembly of Armenia updated its Law on Reproductive Health and Reproductive Rights. As of 2022, the 2016 version of the Law on Reproductive Health and Reproductive Rights is in effect regarding abortion (National Assembly of Armenia, 2022).

The only policy document on abortion in Georgia that I could find was from 2014, but it mentioned an Order of the Minister of Labor, Health, and Social Protection from 2000 that it made invalid, so there was abortion legislation in Georgia before 2014. The 2014 Order of the Minister of Labor, Health, and Social Protection installs a 5-day mandatory waiting period for an abortion, lists medical (table 4.9) and social (table 4.10) indications for abortion until 22 weeks, describes the procedures for different types of abortion, and provides specific informed consent women must sign before an abortion (Minister of Labor, Health, and Social Protection of Georgia, 2014).

Overall, the language of the document is neutral, but the informed consent is focused on the negative and rare side-effects of abortion, which can be scary to some women. This document only lists three social indications for abortion in Georgia – rape (as documented and prosecuted by a court), being under 15 years old, and being over 49 years old. This means that Georgia has the lowest number of social indications for abortion among the Caucasus countries.

Interestingly, the Public Defender of Georgia wrote a claim in 2022 arguing that the requirement of documented and prosecuted rape for an abortion is unconstitutional. He stated that the legal process often takes months and many rapists are never prosecuted, which puts women in a legally vulnerable position when it comes to an abortion (Public Defender of Georgia, 2022).

Table 4.9

Medical Indications for Abortion in Countries in the Caucasus Region in 1990s and Comparison to the USSR

Conditions	USSR (1982)	Armenia (1993)	Azerbaijan (1993)	Georgia (1994)
Infectious diseases	Yes	Yes	Yes	Yes
Cancer	Yes	Yes	Yes	Yes
Blood disorders	Yes	Yes	No	Yes
Endocrine disorders	Yes	Yes	Yes	Yes
Mental disorders	Yes	Yes	Yes (schizophrenia)	Yes
Nervous system disorders	Yes	Yes (includes vision)	Yes	Yes
Vision disorders	No	No	Yes	Yes
Cardiovascular disorders	Yes	Yes	Yes	Yes
Respiratory disorders	Yes	Yes	No	Yes
Digestive disorders	Yes	Yes	No	Yes
Genitourinary disorders	Yes	Yes	No	Yes
Pregnancy, labor and post labor period disorders	Yes	No	No	Yes
Musculoskeletal and connective tissue disorders	Yes	Yes	No	Yes
Fetal anomalies, deformities and chromosomal disorders	Yes	Yes	Yes	Yes
Physiological disorders	Yes	Yes	Yes	No
Other reasons	Skin disorders	Vulgar pemphigus, removal or transplant of a vital organ.	-	-

Table 4.10

Social Indications for Abortion in the Caucasus and a Comparison to the USSR

Condition	USSR	Armenia		Azerbaijan	Georgia
Year	1987	2004	2017	1999	2014
Rape	Yes	Yes	Yes	Yes	Yes
Husband's death	Yes	Yes	Yes	Yes	No
Husband in prison	Yes	Yes	Yes	Yes	No
Pregnant woman in prison (often grouped with husband in prison)	Yes	Yes	Yes	Yes	No
Divorce	Yes	Yes	Yes	Yes	No
Pregnant woman got maternal rights taken away	Yes	Yes	No	Yes	No
Paternal rights got taken away (usually grouped with maternal rights)	Yes	No	No	Yes	No
Disability of pregnant woman	Yes	No	No	No	No
Disability of husband	No	No	No	Yes (groups 1 or 2)	No
Presence of disabled child	No	No	No	Yes	No
Unmarried	No	No	No	Not explicitly. The law states "out of wedlock"	No
Extramarital pregnancy	No	No	No	Yes	No
3 or more children	No	No	No	Yes	No
Woman is refuge	No	No	No	Yes	No
Unemployed woman	No	No	No	Yes	No
Unemployed husband (usually grouped with unemployed woman)	No	No	No	Yes	No
Lack of housing	No	No	No	Yes	No
Other	-	-	-	-	Yes, under 15 or over 49

As seen in tables 4.9 and 4.10, Armenia and Georgia restricted access to abortion through reduction of social indications, while Azerbaijan kept all of its original social indications, including a pregnancy out of wedlock. Just like with South-Central Asian countries, it is important to recognize the cultural difference of the Caucasus from Eastern and Northern Europe. As the Caucasus countries have highly religious populations (Pew Institute, 2019), a pregnancy out of wedlock would be taboo, so that factor remaining a social indication for abortion in 2010s shows the Azerbaijan government's commitment to women's right to abortion. The same cannot be said for Armenia and Georgia, which added a mandatory waiting period for an abortion and reduced the number of social indications for abortion.

Interestingly, governments of both Georgia and Armenia instituted a mandatory waiting period for an abortion, but through different means. In Georgia, the Ministry of Health first published an Order with the mandatory waiting period in 2014, which prompted the government of Georgia to change its main healthcare law to include the waiting period in 2016. So, a change in a small law triggered a change in a big law. In Armenia, the government decided to add the mandatory 3-day waiting period in 2016 via changing its 2002 Law on Reproductive Health and Reproductive Rights and updated its procedure for pregnancy termination to include this information in 2017. Therefore, the change in Armenia first happened in a bigger law on reproductive health and subsequently appeared in a smaller guidance document on abortion. Still, Georgia remains the only Caucasus country to mention the mandatory waiting period in its main healthcare law as of 2022.

Conclusion

The comparison of the main healthcare laws in post-Soviet countries shows that, generally, the governments of post-Soviet countries accept abortion as a woman's right. In fact, the woman's legal right to abortion after 1991 became more ingrained in the healthcare legislation of most post-Soviet countries than it was in the USSR before its dissolution. Most newly independent governments added the right to abortion to the first editions of their laws that govern all of healthcare – basically their healthcare Constitutions and have kept abortion right in those laws as of 2022. The only countries that do not mention abortion in their main healthcare laws are Lithuania and Uzbekistan.

Also, the main healthcare laws in two other Baltic countries – Estonia and Latvia – are different from those in all other post-Soviet countries, as they do not govern abortion directly and only mention that it is legal. This means that the Baltic countries primarily govern abortion via smaller legislative documents, which can be changed and overturned much easier than the main healthcare laws of other post-Soviet countries that govern abortion.

Six of fifteen post-Soviet countries made changes to their main healthcare laws that restricted abortion access in different ways. Kyrgyzstan changed its main healthcare law to explicitly include abortion term limits, while the other countries added mandatory waiting periods before an abortion, mandatory informed consent, or a physician's right to decline to perform an abortion. The most extreme change was in Turkmenistan, which reduced the legal term limit for abortions upon request from 12 to 5 weeks in 2015. Still, those laws, except for Turkmenistan's law, fundamentally allow abortion until 12 weeks of gestation upon request.

So, as of 2022, fourteen of fifteen post-Soviet countries allow abortion upon request until 12 weeks of gestation and have not changed that since the dissolution of the USSR in 1991. Still, as seen in the previous chapter, this same law exists in vastly different economic, religious, and geographic contexts, as well as within healthcare systems of varied quality, which all likely contribute to differences in abortion rates and other fertility metrics. I explore those relationships quantitatively in the following chapter.

Just as with Russia, most changes in specific laws on abortion concerned the number of social indications for abortion. Asian countries generally maintained the highest numbers of social indications for abortion, while the Baltic countries completely got rid of them, and Eastern European countries significantly reduced the number of allowed social indications for abortion. The only exception to the previous statement is Uzbekistan, as it got rid of all social indications for abortion in 2019. Since these were the biggest changes to abortion legality in post-Soviet countries, I explore the relationship between the number of social indications for abortion and abortion rate of a country in the following chapter.

There are two large limitations to the work presented in this chapter. First, it was quite hard to find legal documents from many post-Soviet countries, especially any documents before 2010s, as many of them only exist in print form in national libraries and archives and I do not have access to those. For example, Georgian government only started collecting and posting online their legal documents in 2013 (Ministry of Labor, Health, and Social Protection of Georgia, 2022).

I requested seven other laws via ILLIAD but only received one response, which included a newer version of the law I already had read instead of the older version I requested. In table 4.11 below, I point to the documents I identified and could not find, but it is likely that there are more legal documents I missed entirely.

Table 4.11

List of Documents Excluded from the Discussion in this Chapter

Country	Year	Legal document name
Moldova	2002	Unknown, but includes social and medical indications
Moldova	2010	*Ordin N 782 [Order no. 782]*
Kyrgyzstan	2005, 2006, 2009	Order on approval of instructions on the procedure for performing artificial termination of pregnancy.
Tajikistan	2000	Order N°121 on abortion grounds and procedures
Tajikistan	2004	Strategic plan on reproductive health
Tajikistan	2011	Order N° 204 on National Standards on safe abortion and post-abortion care
Uzbekistan	1996	Order on abortion [unclear what the name is]
Georgia	2000	Order No. 30/O "On approval of the list of medical indications for artificial termination of pregnancy of more than twelve weeks' duration"
Turkmenistan	1991-2022	Any legal documents on abortion in Turkmenistan besides its main law on healthcare

Second, many legal documents from post-Soviet countries are in their respective native languages, so I had to use Google Translate to read them. The translations are not always exact, so I may have missed some points, and, thus, additional research by native language speakers residing in each post-Soviet country with access to national archives is needed to further this work.

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5: COMPARATIVE ANALYSIS OF FERTILITY BEHAVIOR IN POST-SOVIET COUNTRIES

Introduction

Based on the findings from the previous chapters, it seems that abortion laws in post-Soviet countries have remained very similar since the dissolution of the USSR, so the next logical step is to look at the fertility data from those countries to find other reasons for varied abortion rates. In this chapter, I present the results of my data collection and analysis together with contextual findings from general literature review to tell a story of existing and emerging differences in fertility behavior, including abortion, in post-Soviet countries from 1990[12] to 2020[13]. **As this chapter is rather long, the main findings are in bold, just like this sentence, for the reader's convenience.**

There are six total parts to this chapter. In each of the first five parts, I begin by showing and discussing the historical trends in data, then provide some simple analyses to highlight the significance of the findings. First, I discuss the differences in abortion rates over time in relation to the legal status of abortion in post-Soviet countries, as that continues the narrative from the previous chapter. Then, I discuss total and age-specific fertility rates and show that high rate of abortion is not related to reduced fertility in the twenty-first century. Next, I present the historical changes in marriage data to show the differences in abortion among married and unmarried women of post-Soviet countries to highlight the different profiles of abortion seekers in Asia and Europe.

[12] or 1970 or 1980, if data are available
[13] or 2030 if projections are available

Afterwards, I dive into the longest, and arguably the most important, section of this chapter, which is about the general and specific methods of contraception and their effect on abortion rate. In the following section, I briefly discuss religion and sex education in relation to abortion. Together, these sections help me answer the first driving question of my dissertation – why does Russia have the highest abortion rate for most years since 1991 among all post-Soviet countries in the presence of the same law on abortion in the last part of this chapter – conclusion.

General Trends in Abortion Rates Between 1980 and 2020[14]

According to the existing data, abortion rates have gone down significantly in all post-Soviet countries between 1980 and 2018 (figure 5.1). In 1980s, Soviet republics had a large difference in abortion rates and that difference shrunk significantly by late 2010s (figure 5.1). In 1988, Russia had the highest abortion rate of 130 abortions per 1,000 women of reproductive age and Azerbaijan had the lowest abortion rate – 30 (figure 5.1). However, as of 2017, an abortion rate of 24 in Russia and 30 in Georgia are the highest abortion rates among all post-Soviet countries, and an abortion rate of 7 in Uzbekistan is the lowest (figure 5.1).

[14] Or latest available year for each country

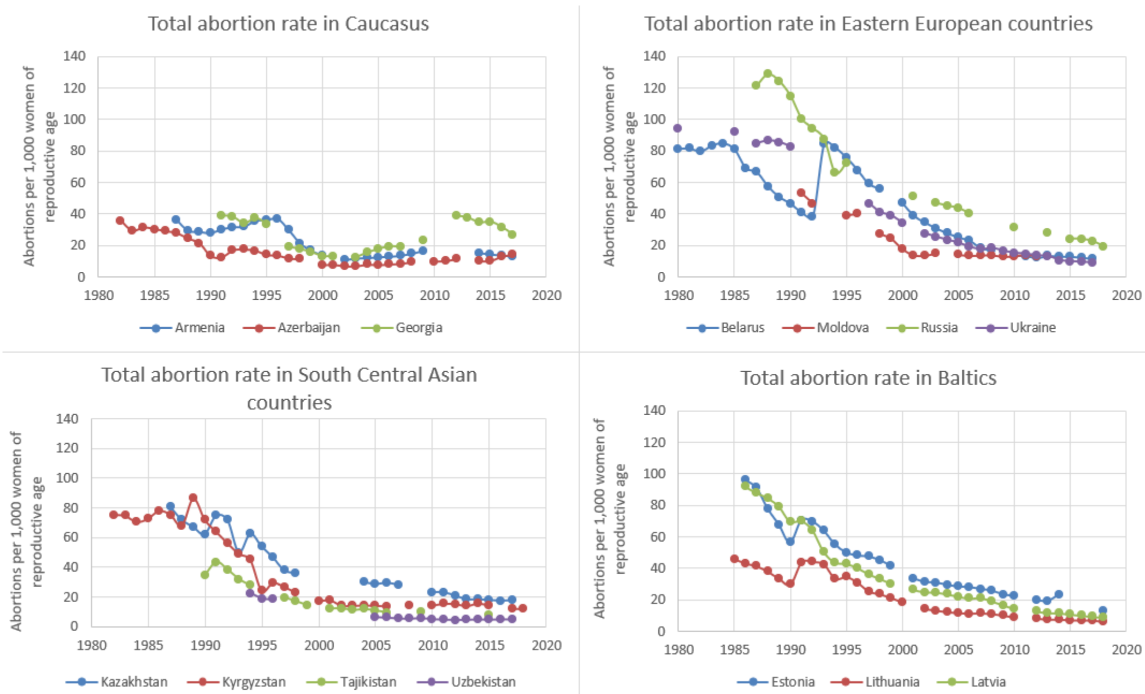

Figure 5.1. Comparison of estimated total abortion rates for all women of reproductive age between 1980 and 2018 by region (UN *Demographic Yearbooks* 1992, 2000–2018; ROSSTAT, 2019).

Most countries in all regions experienced a spike in abortion rates in the 1990s, likely as an effect of the dissolution of USSR. Kazakhstan, Estonia, and Lithuania had the largest spikes in their total abortion rates in the early 1990s before returning to previous levels in the mid to late 1990s (figure 5.1). Conversely, Georgia, Russia, Kazakhstan, Kyrgyzstan, and Lithuania saw a sudden drop and an immediate increase of abortion rates to previous levels in the mid-1990s (figure 5.1).

It is unclear whether these downward spikes are due to underreporting during an economically and politically tumultuous time after the dissolution of USSR or whether the data show the reality of what was happening in those countries at the time. However, Russian researchers have conducted surveys and other studies on existing abortion data and have concluded that Russian abortion data, as reported by ROSSTAT, which, in turn, reports it to the UN, is accurate and corresponds to the real abortion rate of the population in the 1990s (Avdeev et al., 1995; B. Denisov et al., 2012; B. Denisov & Sakevich, 2015; Vishnevsky et al., 2017).

Georgia is the only country that had an increase in its abortion rate in the 2000s and 2010s, but it has been decreasing in the most recent years. That trend can potentially be explained by high unmet need for contraception in Georgia and high political instability (Tsuleiskiri, et al., 2019). This is interesting, as the same study shows that women in Georgia face many barriers to accessing abortion such as high cost of the procedure, potentially biased abortion counselling, and a mandatory 5-day waiting period (Tsuleiskiri et al., 2019).

While the total abortion rate graph (figure 5.1) helps compare the general abortion trends in post-Soviet countries, many countries do not report age specific abortions in standard 5-year age groups, so I can only discuss age-specific abortion trends for Armenia, Belarus, Estonia, Georgia, Kyrgyzstan, Latvia, Lithuania, and Russia. Also, the UN did not report a single abortion statistic for Turkmenistan, so I exclude it from any abortion-related analysis and discussion in this chapter.

According to the UN data from countries that reported number of abortions in standard 5-year age groups, most abortions happen in the 20-24-year-old group and the 25–29-year-old group (figure 5.2). Russia consistently has one of the highest abortion rates for each age group, but Georgia overtakes it in recent years (Appendix A figures 1A–7A). However, if we look at the average abortion rate for the countries that reported data in standard 5-year age groups, Russia consistently has the highest abortion rate (figure 5.2).

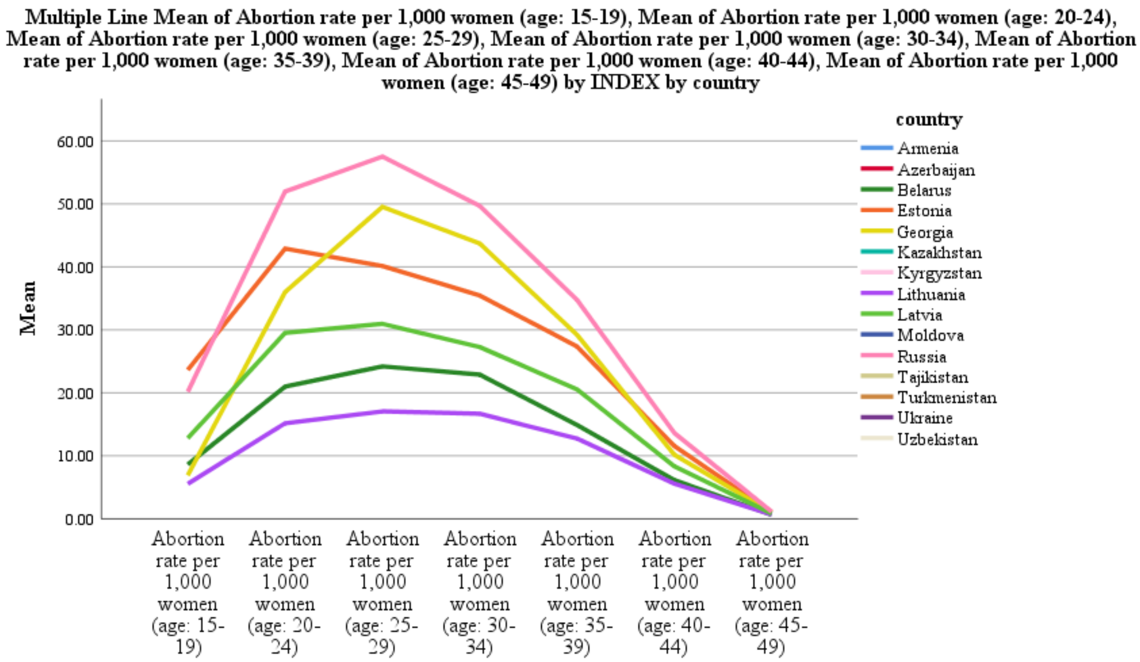

Figure 5.2. Comparison of means of estimated age-specific abortion rates for each of the standardized 5-year age groups for women of reproductive age between 1990 and 2018.

Although abortion rates went down in all post-Soviet countries after the dissolution of the USSR, fourteen of fifteen post-Soviet countries maintained the same fundamental law on abortion – it is legal upon request until 12 weeks of gestation, and at later terms for social and medical reasons. As seen in the previous chapter, Turkmenistan is the only country that decreased the term limit for abortion upon request from 12 to 5 weeks in 2015, but the UN does not have a single data point on abortion for Turkmenistan, so I excluded it from all abortion-related analysis. Given than over 90% of induced abortions occur before 12 weeks (International Planned Parenthood Federation, 2012), there is no evidence that these changes were significant enough to change abortion rates in post-Soviet countries to make them so drastically different from each other (figure 5.1). What about specific smaller pieces of legislation on abortion in post-Soviet countries?

I showed in the previous chapter that the main changes in abortion legislation in post-Soviet countries concerned the number of social indications for abortion until 22 weeks of gestation, as the governments of European post-Soviet countries gradually reduced the legal number of social indications for abortion and most Asian ones did not. Also, in some post-Soviet countries, specifically in Russia, Ukraine, Moldova, Kazakhstan, and Turkmenistan, abortions for social indications are free of charge in state-sponsored clinics, so I explored the relationship between the latest number of social indications for abortion and abortion rate in 2017.

Ironically, there is a weak negative correlation ($r = -0.36$, Appendix B table 1B) between the number of social indications for abortion and the abortion rate of a country (figure 5.3). This means that countries with more social indications for second-trimester abortion actually tend to have lower abortion rates than countries with no or very few social indications for abortion. Specifically, South-Central Asian countries at the same time have the highest number of social indications for abortion and the lowest abortion rates in 2017. Why? Let us explore the differences in fertility rates of those countries next to find some clues.

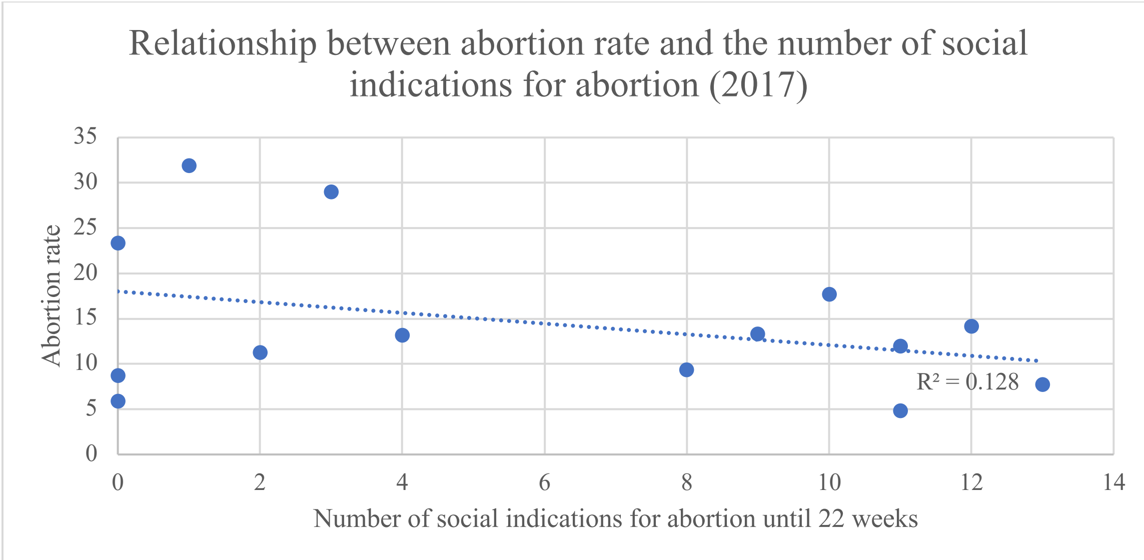

Figure 5.3. Correlation between the number of social indications for abortion until 22 weeks and abortion rate in 2017, each dot is a different post-Soviet country.

General Trends in Fertility Rates between 1979 and 2019 and their Relation to Abortion Rates in Post-Soviet Countries

Fertility rate is one of the most important metrics for a government to monitor, as it helps predict the size of a population, and, thus, plan funding allocation accordingly. Fertility rates, both total (TFR) and age specific (ASFR)[15] are among the most time-sensitive indicators in a population, as they vary greatly year by year according to the number of new births, but general trends can still be observed. A TFR of 2.1 is called replacement TFR, which means that the total number of people in a population will stay the same if all women have an average of 2.1 children (Craig, 1994). Logically, if TFR is higher than 2.1, the population gets larger and younger over time and if TFR is lower than 2.1, it shrinks and ages over time.

[15] ASFR is the number of live births per 1,000 women in a specific 5-year age group, which is why the scale is different than TFR, which is the average number of children per woman.

There was a large difference between the average number of children per woman (TFR) among Soviet republics in 1980s (figure 5.4). **This means that all fifteen post-Soviet countries began their independence with vastly different projections for population growth and, thus, the new governments had different goals and priorities for fertility control in their countries.**

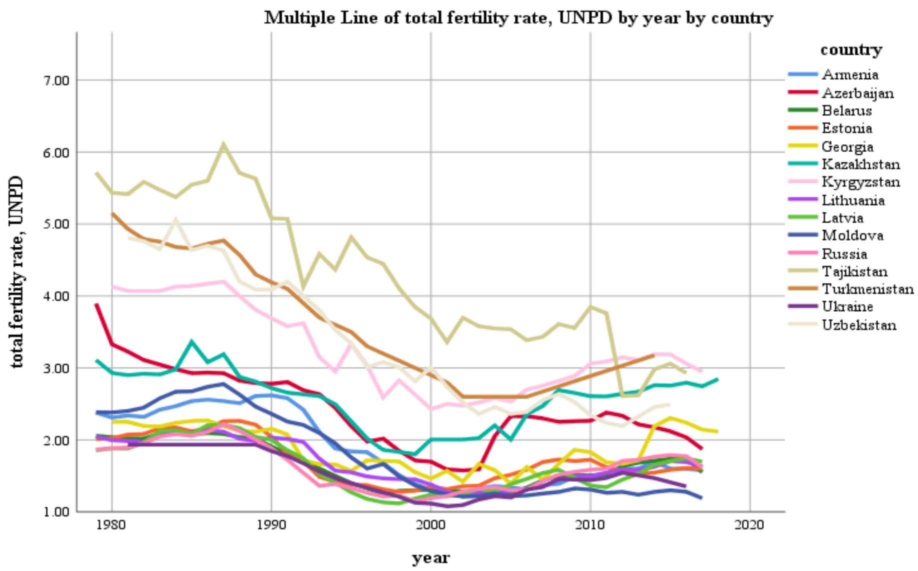

Figure 5.4. Comparison of recorded total fertility rate for all women of reproductive age in post-Soviet countries between 1979 and 2019 (UN *World Fertility Data*, 2019).

Figure 5.5 below shows the same data as figure 5.4 but separated by geographic region. In that figure, similarities in TFR among countries in the same region become more apparent.

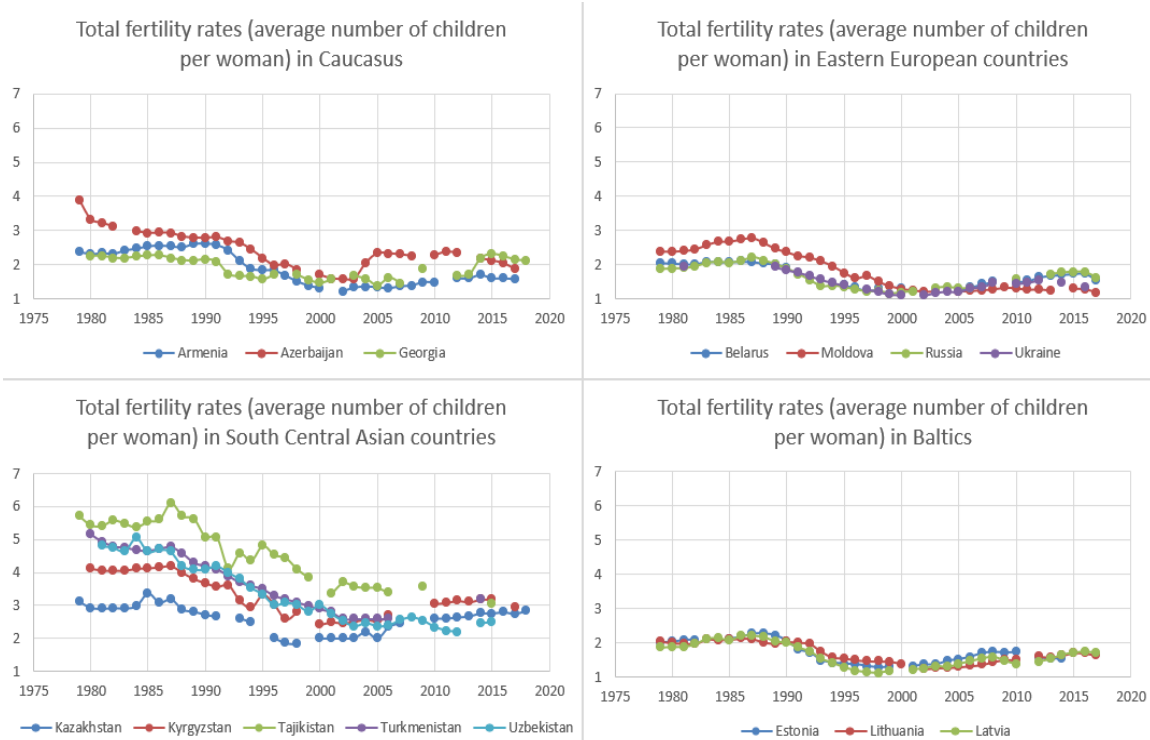

Figure 5.5. Total fertility rates of women of reproductive age (15–49) in 15 post-Soviet countries by region (data source: UN *World Fertility Data*, 2019).

Together, data from figures 5.4 and 5.5 illustrate several key findings about the changing TFR in post-Soviet countries:

1. European post-Soviet countries generally have lower TFR than Asian post-Soviet countries and that trend persists over time (figure 5.5). For example, in 1980s, Tajikistan had the highest TFR of 5.5, while Russia and Latvia were the lowest at 1.8. In 2018, Tajikistan and Kyrgyzstan had the highest TFR of 3, while Ukraine and Moldova had the lowest TFR, below 1.2.
2. All countries had a decrease in TFR after the dissolution of the USSR in 1991.
3. Asian post-Soviet countries had a small increase in TFR in 2000s and most returned to TFR above replacement (2.1), while European countries did not

recover from the TFR decrease following the dissolution of the USSR and still maintain a TFR below replacement as of 2018.

4. Countries in each of the four geographic regions have similar patterns for changes in TFR, but there is a large diversity in TFR of South-Central Asian countries, less diversity in Caucasus, and almost no diversity in Eastern Europe and the Baltic countries.

Statistical comparison of fertility data further quantifies the visual findings above. First, there are statistically significant differences among the geographic regions ($p = 4.6967E-41$, Appendix B table 2B). However, the TFR in Baltic countries and in Eastern European countries are so similar for most years, that there are no statistical differences among countries in the Baltic region ($p = 0.317$, Appendix B table 3B) and in Eastern Europe ($p = 0.463$, Appendix B table 4B). At the same time, there are statistically significant differences among fertility rates of the countries in South-Central Asia ($p = 7.06906E-16$, Appendix B table 5B) and in Caucasus ($p = 0.000000691$, Appendix B table 6B).

Furthermore, interesting findings emerge from looking at age-specific fertility data. In each age group, Asian countries have higher fertility rates than the European countries, with Tajikistan consistently being the highest of all (figures 5.6 and 5.7). This further supports the concept of differing fertility rates in European and Asian post-Soviet countries. Most post-Soviet countries saw an increase in ASFR, for 25–44-year-olds after year 2000 but Tajikistan did not (Appendix A, figures 8A–11A). This means that women in all post-Soviet countries except for Tajikistan are starting to have children at a later age or are spreading out their childbearing over a longer period of time.

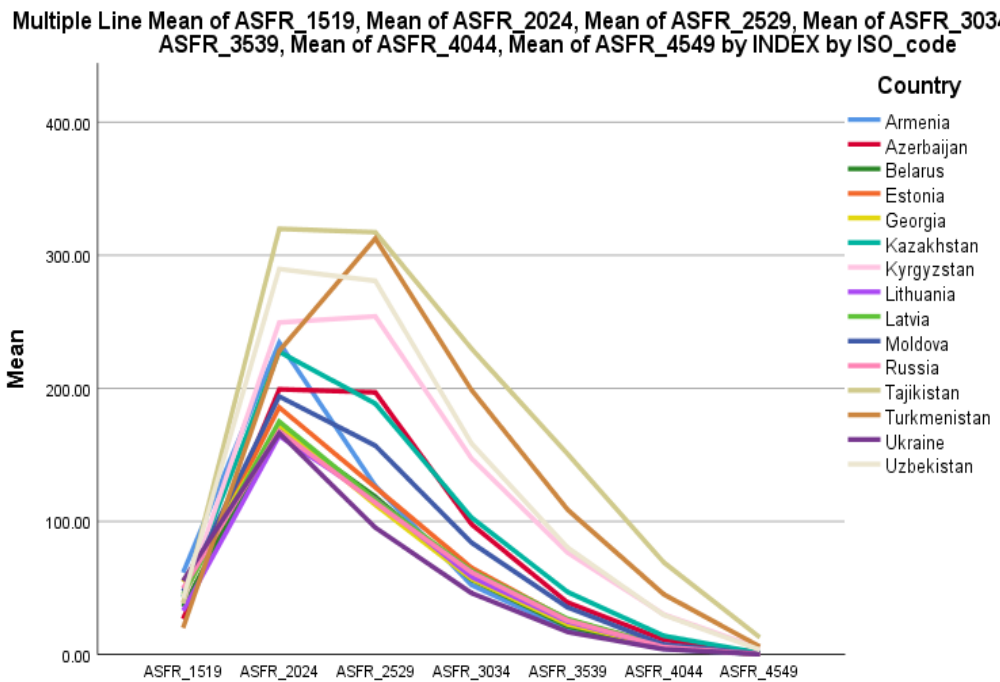

Figure 5.6. Comparison of mean recorded fertility rates for each of the standardized 5-year age groups for women between 15 and 49 years-old in post-Soviet countries in 1989 (UNPD, 2019).

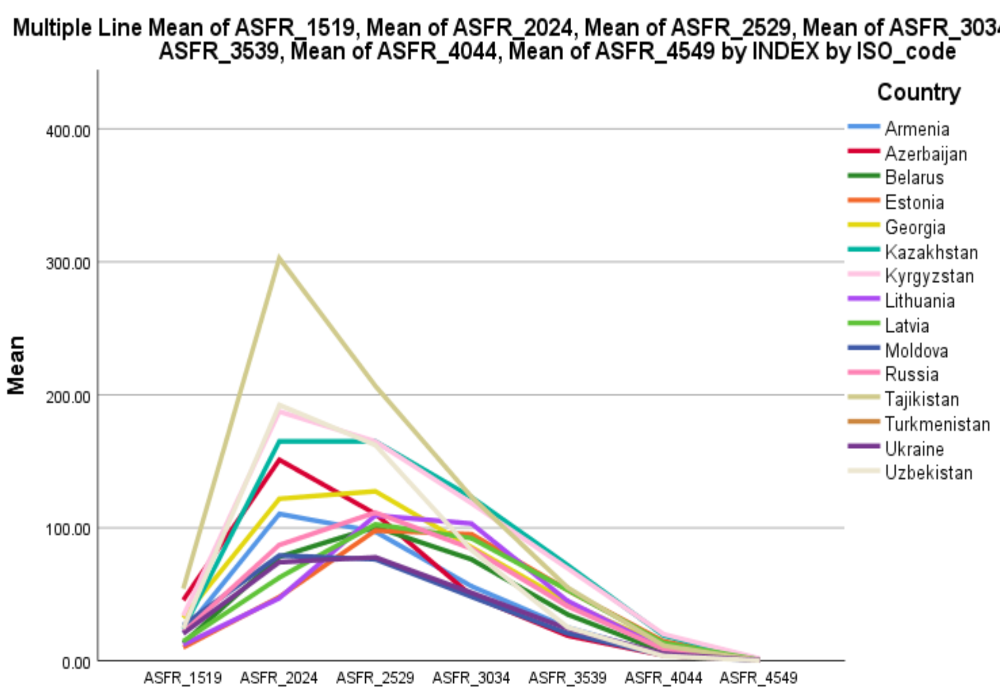

Figure 5.7. Comparison of mean recorded fertility rates for each of the standardized 5-year age groups for women between 15 and 49 years-old in post-Soviet countries in 2018 (UNPD, 2019).

Figures 5.6 and 5.7 show the differences among age specific fertility rates of post-Soviet countries in 1989 and in 2018. In 1989, prior to dissolution of USSR, most countries saw the most childbearing in the 20–24 and 25–29-year-old age groups (figure 5.6). Comparatively, in 2018, childbearing is spread out more over the age groups and the fertility rates for each age group are lower than they were in 1989 (figure 5.7).

The aforementioned changes contribute to the increase in the mean age of childbearing (MAC) for all countries, except for Azerbaijan. The difference between the highest and lowest MAC is slowly shrinking among post-Soviet countries, as it was around 5 in 1990 and is at 2.5 in 2018 (figure 5.8). This means that in terms of MAC, these countries are becoming more similar to each other as time goes on[16].

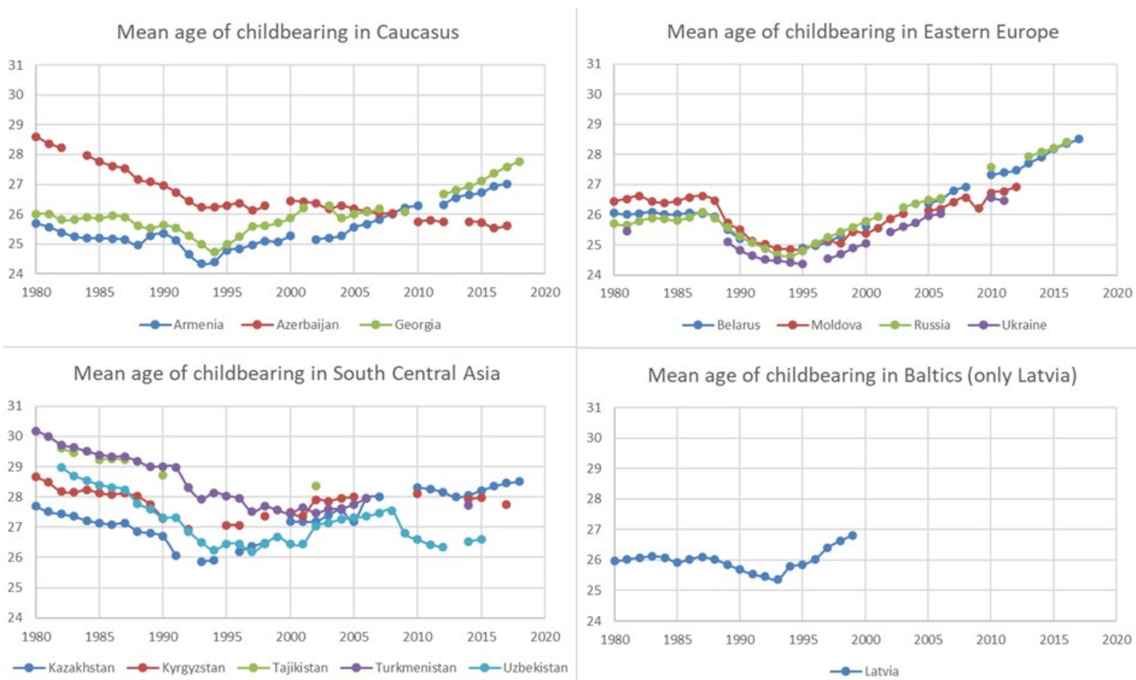

Figure 5.8. Comparison of recorded mean age of childbearing in post-Soviet countries between 1980 and 2019 by region (UNPD, 2019).

[16] As seen on figure 5.8, there is not enough data to discuss the mean age of childbearing in the Baltic countries, as only Latvia has reported data for this indicator and the last reported year was 2000. Still, the Latvian trend of increase in mean age of childbearing is similar to that of Eastern European post-Soviet countries, so it is likely that that it continued in 2000s and 2010s.

Most post-Soviet countries had a dip in MAC in 1990s, primarily due to the increase in ASFR of 15–19-year-olds (figure 5.9). Interestingly, ASFR for the 15–19-year-old group was rising in all countries in 1980s, spiked in early 1990s, and had a sharp decrease in mid- to late-1990s (figure 5.9). Typically, births in the 15–19-year-old age group are results of unintended pregnancies of unmarried girls, while births in all older age groups may be the result of both intended and unintended pregnancies. However, the highest ASFR for 15–19-year-olds in 1990s was in Asian countries like Armenia, Tajikistan, and Kyrgyzstan (figure 5.9). Those are countries with high prevalence of religion and traditional values, so teen marriages and, thus, childbearing are common in those countries and the pregnancies may have been planned (Clifford et al., 2010; Hovhannisyan, 2004; Ibraimova et al., 2011; World Health Organization. Regional Office for Europe et al., 2016).

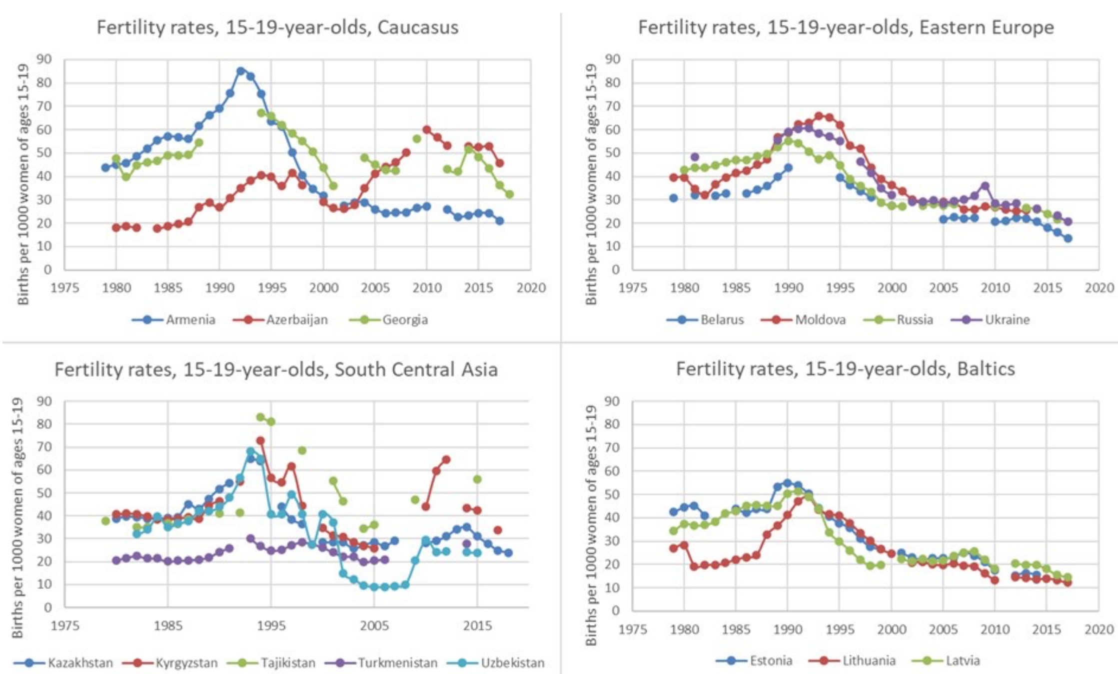

Figure 5.9. Comparison of recorded age-specific fertility rate for women aged between 15 and 19 years-old in post-Soviet countries between 1979 and 2018 (UNPD, 2019).

The dissolution of the USSR had both short-term and long-term effects on fertility trends in post-Soviet countries. Most post-Soviet countries went through a period of economic hardship directly after the dissolution of the USSR (Miller, 2016), which is quantified by decreased World Bank (WB) income classification for all post-Soviet countries immediately after dissolution (figure 5.10). This likely reduced all women's desire and financial ability for childbearing and contributed to spikes in total abortion rates (figure 5.1) and a decrease in TFR in 1990s (figure 5.4). This is consistent with existing research on the economic determinants of fertility (Sobotka et al., 2011).

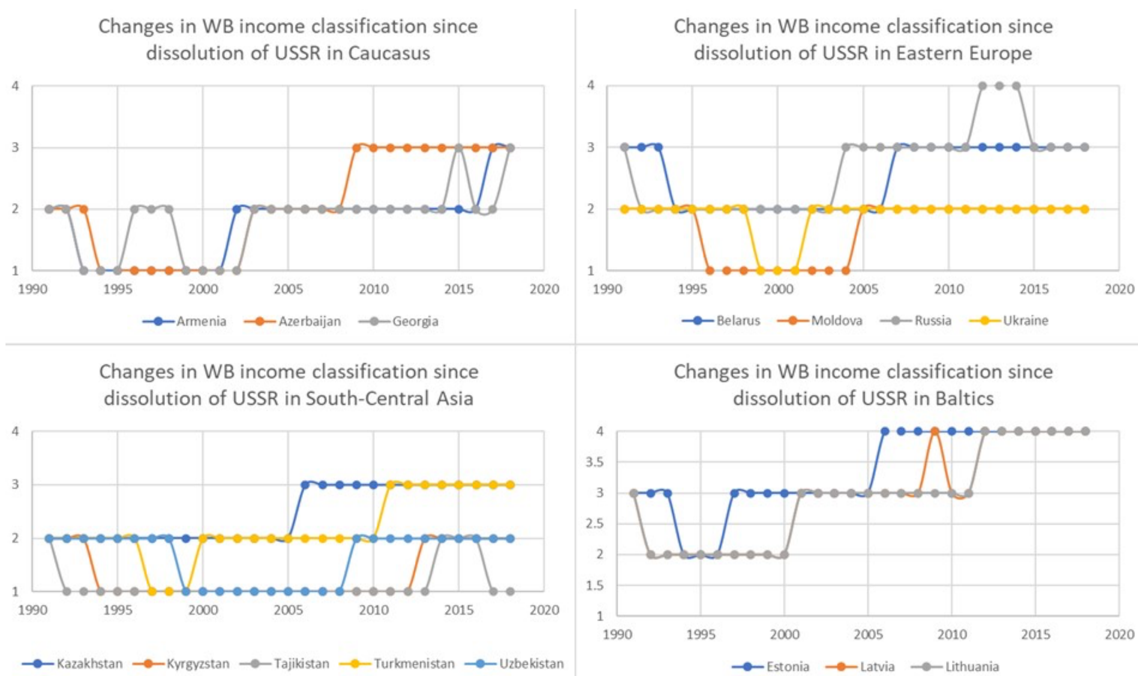

Figure 5.10: Comparison of WB income classification (1 = low income; 2 = lower middle incline, 3 = upper middle income, 4 = upper income) 1991 and 2019, by region (WB, 2019).

While income is not a proximate determinant of fertility[17] (Davis & Blake, 1956; Bongaarts, 1982), generally, high-income countries, as defined by the WB, tend to have lower TFR than middle- and low-income countries (Price, 2013; Schultz, 2005; Tertilt et al., 2022). This is primarily due to increased contraceptive prevalence and increased fertility awareness via general education and sex education in high-income countries (Price, 2013; Tertilt et al., 2022). The negative correlation of income level and TFR holds true for post-Soviet countries, as well, though it was moderate in 1991 ($r = -0.55$, Appendix B table 7B) and weak in 2018 ($r = -0.38$, Appendix B table 7B).

The statistical relationship between abortion and total fertility rate of a population is important to explore as abortion is a proximate determinant of fertility (Bongaarts, 1978), but data on fertility are much more accurate than data on abortion. Fertility rates are calculated via vital registration of births and most countries have a strong vital registration framework (Powers, 2003; World Health Organization, 2020).

The large differences in TFR of post-Soviet countries upon their independence in 1991 meant that the governments had to take different approaches to controlling fertility in their countries. While the dissolution of USSR triggered a decline in TFR for all countries, European post-Soviet countries have still not recovered from that decline, as their TFR was below replacement level of 2.1 as of 2018. Such low TFR is often a concern for lawmakers, as it means that over time there will be fewer people and, thus, workers and taxpayers, in the country (P. Caldwell & Mcdonald, 2006; Harris, 2006). A low TFR is a common reason for introducing pronatalist policies and some lawmakers

[17] A factor that directly affects the fertility rate of a population. Proximate determinants of fertility are marriage, contraceptive use, abortion, involuntary fecundity, and postpartum amenorrhea.

even cite it as an argument in favor of banning abortion, as I showed in chapter 3 (Krutov & Leonov, 2005).

So, if lawmakers assert that high rates of abortion lead to a decrease in total fertility of a population and use that as an argument against legal abortion, do the data support that? Not really, as there was a weak to moderate[18] negative correlation (r = –0.38, Appendix B table 8B) between abortion rates and TFR in 1990 (figure 5.11) and negligible correlation (r = –0.05, Appendix B table 8B) in 2017 (figure 5.12). The trendlines and R^2 on figures 5.11 and 5.12 show that while there was a slight inverse correlation between abortion and fertility rates in 1990, that correlation no longer exists as of 2017.

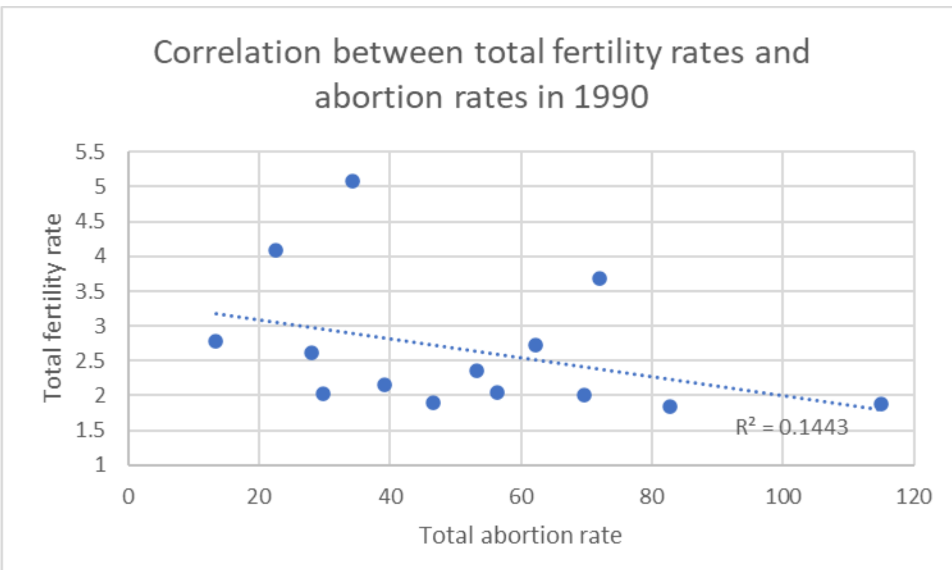

Figure 5.11. Correlation between TFR and abortion rate in 1990, each dot is a different Soviet Republic.

[18] Typically, below |0.1| is negligible, |0.1-0.39| is weak, |0.4-0.69| is moderate, |0.7-0.89| is strong, and |0.9-1| is very strong for precise data, but given variability in abortion data reporting, these values can be relaxed slightly.

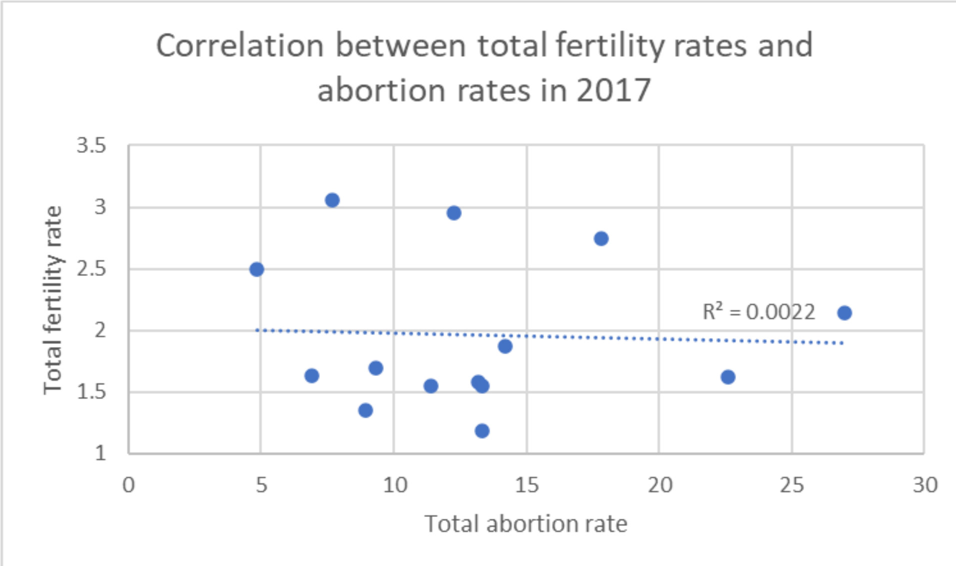

Figure 5.12. Correlation between TFR and abortion rate in 2017, each dot is a different post-Soviet country.

This means that while higher abortion rates may have contributed to lower fertility rates in some Soviet Republics (mainly in Europe) in 1990, there is no evidence of high abortion rates causing lowered fertility rates in 2017 among post-Soviet countries. **Therefore, the argument that high abortion rate reduces total fertility rate of a population is flawed and has no quantitative support as of 2017. The general income level of a country, as defined by the World Bank, has a stronger correlation with the TFR of a country than its abortion rate.**

Conversely, a high TFR can also be a concern for lawmakers, as there are too many children who often require government funding for public schooling or healthcare but cannot contribute as taxpayers yet. South-Central Asian countries had the highest TFR among all post-Soviet countries upon dissolution and the largest decrease in TFR after the dissolution (figure 5.5). How did that happen? The governments of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan collaborated closely with the UN, USAID, and other international organizations to get modern contraceptives imported and make special programs for sex education (Ahmedov et al., 2014; Dominis et al., 2018; Ibraimova et al., 2011; Katsaga et al., 2012; World Health Organization. Regional Office for Europe et al., 2016). More information on contraception use and sex education appears later in this chapter.

General Trends in Marriage Behaviors between 1970 And 2020[19] and their Relation to Abortion Rates of Post-Soviet Countries

Women who are married or in a union are statistically more likely to get pregnant and give birth than those who are not (Barr & Marugg, 2019; Lichter et al., 2014), so examining marriage data among post-Soviet countries is vital after looking at their fertility rates. While the fertility rates became more similar among all post-Soviet countries since the dissolution of the USSR, proportion of married women among all women of reproductive age became much more different over time, which signals a divergence in marriage trends and helps explain lower TFR in European countries than in Asian countries.

In 1970, the lowest proportion married was in Latvia at 64% and the highest was in Ukraine at 70% (figure 5.13). This means that in 1970 in *all* Soviet Republics, *over three in five* women between the ages of 15 and 49 were married. That changed over time, and as of 2020 the lowest proportion married of 48% was in Estonia, and the highest one was in Tajikistan at 72.5% (figure 5.13). This means that in 2020, almost *two thirds* of women of reproductive age were married or in a union in Tajikistan, but *less*

[19] Data are based on estimations and projections, so projections up to 2030 are available, but I only focus on data until 2020, as that is most relevant to this project.

than half were married in Estonia. This shows that the difference between the highest and the lowest proportion married in post-Soviet countries increased over by over four times from 6% in 1970 to 24.5% in 2020.

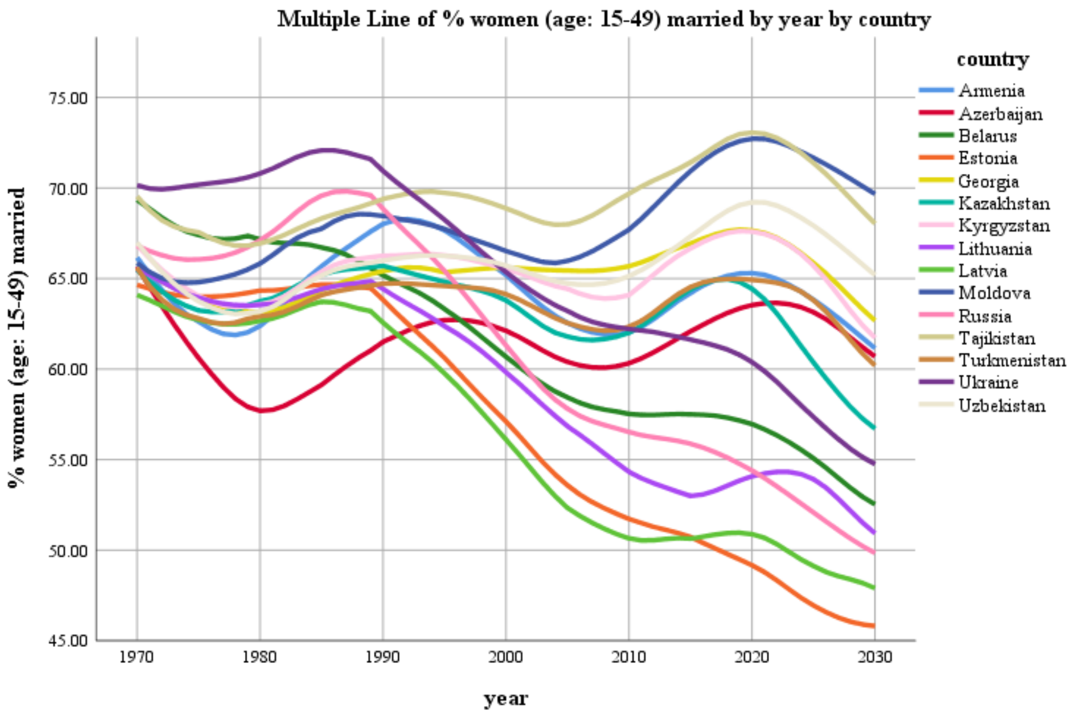

Figure 5.13. Comparison of estimated and projected trends for proportion (or percentage) of women of reproductive age who are married or in a civil union in post-Soviet countries between 1970 and 2030 (UNPD, 2020).

Figure 5.14 shows the same data as figure 5.13 but separated by geographic region. Dissolution of the USSR led to a decrease in proportion of women of reproductive age married or in a union in 1990s for all post-Soviet countries, but the European countries had a much steeper decrease in proportion married than the Asian countries (figure 5.14). All European countries (except for Moldova) have not recovered from the decrease in proportion married since the dissolution of the USSR, while all Asian countries saw an increase in proportion married between 2010 and 2020 (figure

5.14). The UN projects that proportion of women of reproductive age who are married or in a civil union will keep declining in all post-Soviet countries until 2030.

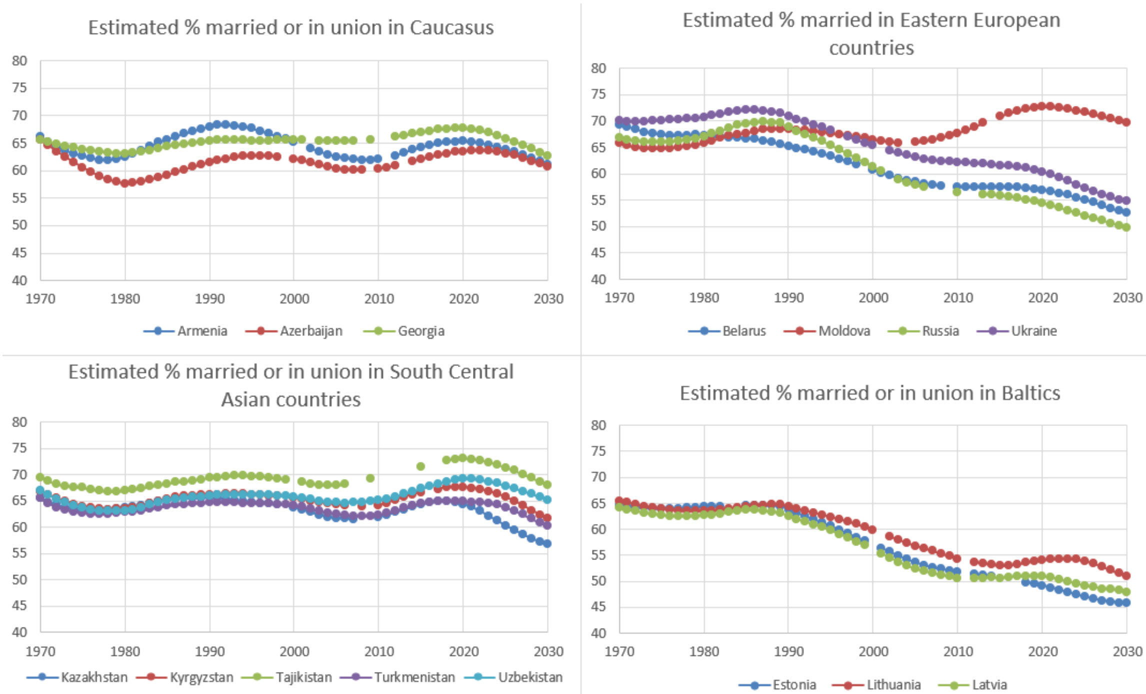

Figure 5.14. Comparison of estimated and projected trends for proportion (or percentage) of women of reproductive age who are married or in a civil union in post-Soviet countries between 1970 and 2030 by region (UNPD, 2020).

South-Central Asian countries are the only ones that did not have a significant decrease in proportion married for all women of reproductive age between 1970 and 2020 (figure 5.14), which means that women in these countries are getting married at similar rates as their mothers, although each country experienced some fluctuations following the dissolution of the USSR. In 1970, between 65% and 70% of all women of reproductive age in South-Central Asian countries were married or in a union. As of 2020, the situation is very similar, with Kazakhstan at 65% and Tajikistan at 73% (figure 5.14).

Data show that in recent years, women in *all* post-Soviet countries are getting married at older ages than their mothers had been in 1970s and 1980s. Between 1970s and 1990s, most women in all republics of the USSR got married between 20 and 24 years old, as for those years proportion married in 15–19-year-olds was 6–16% (figure 5.15) but it jumped to 52–76% in 20–24-year-olds (figure 5.16) and 76–89% in 25–29-year-olds (figure 5.17). Conversely, in 2020, 2–14% of 15–19-year-olds, 16–77% of 20–24-year-olds, and 45–88% of 25–29-year-olds are married, with the lowest proportions in Latvia and Lithuania and the highest in Tajikistan and Georgia[20] (figures 5.15–5.17).

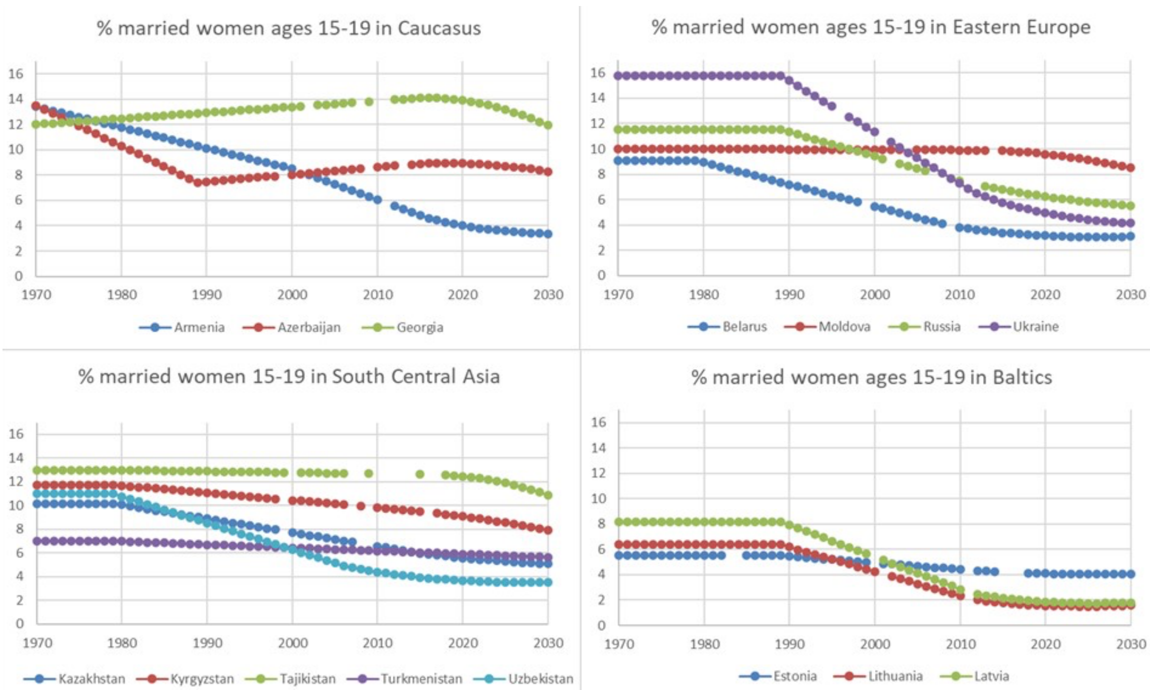

Figure 5.15. Comparison of estimated and projected trends for % of women (ages 15–19) married or in a union in post-Soviet countries between 1970 and 2030 by region (UNPD, 2020).

[20] Georgia is only the highest for 15–19-year-olds (figure 5.15)

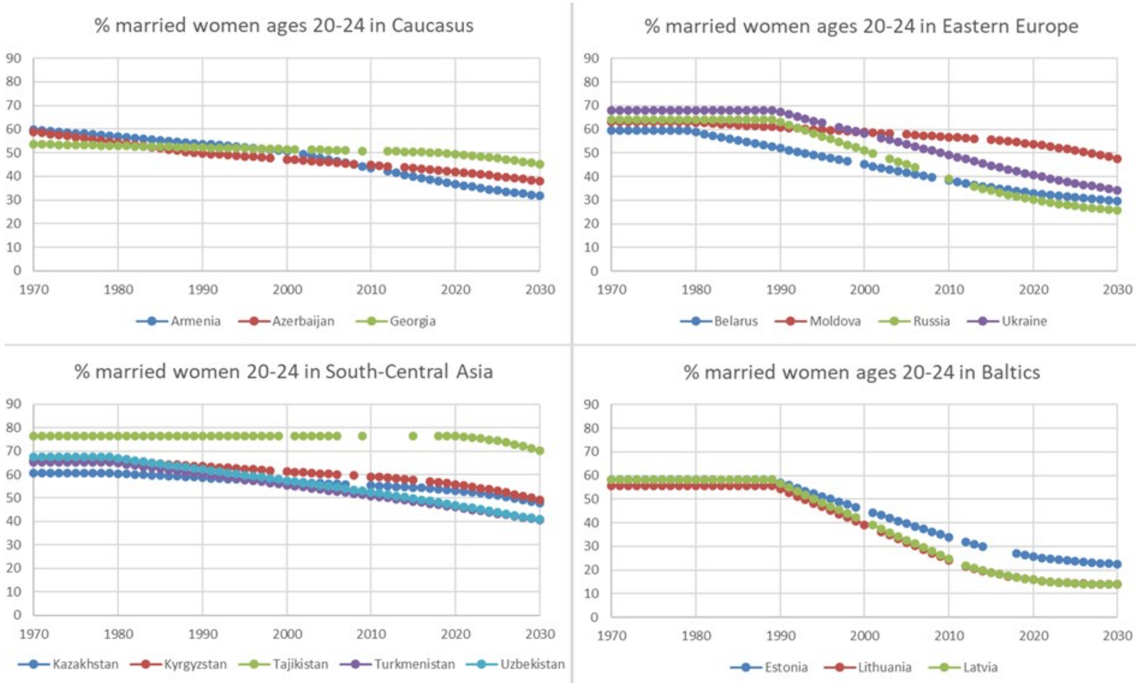

Figure 5.16. Comparison of estimated and projected trends for percent of women (ages 20–24) married or in a union in post-Soviet countries between 1970 and 2030 by region (UNPD, 2020).

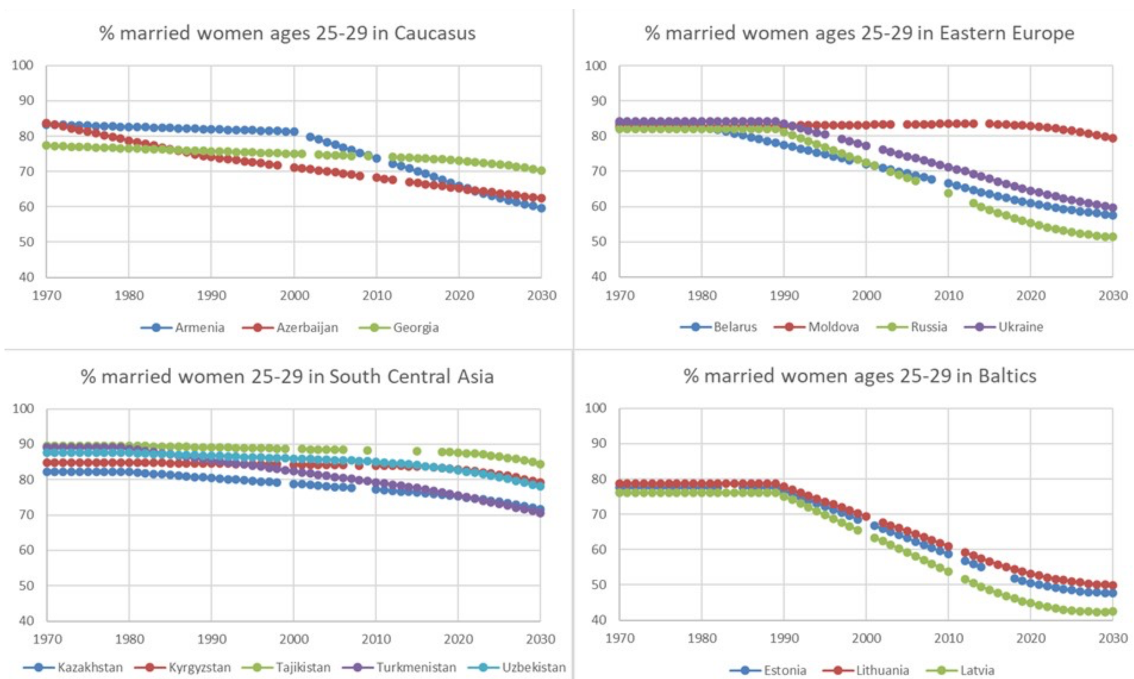

Figure 5.17. Comparison of estimated and projected trends for percent of women (ages 25–29) married or in a union in post-Soviet countries between 1970 and 2030 by region (UNPD, 2020).

Some differences in marriage behavior existed before the dissolution of the USSR but may have been amplified by it. In years directly before the dissolution, the difference between the highest and lowest proportion married for every age group among all post-Soviet countries was around 10% (figure 5.18). **This means that prior to the USSR dissolution, most women got married in their early twenties and stayed married throughout their reproductive years.**

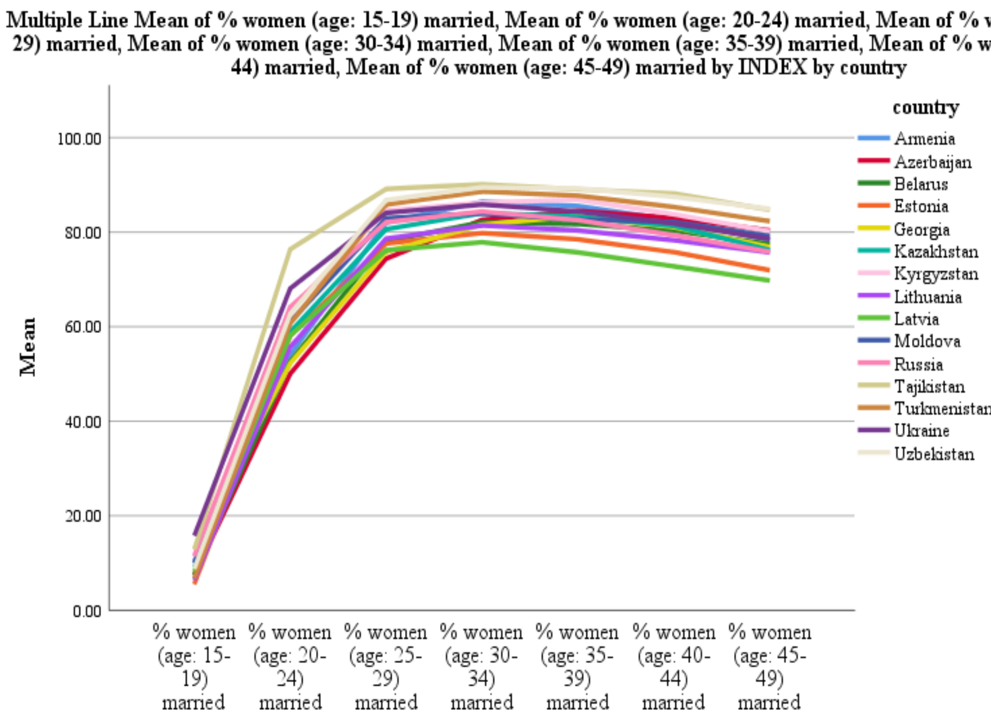

Figure 5.18. Comparison of estimated and projected proportions (or percentage) of women of reproductive age in each standardized age group who are married or in a civil union in Soviet Republics in 1989 (UNPD, 2020).

However, there is much more variability in 2020 – about 25% between the highest and the lowest proportion married for each age group (figure 5.19) among different post-Soviet countries, which further shows that they are diverging from each other in terms of marriage behavior. Nevertheless, the countries with the highest proportions married in

1989 (South-Central Asian countries) are still the highest in 2020, just like the ones with the lowest proportions married in 1989 (Baltic countries) are still the lowest in 2020.

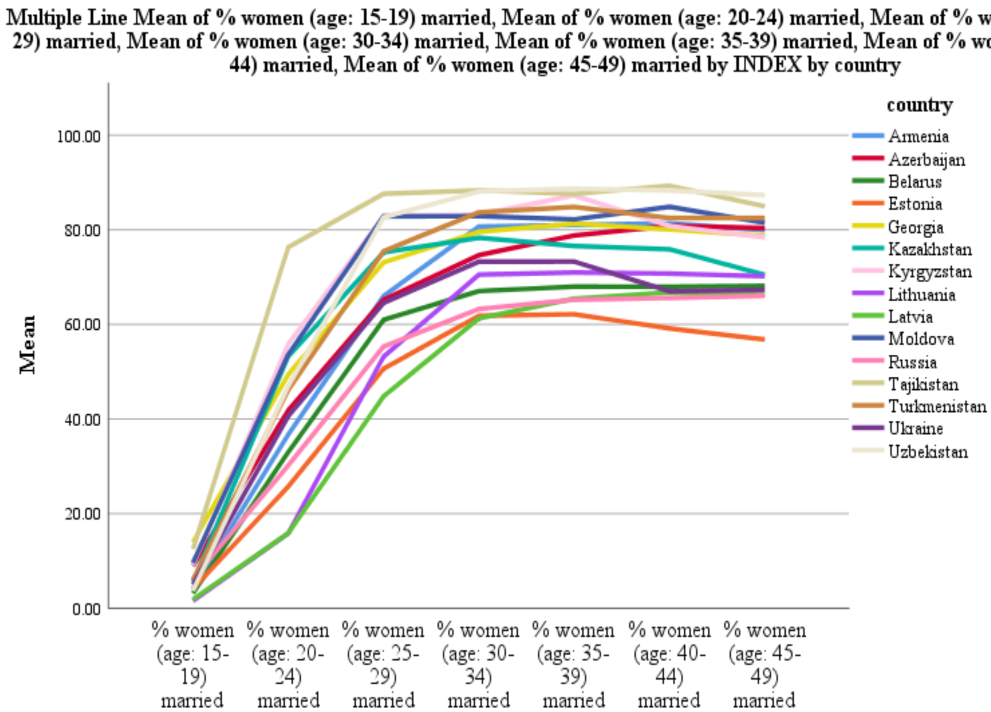

Figure 5.19: Comparison of estimated and projected proportions (or percentage) of women of reproductive age in each standardized age group who are married or in a civil union in in post-Soviet countries in 2020 (UNPD, 2020).

While most European post-Soviet countries saw a large decrease in proportion married or in a union between 1990 and 2020, the Asian post-Soviet countries maintained a relatively stable proportion married over time, which contributed to a statistically significant difference in average proportions married among regions of post-Soviet countries (p = 1.44E-27, Appendix B table 9B).

This shows cultural differences among the four geographic regions that the fifteen post-Soviet countries fall into, as Caucasus and South-Central Asian countries still maintain more traditional societies than European countries with a high emphasis on religion and importance of marriage, often at a young age (Edwards & Booth, 1976;

Rechel et al., 2012). An obvious outlier is Moldova, which maintained a high proportion married compared to other European countries, but it is also the least developed and most traditional country among European post-Soviet countries (Turcanu et al., 2012). **South-Central Asian post-Soviet countries maintain high proportions married, which correspond to their high fertility rates. European countries had a large decrease in proportion married after the dissolution of the USSR and have not recovered from that decrease, which can be a reason for low fertility rates in those countries.**

Data show interesting differences in the relationships between proportions married, fertility rates, and abortion rates in 1990 and 2017. In 1990 there was a weak correlation (r = 0.19, Appendix B table 10B) between proportion married and total fertility rate among post-Soviet countries (figure 5.20). At the same time, there was a moderate correlation (r = 0.40, Appendix B table 11B) between proportion married and abortion rate for Soviet Republics (figure 5.21). **This means that it is likely that most abortions in 1990 were abortions of married women, as over 60% of all women of reproductive age in the USSR were married in 1990.**

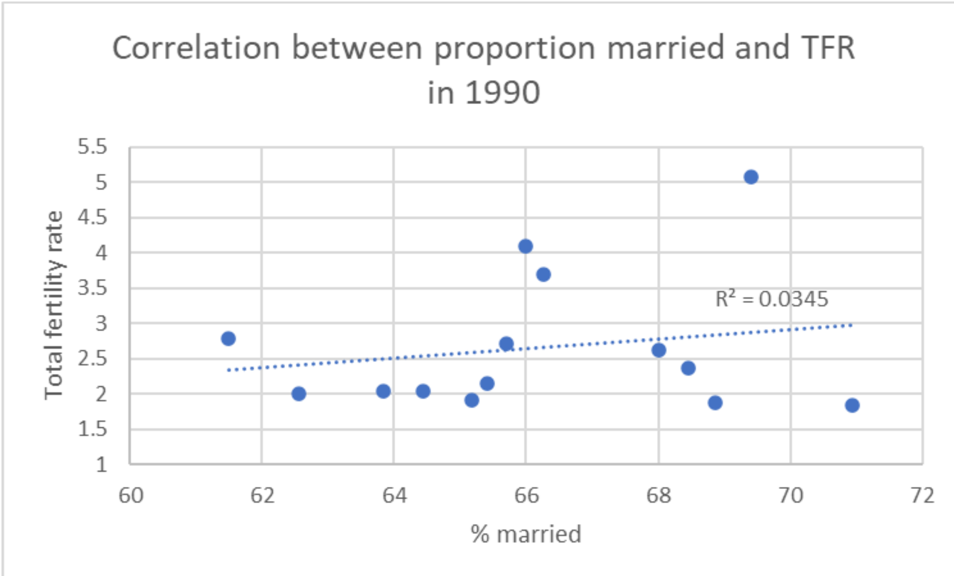

Figure 5.20. Correlation between TFR and proportion married in 1990, each dot is a different Soviet Republic.

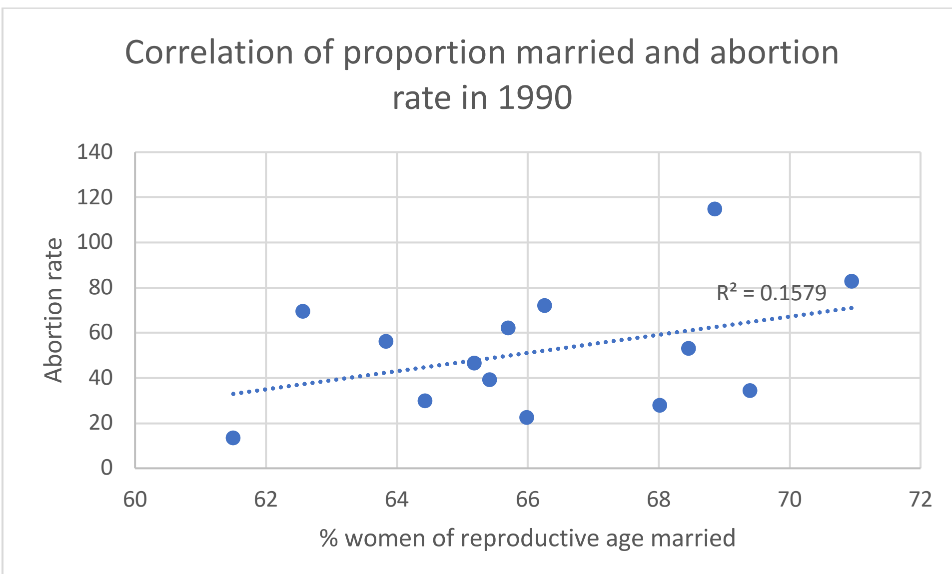

Figure 5.21. Correlation between abortion rate and proportion married in 1990, each dot is a different Soviet Republic.

In 2017, however, the correlations observed above switch. There is a moderate correlation (r = 0.50, Appendix B table 10B) between proportion married and total fertility rate (figure 5.22) and negligible correlation (r = 0.03, Appendix B table 11B) between proportion married and abortion rate (figure 5.23). **Therefore, it is likely that abortions in most post-Soviet countries in 2017 were abortions of both married and unmarried women, while married women were more likely to give birth than unmarried women.**

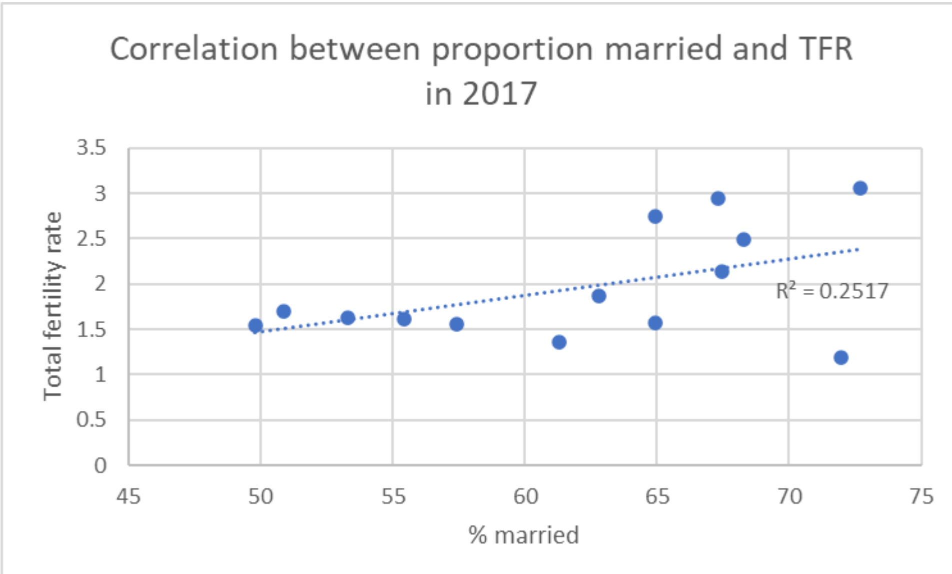

Figure 5.22. Correlation between TFR and proportion married in 2017, each dot is a different post-Soviet country.

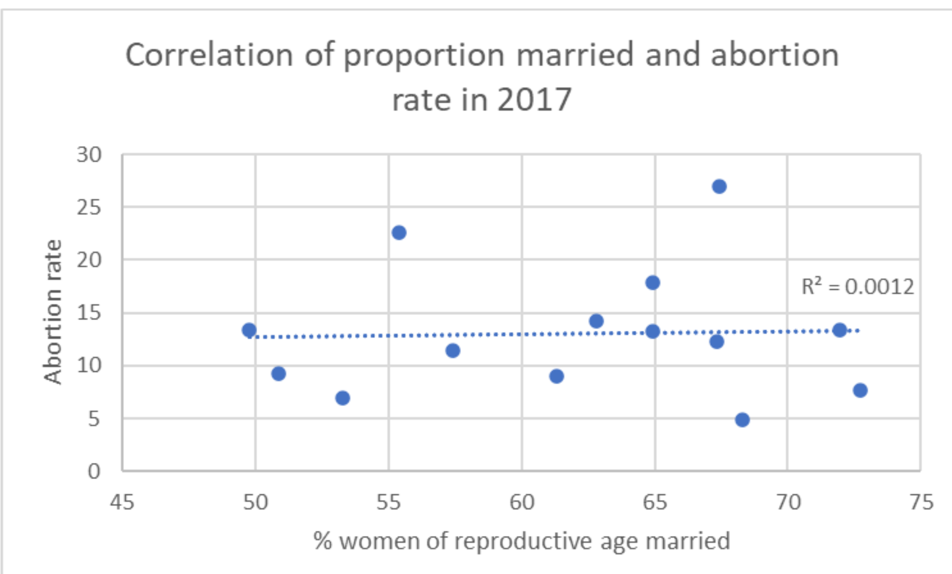

Figure 5.23. Correlation between abortion rate and proportion married in 2017, each dot is a different post-Soviet country.

General Trends in Contraception Use Between 1970 And 2020[21] and their Relation to Abortion Rates in Post-Soviet Countries

Given the differences in proportions of women of reproductive age married or in a civil union in post-Soviet countries, it is interesting to look at the differences between contraception use in married and unmarried women. Contraception use may change several times in a typical woman's life based on her health and reproductive needs, but it is a relatively stable indicator in a population, as it shows the general preference and availability of contraception in a population (Alkema et al., 2013; Barrett & Buckley, 2007; Brunner Huber et al., 2006; Festin et al., 2016).

There are age-related expected trends in contraceptive use. Adolescents may not be aware of their fertility and may not use any contraception because of that (Jarienė et al., 2022; Kantorová et al., 2021). As the woman ages, she becomes more aware of her fertility and the contraceptive choices available to her (Pedro et al., 2018). Dissatisfaction with a contraceptive method may lead to sporadic use or discontinuation of that method (Pazol et al., 2015). Some women also discontinue using their oral birth control due to resulting side effects, like weight gain or high risk of blood clots (Brunner Huber et al., 2006).

Generally, contraceptive use relies on the availability of those contraceptive methods and the woman's awareness of her own fertility, existence, and effectiveness of those methods. Traditional methods of contraception, such as rhythm method and

[21] Data are based on estimations and projections, so projections up to 2030 are available, but I only focus on data until 2020, as that is most relevant to this project.

withdrawal, are always available because they are free, but there are major downsides to them. Women must learn to use traditional methods of contraception and withdrawal requires skillful cooperation of the male partner, which is completely outside of a woman's control. Modern methods may be hard to acquire, as a woman may need prescription from a doctor and/or money to purchase the contraceptive.

Because of that, differences and changes in trends for contraception use are more closely related to issues of access, women's awareness about their fertility, and availability of contraceptive methods than to a sudden change in women's choice of contraception. Traditional contraception is much less effective than modern, so a decrease in use of traditional contraception and increase in use of modern contraception as a replacement for traditional methods is expected for all groups of women in all countries in the 1990s and later years (Dereuddre et al., 2016).

Overall, there is a large variability among post-Soviet countries in the use of any[22], modern, and traditional contraception that existed before the dissolution of the USSR and prevails to this day for all[23], married, and unmarried women. It is important to look at both types of contraception (modern and traditional) and both types of women (married and unmarried) cumulatively and separately, as that shows the specifics of changing dynamics in contraception use.

I first discuss the use of any contraception by all groups of women, then the use of traditional contraception, then modern. Afterwards, I present some data on desires satisfied by modern contraception, which is a measure of the percentage of women who

[22] Includes both modern and traditional contraception.
[23] Includes both married and unmarried women of reproductive age.

have regular access to multiple methods of modern contraception and are able to use it (Alkema et al., 2013; Powers, 2003; World Health Organization, 2020).

Any contraception. There are clear differences in the use of any method of contraception by all women in all post-Soviet countries. However, as these data include all types of contraception and all women in the country, there is little change over time for each country individually, though most countries have a slight increase in use of contraception over time (figure 5.24). While most countries maintain the same or very similar percentage of all women using any contraception between 1990 and 2020, European countries have higher percentages of all women using any contraception than Asian countries (figure 5.24). **This means that, in very general terms, a higher percentage of women in Europe uses contraception than in Asia. This makes sense given the low TFR in Europe and high TFR in Asia.**

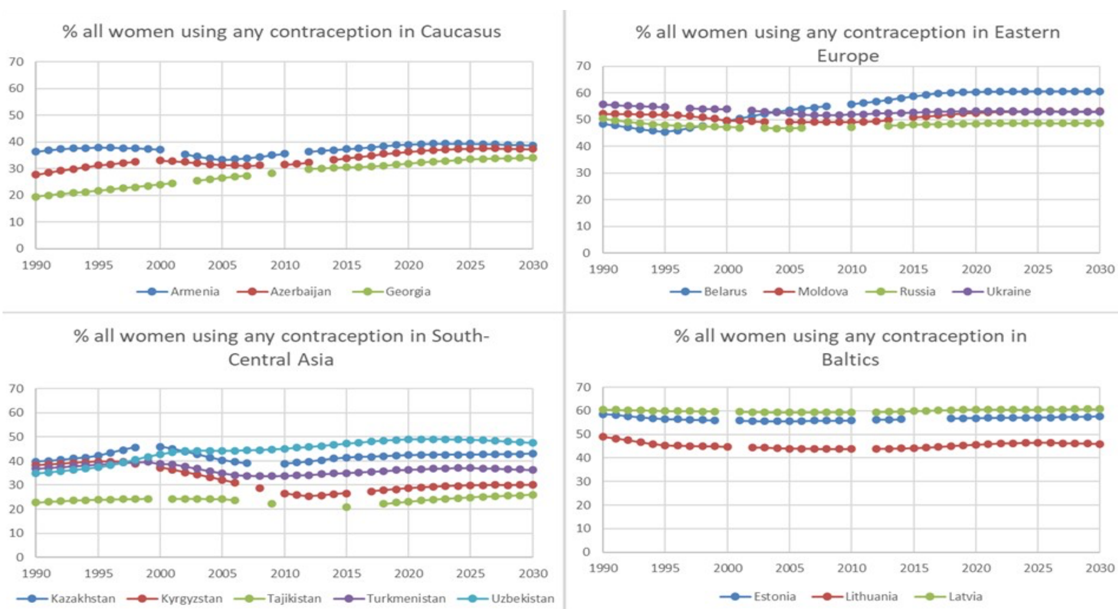

Figure 5.24. Comparison of estimated and projected trends for percent of all women of reproductive age who use any form of contraception between 1990 and 2030 by region (UNPD, 2020).

Now, let us look at the data for any contraception use among married women only (figure 5.25). Any contraception use remained relatively high (60–75%) for married women in European countries since the USSR dissolution, though Belarus and Lithuania had a dip in mid-1990s (figure 5.25). Conversely, any contraception use among married women rose significantly in Asian countries, but only one Asian country – Uzbekistan – achieved the same level (70%) as the European post-Soviet countries have had since the 1970s (figure 5.25). Just like with fertility rates, there is much more diversity in any contraception use in married women among Asian post-Soviet countries than European ones. As of 2020, a large discrepancy in any contraception use among married women in post-Soviet countries remains, with the lowest being in Tajikistan at 32% and the highest in Latvia at 72% (figure 5.25).

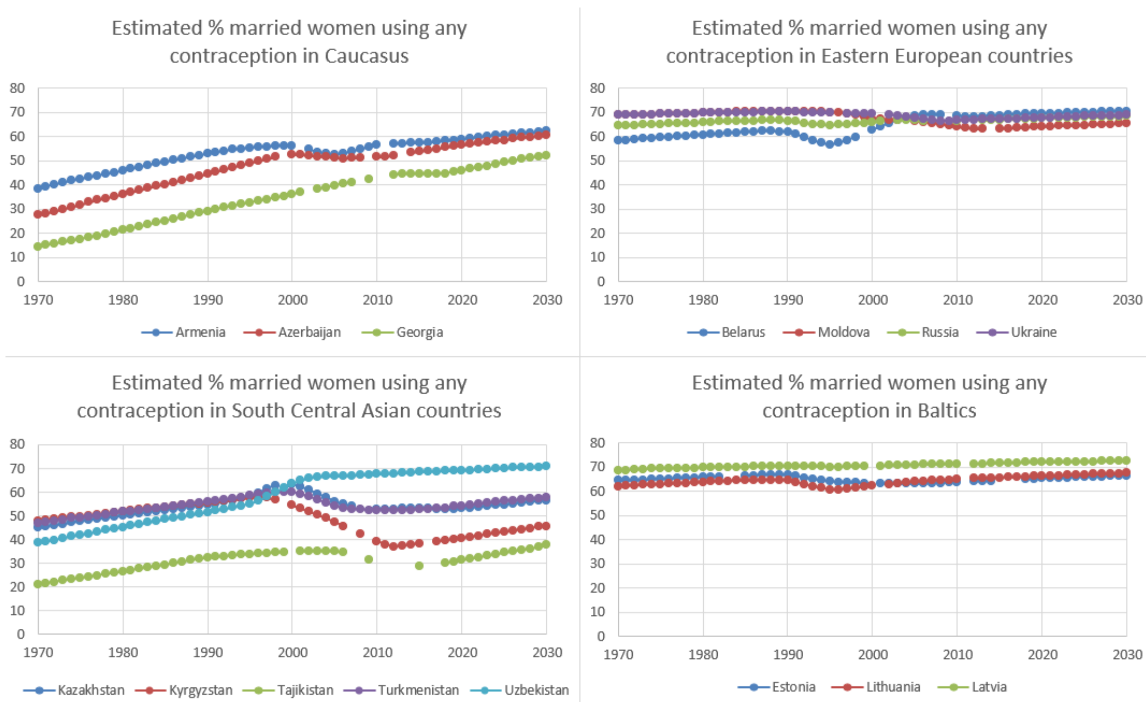

Figure 5.25. Estimated percent of married women of reproductive age (15–49) who use any form of contraception in 15 post-Soviet countries by region (UNPD, 2020).

Data on any contraceptive use among unmarried women paints a drastically different picture than the data on married women (figure 5.26). Asian post-Soviet countries have very low rates of any contraception use for unmarried women, according to the UN, while the estimated percent of unmarried women using any contraception in European post-Soviet countries continues to rise steadily (figure 5.26). The only outlier for this trend is Kazakhstan. **This means, again in very broad terms, that unmarried women in Asian post-Soviet countries mostly have not and still do not use any contraception and are unlikely to be sexually active.**

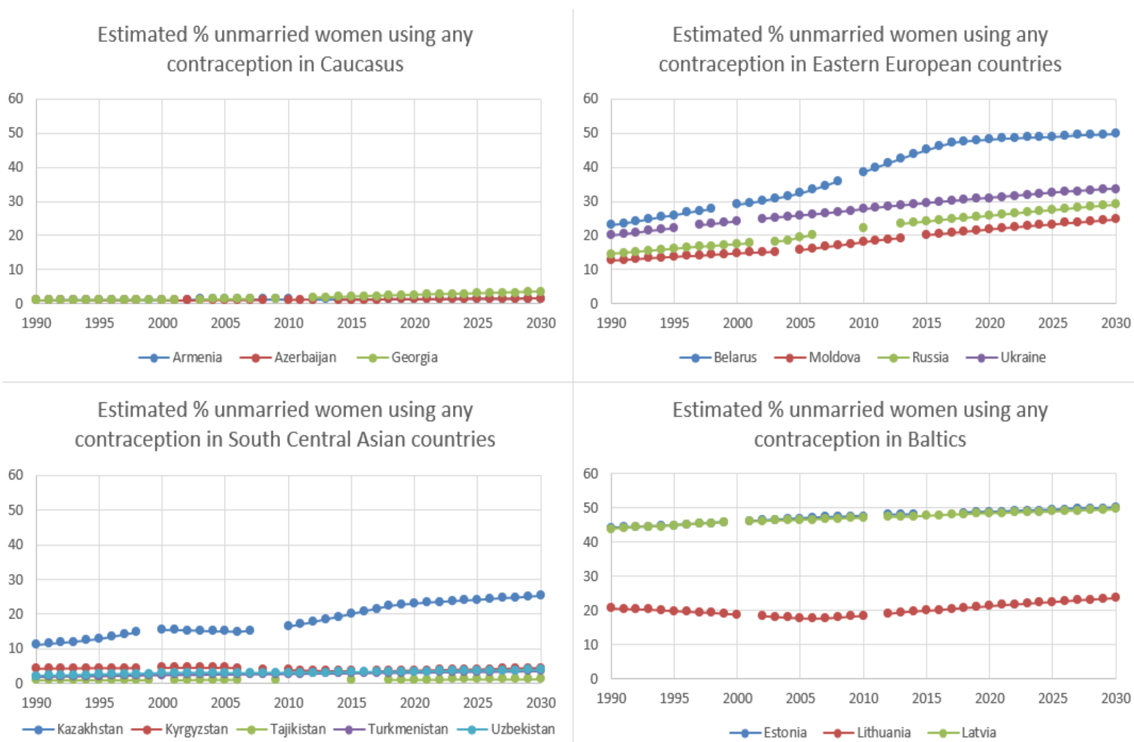

Figure 5.26. Estimated percent of unmarried women of reproductive age (15–49) who use any contraception in 15 post-Soviet countries by region (UNPD, 2020).

Traditional contraception. While there is large variability among the countries, most of them saw an overall decrease in the use of traditional contraception for all women between 1990 and 2020, except for Armenia and Azerbaijan (figure 5.27). The

Caucasus countries – Armenia, Azerbaijan, and Georgia – had an increase in the use of traditional contraception between 1990 and 2000 and only had a slight decrease between 2000 and 2020 (figure 5.27). Armenia and Azerbaijan are consistently the countries in which women use traditional contraception at the highest rates among all post-Soviet countries (figures 5.27–5.29). Conversely, women in South-Central Asian countries have some of the lowest rates of traditional contraception use among all post-Soviet countries (figure 5.27).

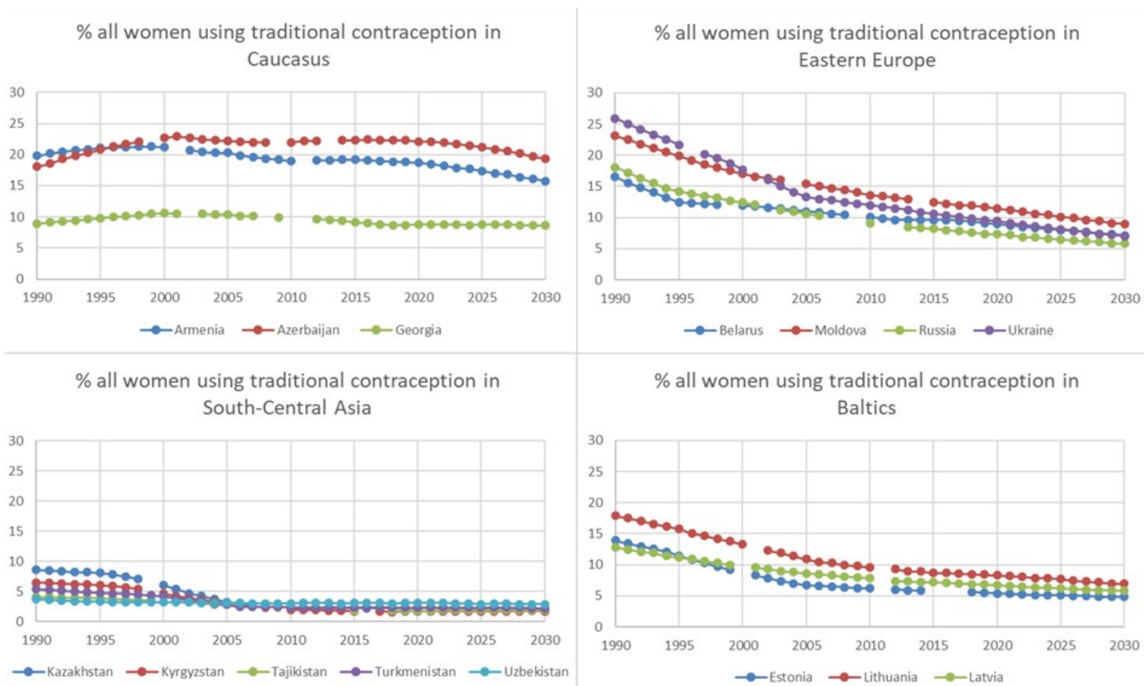

Figure 5.27. Comparison of estimated and projected trends for percent of all women of reproductive age who use traditional contraception between 1990 and 2030 by region (UNPD, 2020).

When the above data are separated by married and unmarried women, more interesting trends emerge. The most drastic decline in the use of traditional contraception was among married women in Eastern Europe (from 35–50% in 1990 to 9–15% in 2020, figure 5.28). At the same time, Eastern European countries have the highest prevalence of traditional contraception use in unmarried women among all post-Soviet countries and Belarus even had an increase in use of traditional methods in 2010s (figure 5.29).

Also, a much smaller proportion of women in each country uses traditional contraception when unmarried than when married. For example, in 1990, the highest percent of married women who used traditional contraception was in Ukraine at 50%, but only 6% of unmarried women in Ukraine used traditional contraception the same year (figures 5.28 and 5.29).

The most interesting finding is the difference between traditional contraception use in married and unmarried women in Asian countries. Note that a very high proportion of married women in Caucasus use traditional contraception compared to other post-Soviet countries (8–22% in 1970 and 12–35% in 2020, figure 5.28), while less than 0.5% of unmarried women use traditional contraception in Caucasus, and that number does not change over time (figure 5.29). All South-Central Asian countries, except for Kazakhstan, have similarly low metrics of single women using traditional methods of contraception (figure 5.29).

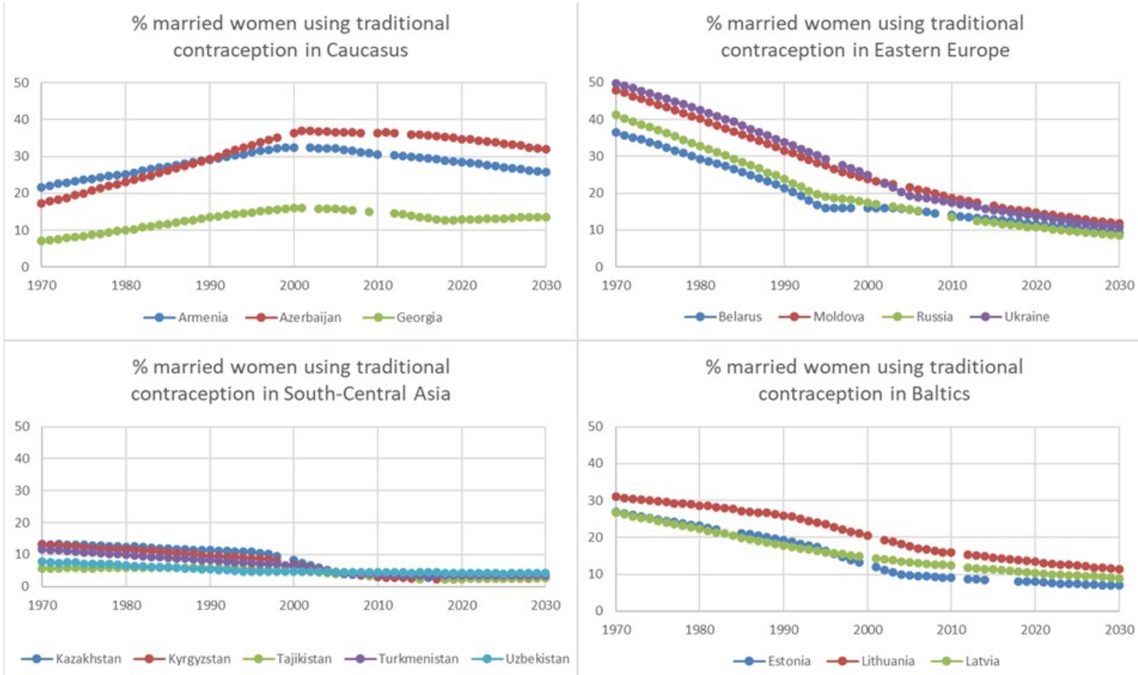

Figure 5.28. Comparison of estimated and projected trends for percent of married women of reproductive age who use traditional contraception between 1990 and 2030 by region (UNPD, 2020).

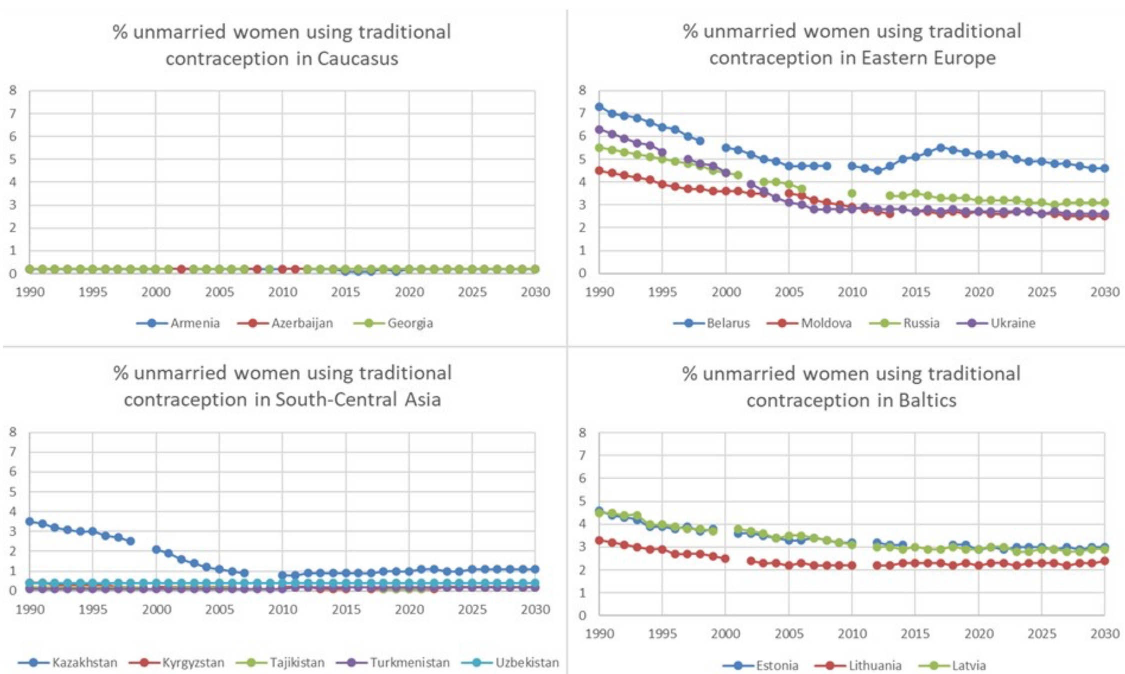

Figure 5.29. Comparison of estimated and projected trends for percent of unmarried women of reproductive age who use traditional contraception between 1990 and 2030 by region (UNPD, 2020).

Since traditional contraception is not very effective at preventing unplanned pregnancies, a correlation between high use of traditional contraception and high abortion rate can be expected. However, there was only weak positive correlation (r = 0.22, Appendix B table 12B) between estimates of traditional contraceptive use by all women of reproductive age and total abortion rates in 1990 (figure 5.30) and negligible correlation (r = 0.06, Appendix B table 12B) between those factors in 2017 (figure 5.31). This means that while high use of traditional contraception may have contributed to high abortion rates in 1990, that no longer holds true in 2017. **This points to an increase in fertility awareness of women in post-Soviet countries, as in 2017, abortion rates are not correlated with general estimates of traditional contraception use, so they may be using those methods more successfully in recent years than they were in 1990.**

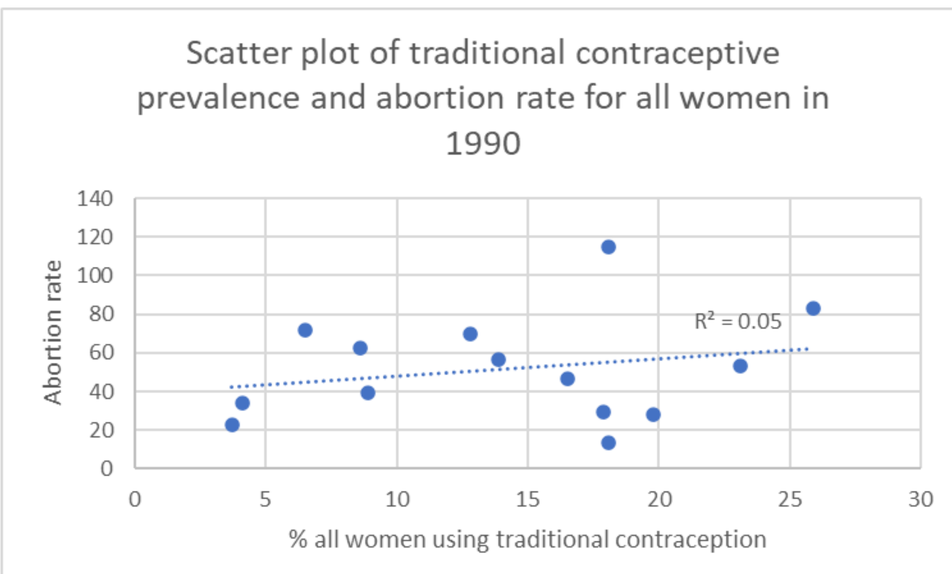

Figure 5.30. Correlation between abortion rate and percent of all women of reproductive age who use traditional contraception in 1990, each dot is a different Soviet Republic.

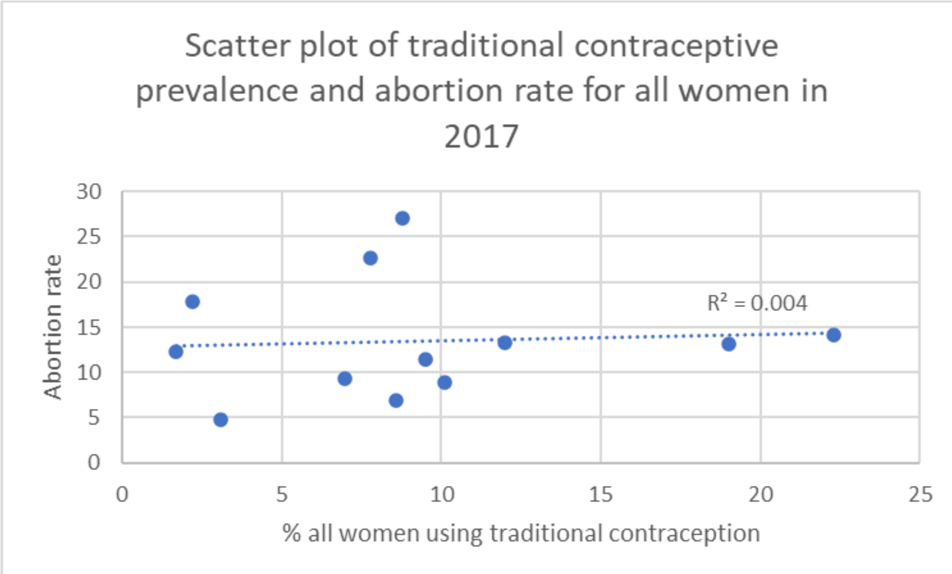

Figure 5.31. Correlation between abortion rate and percent of all women of reproductive age who use traditional contraception in 2017, each dot is a different post-Soviet country.

Data on the use of specific contraceptive methods is only available via surveys, so there are only 2–7 data points for every country, but these data are still valuable to observe, as every method has a varied percent of effectiveness and may thus affect the fertility metrics of a population, including abortion rate (Festin et al., 2016; Tietze, 1965). All South-Central Asian countries have below 5% of rhythm method and withdrawal use (figures 5.32 and 5.33), which is consistent with their generally low prevalence of traditional contraception (figures 5.27–5.29). Russia has the highest rate of rhythm method use among all post-Soviet countries at 14–18% (figure 5.32), while Armenia and Azerbaijan have the highest rate of withdrawal use at 25–40% (figure 5.33).

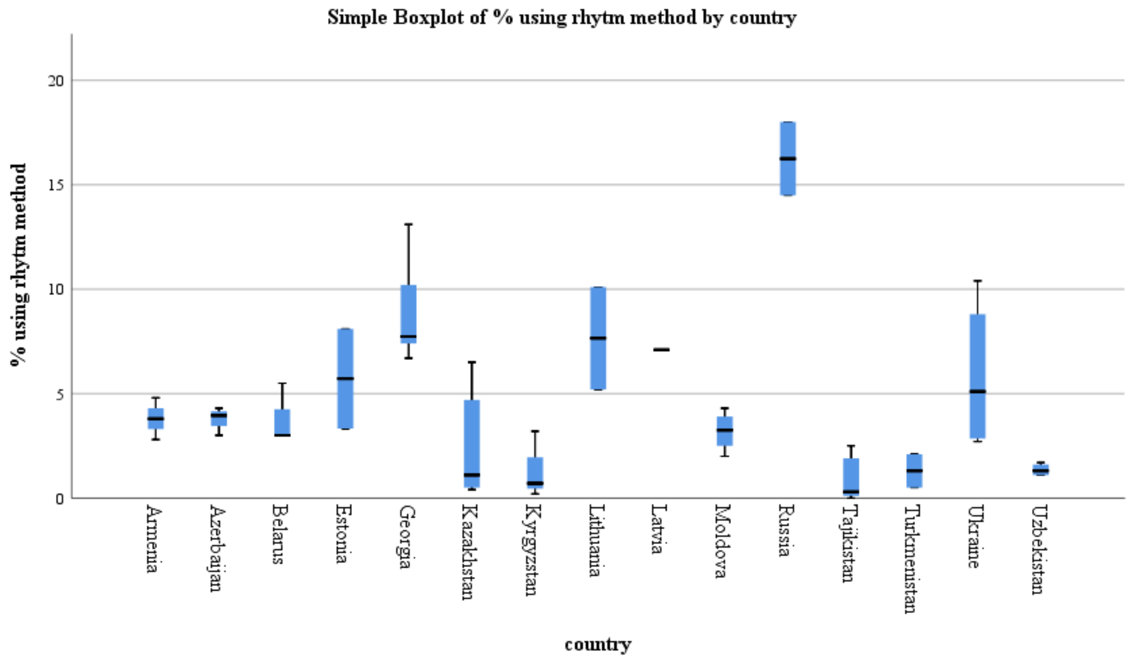

Figure 5.32. Comparison of recorded percent of all women of reproductive age who use rhythm method as their primary contraception (UNPD, 2019).

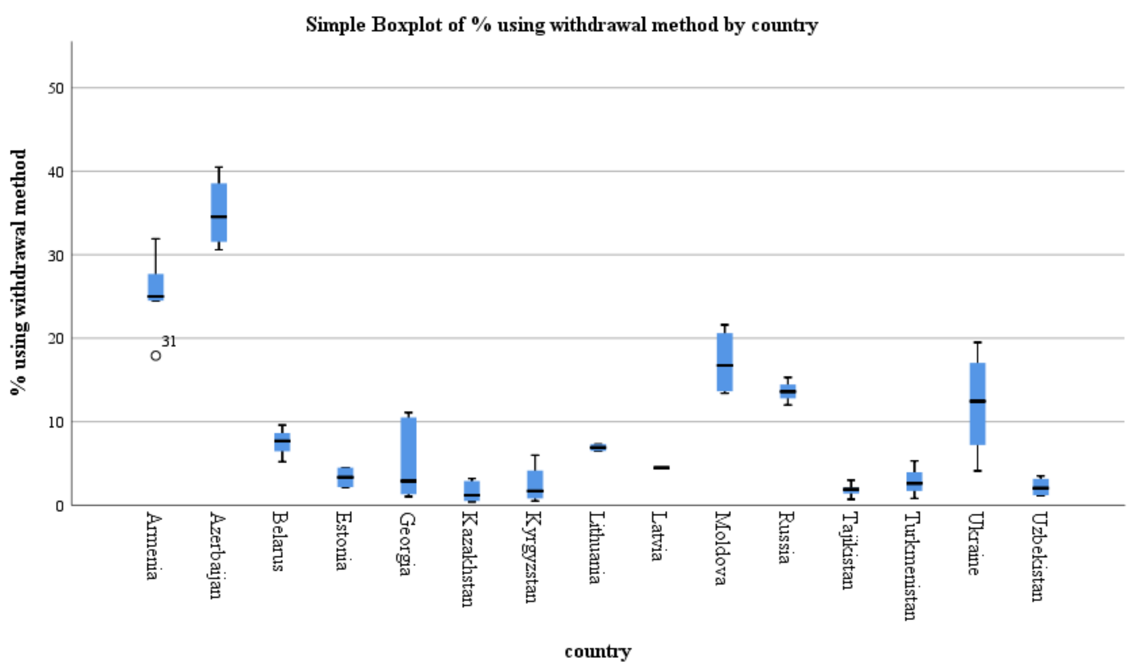

Figure 5.33. Comparison of recorded percent of all women of reproductive age who use withdrawal as their primary contraception (UNPD, 2019).

There was a strong positive correlation (r = 0.77 including Latvia[24] and r = 0.82 excluding Latvia, Appendix B table 13B) between use of rhythm method and abortion rate (figure 5.34) and a negligible negative correlation (r = –0.17 including Latvia and r = –0.05 excluding Latvia, Appendix B table 14B) between the use of withdrawal and abortion rate (figure 5.35). **This means that women who primarily use rhythm method often may not use it correctly and have unplanned pregnancies, which, thus, result in abortions. Additionally, the prevalence of withdrawal as the most common (and oldest) traditional contraceptive method worldwide** (Bertrand et al., 2022) **and the negligible correlation of its use with abortion rates in post-Soviet countries likely contributes to the aforementioned negligible correlation between general use of traditional contraception and most recent abortion rates of 2017** (figure 5.31).

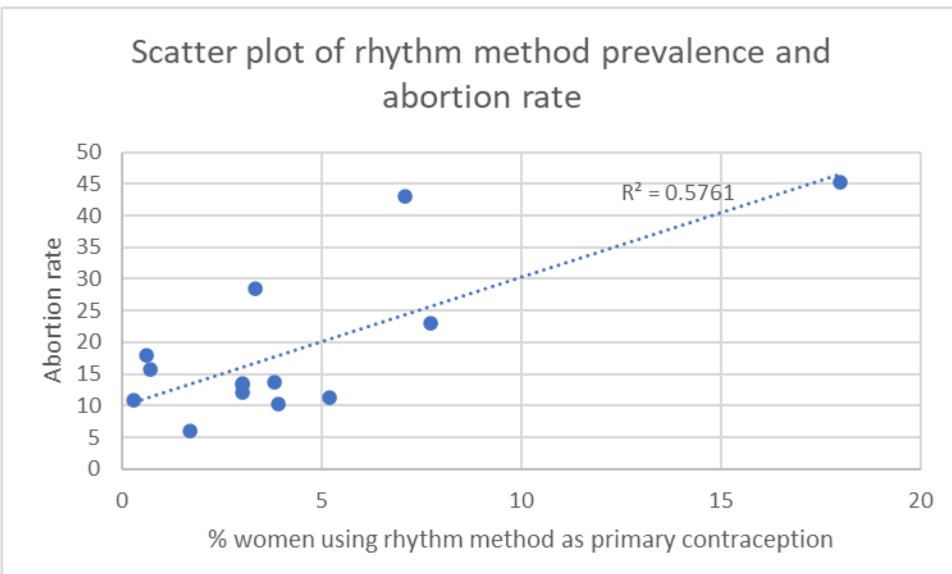

Figure 5.34. Correlation between abortion rate and percent of all women of reproductive age who use rhythm method as their primary contraception, each dot is a different post-Soviet country, including Latvia. Data for latest year available and corresponding abortion rate for the same year.

[24] Recall from the Chapter 1: Methods that Latvia only reported one data point for each contraceptive method use, so I performed the correlation analyses with and without Latvia for each specific method.

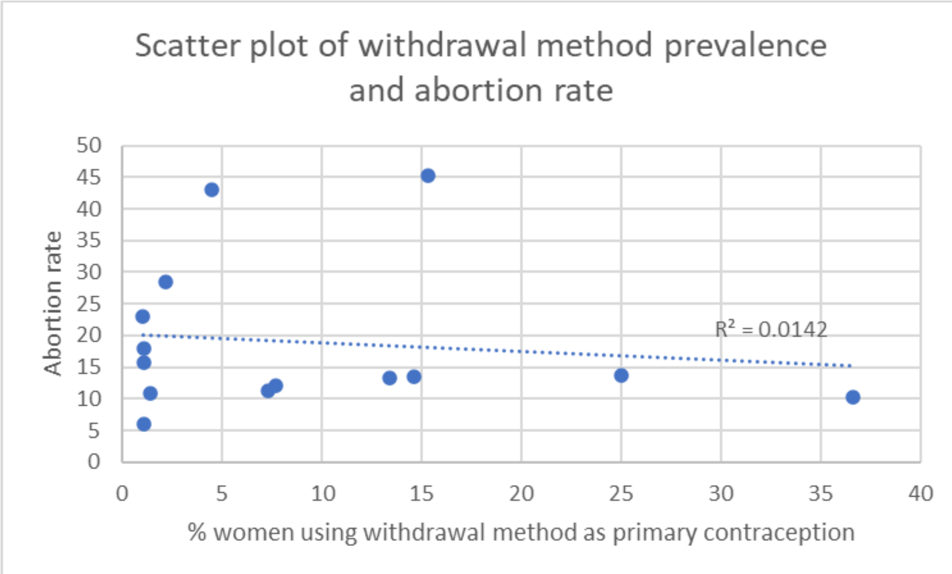

Figure 5.35. Correlation between abortion rate and percent of all women of reproductive age who use withdrawal as their primary contraception, each dot is a different post-Soviet country, including Latvia. Data for latest year available and corresponding abortion rate for the same year.

Modern contraception. There were differences in modern contraception use prior to the USSR dissolution and, generally, all countries had an increase in the use of modern contraception for all women over time (figure 5.36). In 1990, the highest prevalence of modern contraception use was in Latvia, just below 50%, while the lowest was in Azerbaijan at 9%. Comparatively, in 2020, the highest is still Latvia at 62% and the lowest is still Azerbaijan at 14% (figure 5.36). Once again, the countries with the highest values for an indicator (modern contraception use here) before the USSR dissolution maintain the highest values for that indicator three decades later, and the ones with the lowest values before the dissolution maintain the lowest values afterwards.

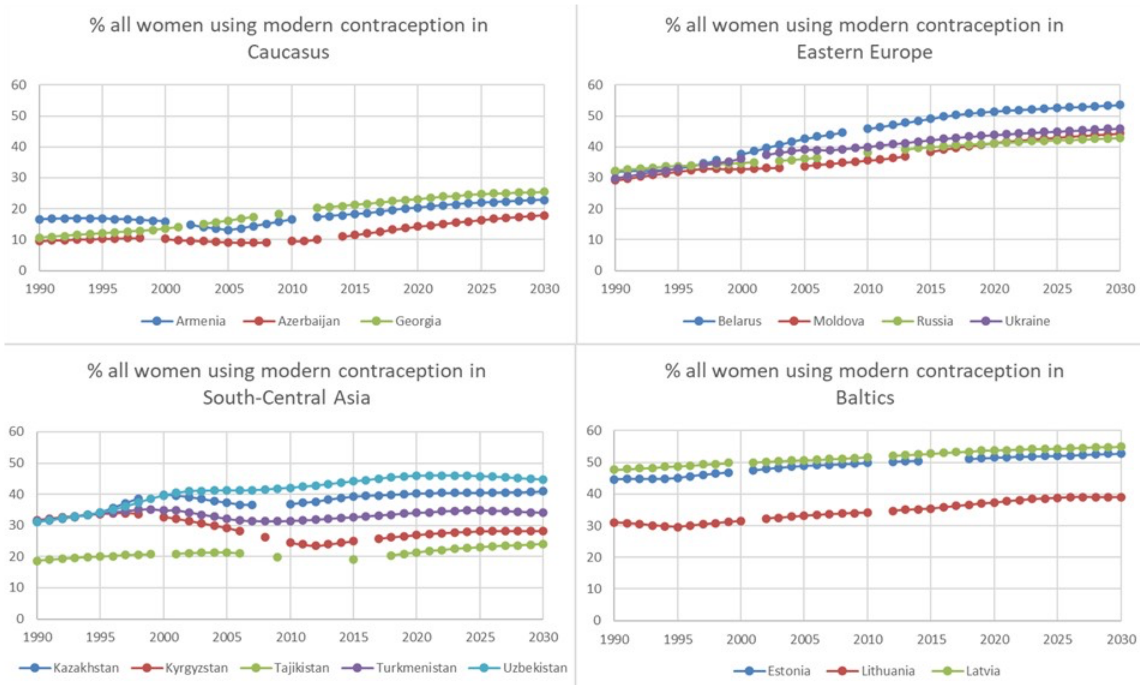

Figure 5.36. Comparison of estimated and projected trends for percent of all women of reproductive age who use modern contraception between 1990 and 2030 by region (UNPD, 2020).

Data on modern contraception use by married and unmarried women complete the picture of contraceptive use in post-Soviet countries. All countries had an increase in use of modern contraception by married women (figure 5.37). Eastern European countries and Uzbekistan had the sharpest increase in use of modern contraception among married women over time, while countries in the Caucasus had the least growth in modern contraception use for married women, which is consistent with generally low modern contraceptive prevalence in the Caucasus (figure 5.36).

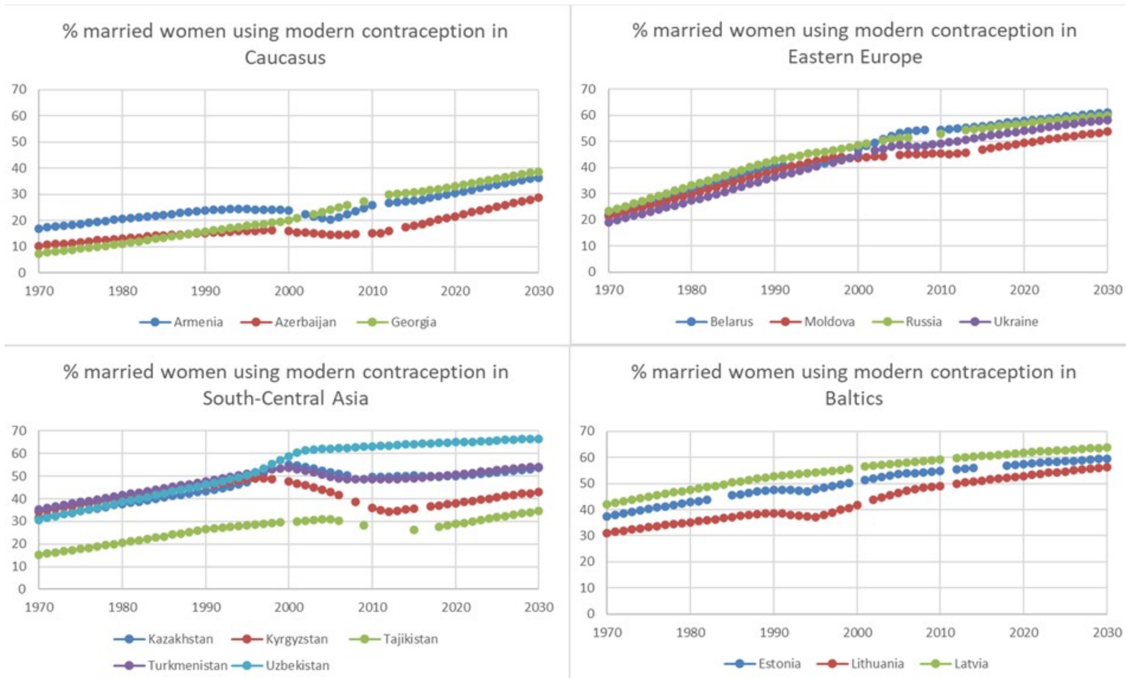

Figure 5.37. Comparison of estimated and projected trends for percent of married women of reproductive age who use modern contraception between 1970 and 2030 by region (UNPD, 2020).

As with any and traditional contraception, Asian countries, except for Kazakhstan, have persistently low prevalence of modern contraception use for unmarried women (figure 5.38). However, 1–5% of unmarried women in South-Central Asian countries use modern contraception, which is much higher than 0.5% of unmarried women in the same region who use traditional methods (figures 5.29 and 5.38). Similarly, there is basically no modern contraceptive use in unmarried women in the Caucasus, but the UN projects that Georgia will increase its modern contraceptive use by about 1% by 2030 (figure 5.38). **Coupled with young age at marriage and high TFR, this likely means that very few unmarried women in Asian post-Soviet countries have intercourse, so most abortions in those countries are likely the abortions of married**

women while abortions in European post-Soviet countries are a mix of married and unmarried women.

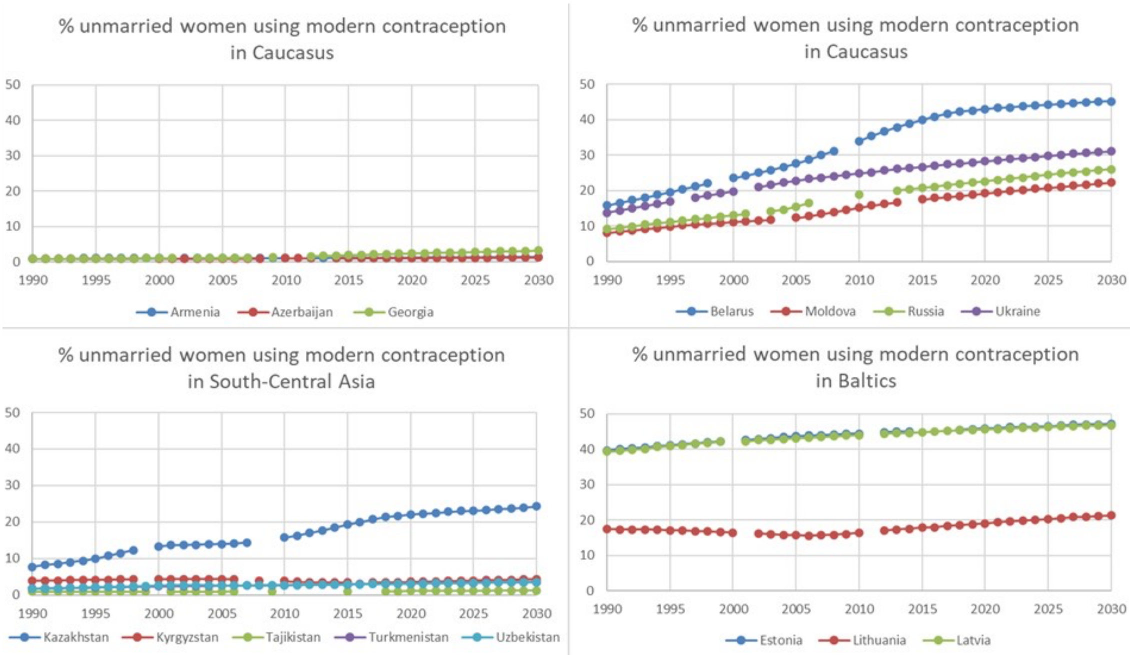

Figure 5.38. Comparison of estimated and projected trends for percent of unmarried women of reproductive age who use modern contraception between 1990 and 2030 by region (UNPD, 2020).

There is an intriguing difference between correlation of modern contraceptive use by all women of reproductive age and total abortion rates in 1990 and 2017. In 1990, there was a moderate positive correlation (r = 0.52, Appendix B table 15B) between these factors (figure 5.39). Conversely, in 2017 (figure 5.40), there was a weak negative correlation (r = –0.25, Appendix B table 15B). This means that in 1990, high prevalence of modern contraception was somewhat correlated with high abortion rate in most post-Soviet countries, but in 2017 it was not. **This likely points to the difference in types of modern contraception that were most widely used in 1990 and 2017, as some modern methods, like condoms, require skillful male cooperation, have lower effectiveness, and higher human error rates than other modern methods, like IUDs**

(World Health Organization & Johns Hopkins Bloomberg School of Public Health, 2018). Therefore, the use of specific modern methods is relevant to explore.

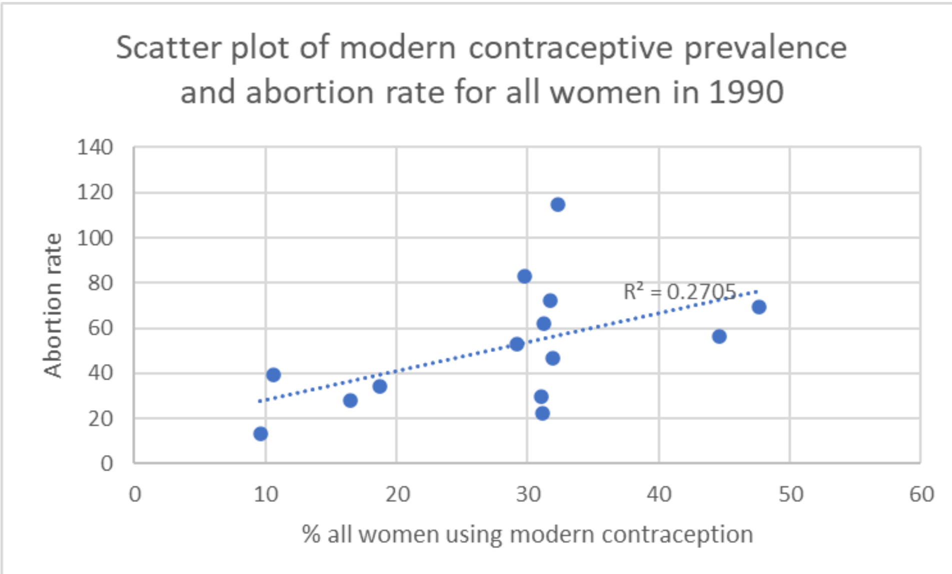

Figure 5.39. Correlation between abortion rate and percent of all women of reproductive age who use modern contraception in 1990, each dot is a different Soviet Republic.

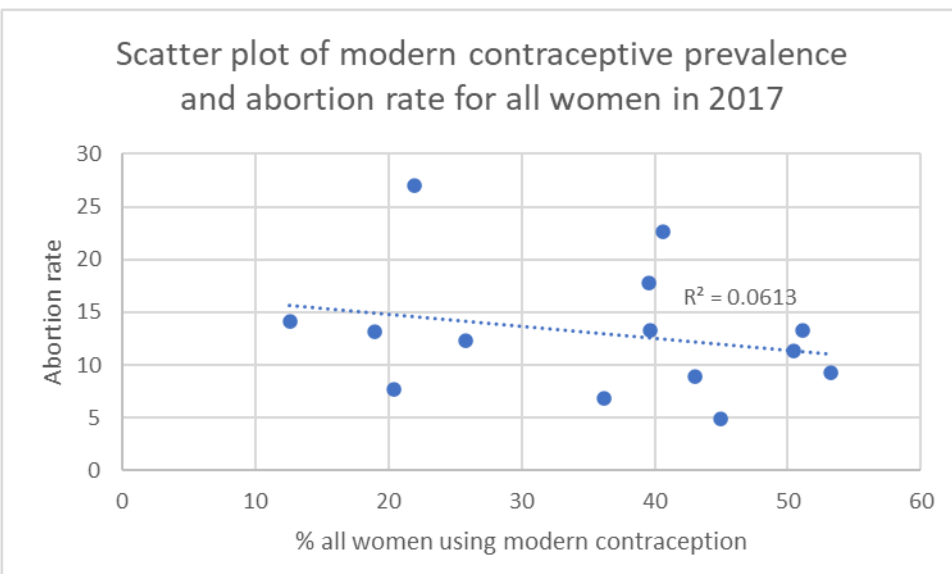

Figure 5.40. Correlation between abortion rate and percent of all women of reproductive age who use modern contraception in 2017, each dot is a different post-Soviet country.

The use of specific modern contraceptive methods is also highly varied among post-Soviet countries. IUD is a long lasting and one of the most highly effective forms of contraception, which prevents over 99% of pregnancies (Barrett & Buckley, 2007; Weismiller, 2004). Uzbekistan has the highest rate of IUD use at 45.8–56.3%, while Armenia, Azerbaijan and Georgia have the lowest rate if IUD use at 6–12% (figure 5.41). It is the most popular modern contraceptive in all Asian post-Soviet countries (Barrett & Buckley, 2007; Sulzbach et al., 2002), even though the rates of its use are only around 10% in the Caucasus (figure 5.41).

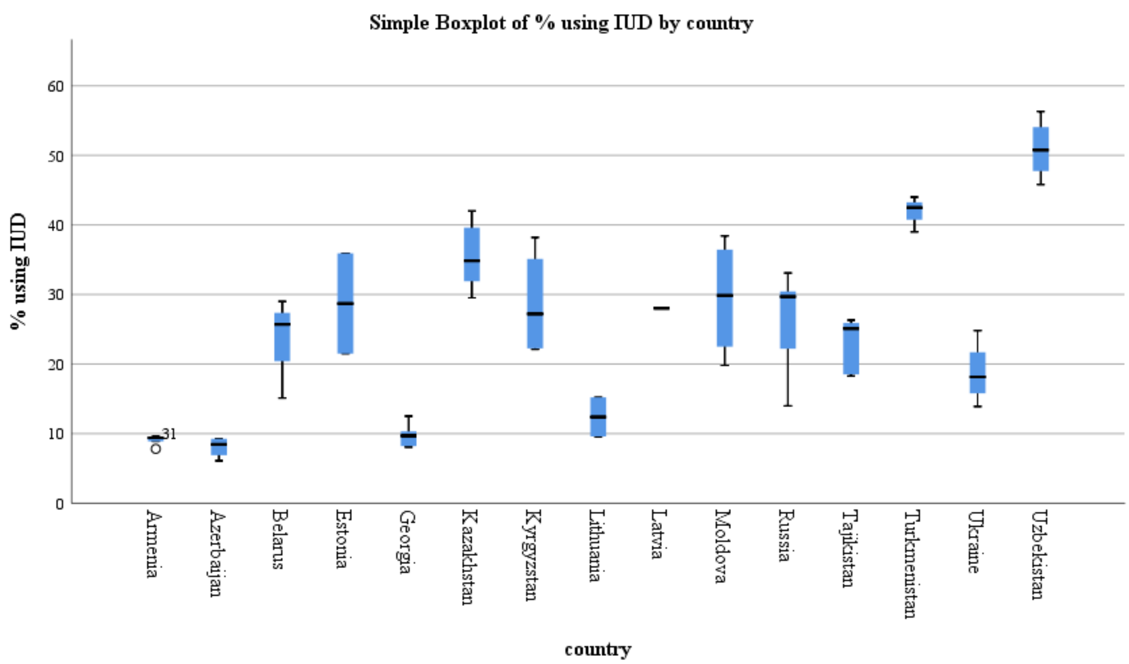

Figure 5.41. Comparison of recorded percent of all women of reproductive age who use IUDs as their primary contraception (UNPD, 2019).

The high prevalence of IUD use in Asian countries is logical for several reasons. First, women in those countries have high fertility rates in the presence of low mean age of childbearing, which means that they have the desired number of children at a young age and can then benefit from a long-lasting, effective, and low-maintenance contraceptive to complete their reproductive years without unintended pregnancies (Barrett & Buckley, 2007; Festin et al., 2016). Second, the UN and USAID provided lots of free IUDs to the governments of Asian countries in 1990s and 2000s, as those governments asked for help in managing their high fertility rates. The high effectiveness and low maintenance of the IUDs made them the perfect target for the contraceptive aid programs in Asia (Barrett & Buckley, 2007; Clifford et al., 2010; Henry & Juraqulova, 2020; Ibraimova et al., 2011; Katsaga et al., 2012; Rechel et al., 2012; Sulzbach et al., 2002; World Health Organization. Regional Office for Europe et al., 2016).

Two other most popular modern contraceptive methods in post-Soviet countries are oral pills and male condoms. Under 20% of women in each country use an oral birth control pill and that statistic is closer to 10% for most countries. Once again, the countries in Caucasus have the lowest rate of use for this reliable form of contraception among all post-Soviet countries at 0.8–6.2% (Appendix A figure 12A). Under 30% of women in each country use male condoms, with Russia being the highest at 25–30.3%, while Azerbaijan, Turkmenistan, Tajikistan, and Uzbekistan have the lowest rates of male condom use at 0.9–3% (Appendix A figure 13A).

There were some surprising correlations with abortion rate for different types of modern contraception. Among them, abortion rate was most closely correlated with hormonal oral pill use, as a moderate positive correlation ($r = 0.55$ with Latvia and $r = 0.56$ without Latvia, Appendix B table 16B) between those indicators emerged (figure 5.42). There was a moderate, but weaker correlation ($r = 0.43$ with Latvia and $r = 0.51$ without Latvia, Appendix B table 17B) between abortion rate and condom use (figure 5.43), and negligible correlation ($r = 0.07$ with Latvia and $r = –0.05$ without Latvia, Appendix B table 18B) between IUD use and abortion rate (figure 5.44). **This shows that among the three most common modern contraceptives in post-Soviet countries, high**

use of oral pills and male condoms correlate with higher abortion rates, as both of those contraceptives are highly prone to human error.

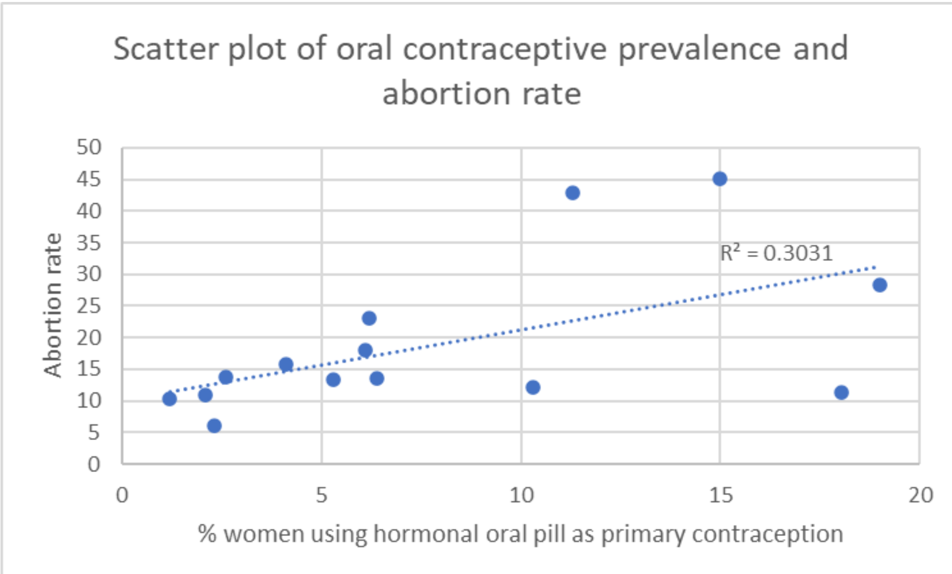

Figure 5.42. Correlation between abortion rate and percent of all women of reproductive age who use hormonal oral pills as their primary contraception, each dot is a different post-Soviet country, including Latvia. Data for latest year available and corresponding abortion rate for the same year.

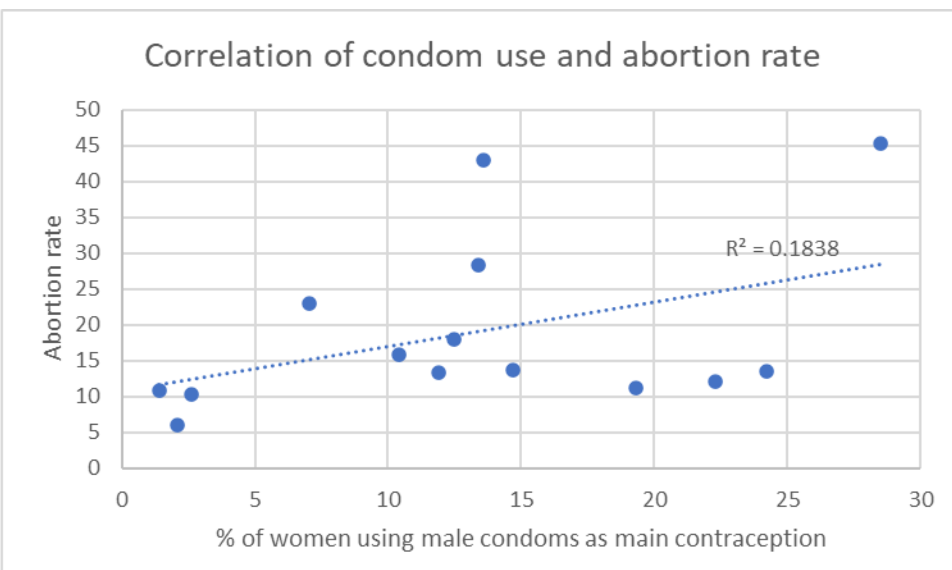

Figure 5.43. Correlation between abortion rate and percent of all women of reproductive age who use male condoms as their primary contraception, each dot is a different post-Soviet country, including Latvia. Data for latest year available and corresponding abortion rate for the same year.

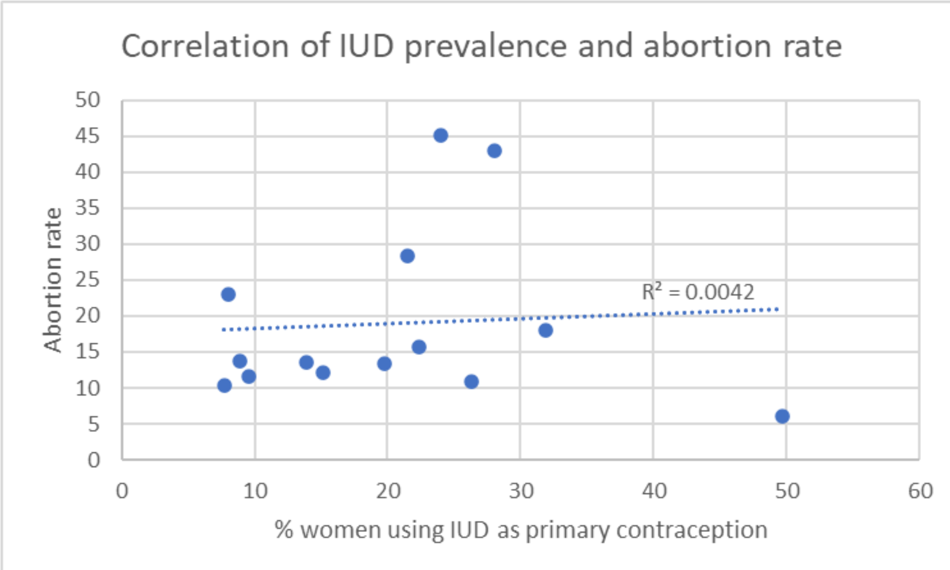

Figure 5.44. Correlation between abortion rate and percent of all women of reproductive age who use IUDs as their primary contraception, each dot is a different post-Soviet country, including Latvia. Data for latest year available and corresponding abortion rate for the same year.

Desired needs for contraception met with modern methods. The trends for desired needs for modern contraception met are consistent with modern contraception use for each country. All post-Soviet countries had a slight increase in percent of women who had their contraceptive desires met between 1990 and 2020 (figure 5.45). As of 2020, Armenia (42%) and Azerbaijan (30%) have the lowest percent of desired needs for modern contraception met and Uzbekistan (85%) has the highest (figure 5.45).

According to the WHO, if 75% or more of desired needs are satisfied with modern contraception, the country has a high contraceptive prevalence (World Health Organization, 2020). Conversely, 50% or lower of desired needs satisfied with modern contraception means that the country has low contraceptive prevalence (World Health Organization, 2020). **This means that, according to the UN classification as of 2020, only four post-Soviet countries – Latvia, Estonia, Belarus, and Uzbekistan – have**

high contraceptive prevalence, and the rest have low contraceptive prevalence

(figure 5.45).

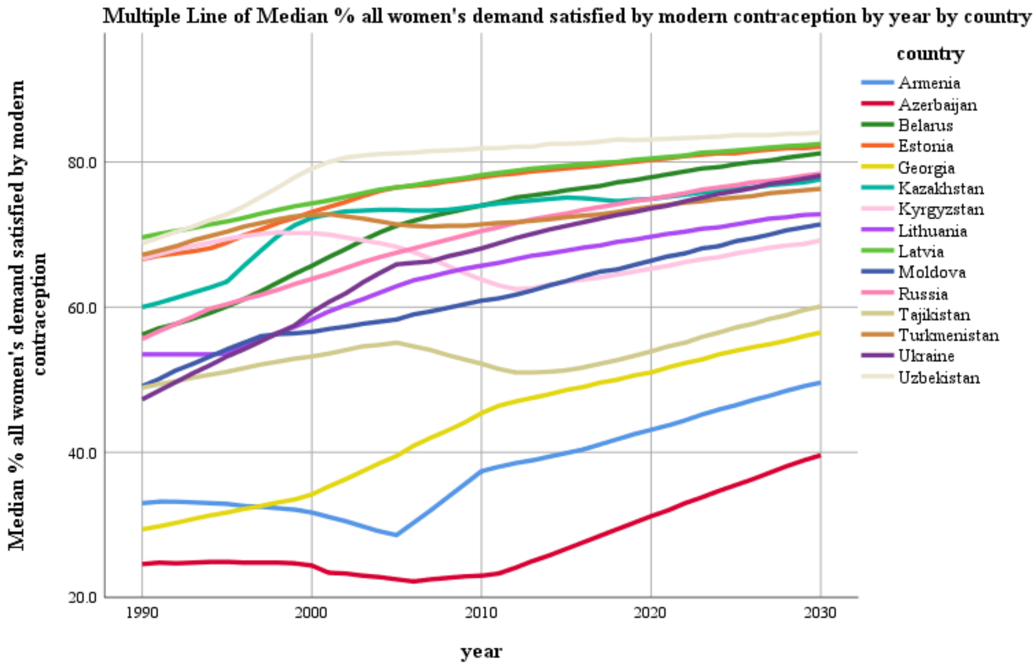

Figure 5.45. Comparison of estimated and projected trends for percent of all women of reproductive age whose demand is satisfied with modern contraception between 1990 and 2030 (UNPD, 2020).

Recall from earlier in this chapter that unmarried women in all Asian post-Soviet countries except for Kazakhstan use any, modern, and traditional contraception at extremely low rates – always below 5%, but closer to 1% for most countries in most years. Of those countries, the UN does not have any data for desired needs of unmarried women satisfied with modern contraceptive methods for Armenia, Azerbaijan, Tajikistan, Turkmenistan, and Uzbekistan (Appendix A, figure 14A). This could be due to the high prevalence of religion[25] in those countries and the resulting male-dominant culture, which puts an emphasis on female virginity before marriage, so the governments of those

[25] Over 95% of people in those countries identify as highly religious (Pew Institute, 2012).

countries do not track the reproductive needs of unmarried women (Albar, 2001; Al-Matary & Ali, 2014). I explore religion of post-Soviet countries in more detail in the following part of this chapter.

As with other indicators, there are large differences in correlations between abortion rates and demand satisfied by modern contraception in 1990 and 2017. Logically, there should be a strong negative correlation between demand for contraception satisfied with modern methods and abortion rates, as use of modern methods effectively reduces unwanted pregnancies.

However, that is not the case for post-Soviet countries. In 1990, there was a moderate positive correlation (r = 0.41, Appendix B table 19B) between demand satisfied by modern methods and abortion rates (figure 5.46), while in 2017, there was a weak negative correlation (r = –0.26, Appendix B table 19B) between the same indicators (figure 5.47). **This means that in 1990, countries with higher percentage of women whose contraceptive demand was satisfied with modern methods had higher rates of abortion, which points to a gap between availability of methods and their successful use to prevent a pregnancy. The negative correlation in 2017 is the expected finding, but the fact that the correlation is weak still points to the same gap between availability and effective use of modern methods.**

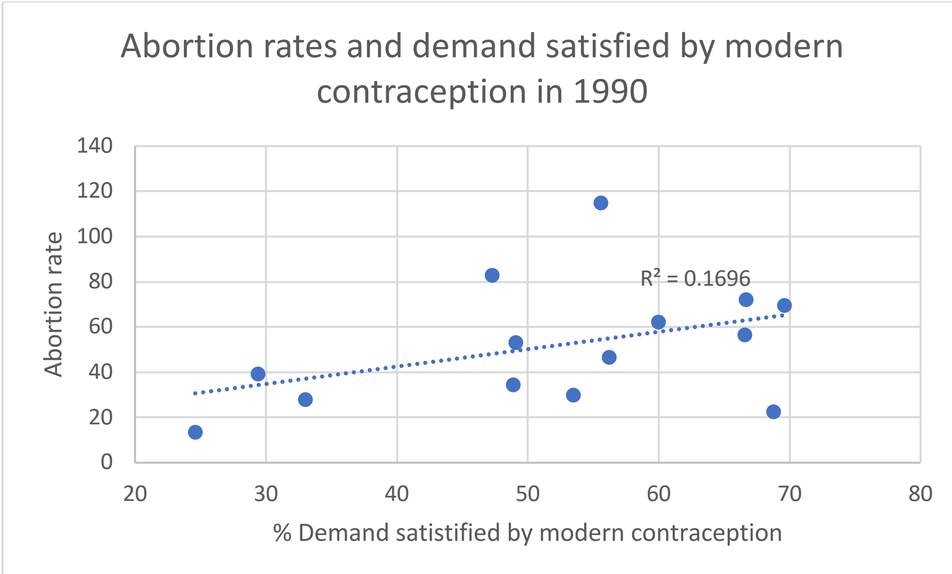

Figure 5.46. Correlation between abortion rate and percent of all women whose demand was satisfied with modern contraception in 1990, each dot is a different post-Soviet country.

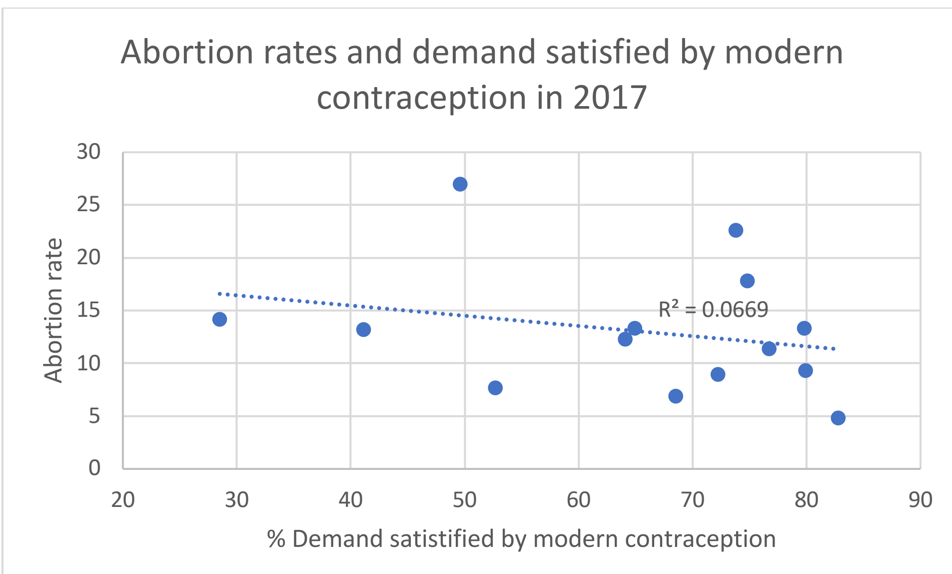

Figure 5.47. Correlation between abortion rate and percent of all women whose demand was satisfied with modern contraception in 2017, each dot is a different post-Soviet country.

Abortion, Religion, and Sex Education in Post-Soviet Countries

Two unexpected points emerged from the previous section of this chapter:

1. The difference in contraception use of unmarried women between Asian and European countries.
2. The positive correlations between various measures of modern contraceptive prevalence and abortion rates.

I hypothesize that the differences in contraceptive use of unmarried women are related to religious differences of post-Soviet countries, which also contribute to differences in proportions married, fertility rates, and abortion rates. Additionally, the unexpected positive correlations between various measures of modern contraception prevalence and abortion rates are likely due to improper use of single use modern contraceptives like oral pills or male condoms, which people can learn to use correctly via sex education. Therefore, the prevalence of religion and sex education in post-Soviet countries are important to explore.

Religion. Religion plays an important role in every society. The Soviet government did not support any religions, even though high proportions of residents in Soviet republics were religious (Bociurkiw, 1965; Fraser, 2017). The two most popular religions in post-Soviet countries are Islam and Christianity (Pew Institute, 2012). The Baltic countries are the least religious, as over 50% of Estonian residents are not affiliated with any religion and only 56% of Latvians are Christian, while all Asian countries except for Kazakhstan have over 90% residents who identify as highly religious (Appendix B table 20B).

While there is a strong positive correlation (r = 0.76, Appendix B table 21B) between proportions of religious people and proportions married (figure 5.48), there is only a weak positive correlation (r = 0.26, Appendix B table 22B) between proportion of religious people and total fertility rates in post-Soviet countries (figure 5.49). **This means that high prevalence of religion is strongly correlated to high prevalence of marriage, which is logical, as both Christianity and Islam promote the importance of marriage** (Marks, 2005).

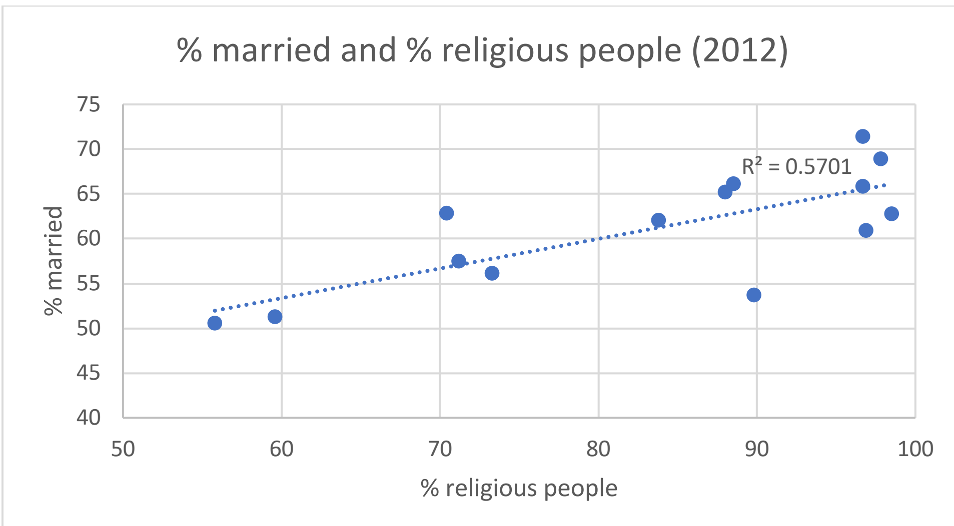

Figure 5.48. Correlation between abortion rate and percent of religious people in 2012, each dot is a different post-Soviet country.

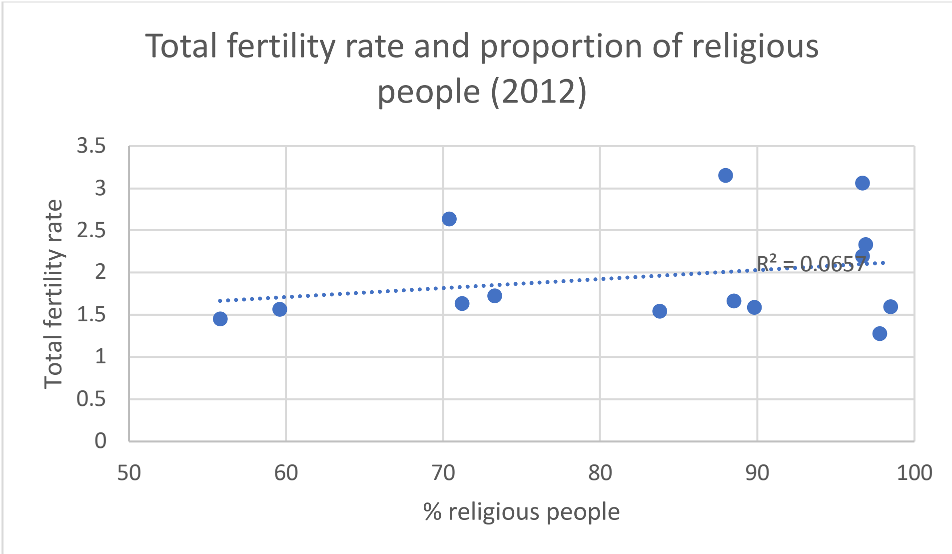

Figure 5.49. Correlation between abortion rate and percent of religious people in 2012, each dot is a different post-Soviet country.

While Islam finds abortion permissible to save a woman's life (Al-Matary & Ali, 2014), Christianity does not (Dillon, 1996; Khorfan & Padela, 2010). However, a visual comparison of abortion rates by the most prevalent religion shows that the abortion rates in countries with high prevalence of Christianity are higher than those with high prevalence of Islam, at least as of 2012 (figure 5.50).

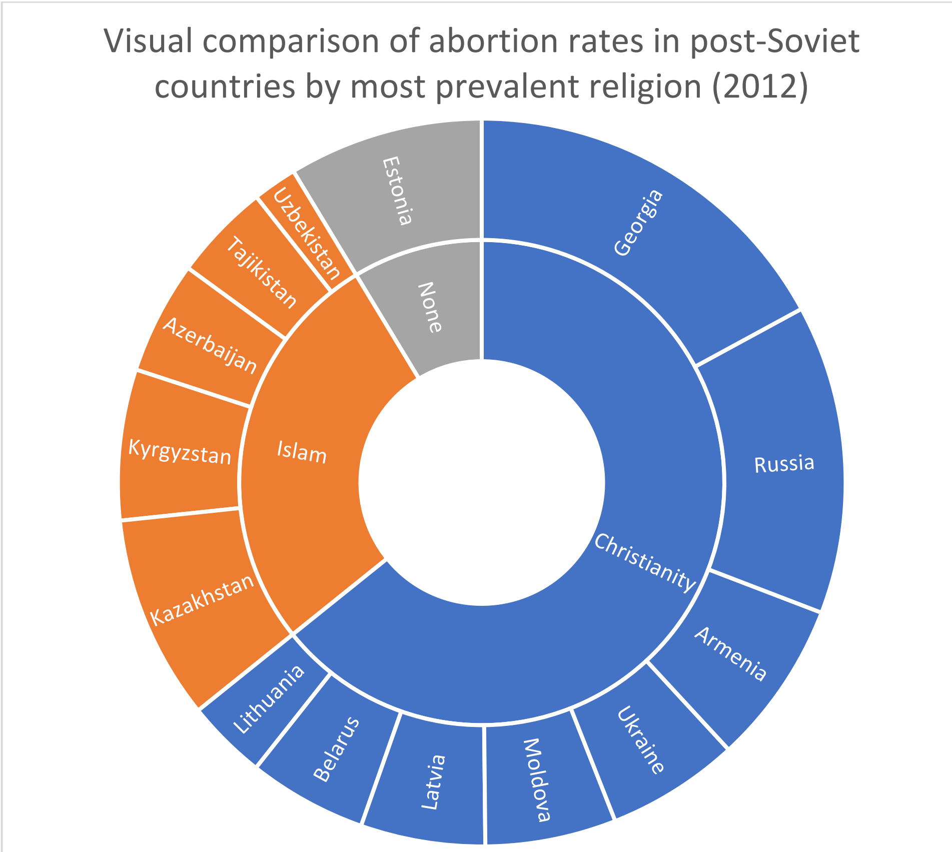

Figure 5.50. 2012 abortion rates in post-Soviet countries hierarchically organized by the most popular religion in each country.

Since religious leaders speak out against abortion and cite religious texts as reasons (Karunaratne, 2017; Mares, 2021), a strong negative correlation between proportion of religious people in the country and their abortion rate is expected. However, there is only a weak negative correlation (r = –0.24, Appendix B table 23B) between proportion of religious people and abortion rates in 2012 (figure 5.51). **This means that even highly religious people may disregard the guidance of their spiritual leaders when it comes to such a personal decision like an abortion. Why? Likely because abortions are primarily results of unintended pregnancies and, thus,**

the last possible birth control choice for people who failed to prevent a pregnancy by any other means.

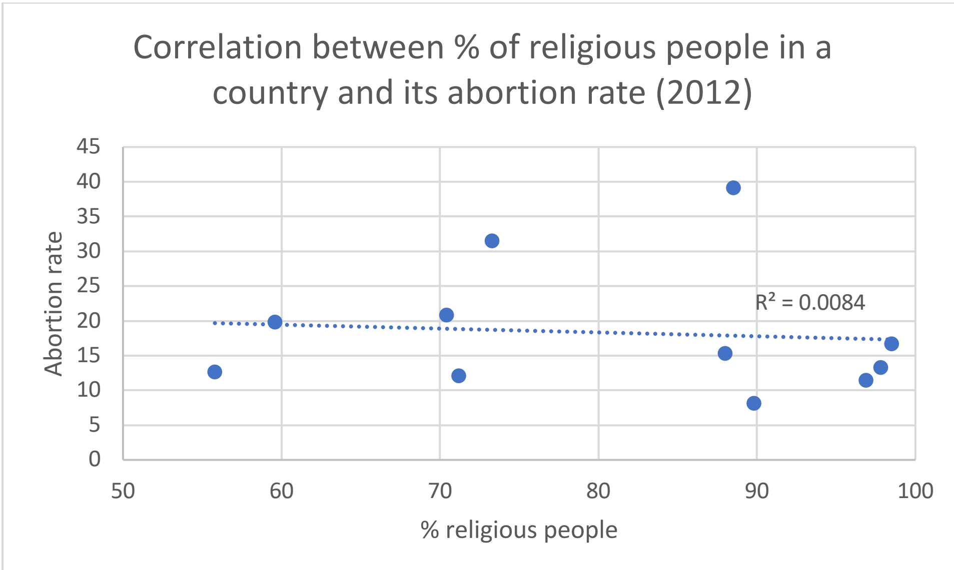

Figure 5.51. Correlation between abortion rate and percent of religious people in 2012, each dot is a different post-Soviet country.

Sex education. How does one learn to prevent an unwanted pregnancy? Usually through some form of sex education, hereafter sex ed. Many studies globally have found that comprehensive sex ed reduces the prevalence of unwanted pregnancies and, thus, abortions (Bright, 2008; Kivela et al., 2014; Murphy, 2022; Neels et al., 2017; Saito, 1998). Other studies also showed that women who are generally less educated are more likely to have unwanted pregnancies, especially at young ages, compared to women with higher education (Lichter et al., 2014; Price, 2013; Serbanescu et al., 2010). All these studies point to the importance of education, and specifically comprehensive sex ed in decreasing unwanted pregnancies, especially among adolescents.

The UN considers comprehensive sex ed incredibly important and has multiple programs that work with governments globally to implement such education inside and outside of schools (UNESCO, 2016). Given that the UN and other international agencies have invested so much into reproductive healthcare, including sex ed, in many post-Soviet countries after the USSR dissolution, one can assume that all countries that received aid have implemented comprehensive sex ed in their schools.

So, how many and which of the post-Soviet countries have comprehensive sex ed in schools? Only one, Estonia, but most other countries incorporate at least some teachings into their school curricula. Given the previously shown differences between Asian and European post-Soviet countries in terms of religion, fertility, marriage, and abortion, I only discuss sex ed in European post-Soviet countries, as they are the most similar to Russia in terms of most other indicators, including abortion rates, so differences in sex ed could be related to differences in abortion rates among those countries.

Introduction of sex ed is often a highly political issue, with religious groups often opposing it for moral reasons. While there was little to no opposition to sex ed in Estonia (Kivela et al., 2014), there was high opposition to it in Latvia (International Planned Parenthood Federation, 2018) and Lithuania (Jarienė et al., 2022). The difference in prevalence of sex ed opposition may be the reason that Estonia is the only country among the Baltics with a national comprehensive sex ed policy and it is also the only one to mention LGBT rights in its sex ed curriculum. Lithuania's sex ed only focuses on abstinence and Latvia has no legal framework for sex ed at all (Ketting et al., 2018).

There was and still remains a lot of opposition to sex ed in schools in Eastern European post-Soviet countries (Denisov et al., 2012; UNFPA, 2016, 2020). Russian government tried to implement a program titled "Children of Russia" in 1994, and a part of it was specifically about sex ed in schools. However, that program did not come to fruition due to the social opposition to discussing sex with children in schools (United Nations, 1999). While there is a legal foundation for comprehensive sex ed in Ukraine and Belarus, only 42% of Ukrainian students get this education (Istomina, 2018), and the focus of sex ed in Belarus is on anatomy, abstinence, and moral values of gender relationships (Shchurko, 2018). This means that none of the Eastern European post-Soviet countries have comprehensive sex education, but only Russia does not discuss any of this material in schools at all.

Overall, the only European post-Soviet country with comprehensive sex ed is Estonia, which also happens to be the only post-Soviet country where over half of the population is not affiliated with any religion. Estonia's sex ed policy first appeared in schools in 1996, specifically to reduce repeat abortions, as the Ministry of Social Affairs recognized that repeat abortions are results of low fertility awareness (Ministry of Social Affairs of Estonia, 2008; Haldre, et al., 2012). The latest Population Health Development Plan explicitly mentions the importance of comprehensive sex education for better reproductive health outcomes (Ministry of Social Affairs of Estonia, 2019), which shows acceptance of sex ed in the main healthcare law in Estonia.

It is worthwhile to compare Russia's abortion rate to that of Belarus and Estonia, specifically. Estonia and Belarus are European post-Soviet countries, like Russia, with historically low fertility rates and high abortion rates, as we saw earlier in this chapter. While over 56% of Estonians are not affiliated with any religion, Orthodox Christianity is its second most common religion (39.9% of population), which is also the most prevalent religion in Russia (73% of population) and Belarus (71% of population), so their religious populations are somewhat comparable (Pew Institute, 2012). Additionally, Estonia has no social indications for abortion, Russia has one – court-prosecuted rape, which is almost impossible to prove, and Belarus closely follows Russia's abortion legislation with only two social indications for abortion remaining as of 2017, so these three countries are quite similar in terms of abortion law specifics, as well.

However, while Russia has no sex ed at all, Estonia is the only post-Soviet country with a mandatory comprehensive sex ed course in schools, and Belarus introduced a gender education course, which covers some relevant topics, but is not truly comprehensive. Together, these three countries provide examples of three arbitrary levels of sex ed – none (Russia), medium (Belarus), and high (Estonia).

A two-sample t-Test with unequal variance shows that the average abortion rate in Russia is statistically significantly higher than in Estonia ($p = 0.02$ one-tail, appendix B table 24B) and in Belarus ($p = 0.03$ one-tail, appendix B table 25B). **Since the existence and quality of sex ed differentiate these countries the most, the statistically significant differences in their abortion rates may be related to differences in sex ed.**

Conclusion

General findings. The USSR dissolution was a period effect that significantly altered fertility behavior in post-Soviet countries both short- and long-term. In the short-term, a period of economic instability may have caused more women in post-Soviet countries to seek out abortions, which is also consistent with the decrease in total and age-specific fertility rates directly after the dissolution. In the long-term, some fertility behaviors became more similar in post-Soviet countries and others became more different, but differences in fertility behavior existed prior to its dissolution and are likely related to differences in prevalence of religion and the resulting culture of each country. The main differences in all indicators can be observed between Asian and European countries but separating those groups into regions shows richer diversity in trends.

The political separation of post-Soviet countries led to an increased difference in proportion married and decreased differences in total fertility and abortion rates of all post-Soviet countries. Mean age of childbearing increased in all countries, which is also consistent with data worldwide, as many women are pursuing higher education and other opportunities prior to motherhood (Neels et al., 2017).

All countries had a sharp decrease in abortion rates, though variability among them remains in the presence of the same fundamental abortion law and it cannot be explained by the differences in the number of social indications for abortion. Decreases in total fertility and abortion rates, as well as in each of the age-specific fertility and abortion rates for all countries during the twentieth and early twenty-first centuries are expected, as modern contraception became more accessible (Alkema et al., 2013; Sedgh et al., 2016; Vishnevskiĭ, 2006; Zakharov, 2008).

While use of modern contraception increased and use of traditional contraception decreased for all women in most countries, increase in modern contraception use was not always correlated with reduced abortion rate. As modern contraceptives have high, but varied, levels of effectiveness at preventing unintended pregnancies, women must use them correctly to maximize effectiveness. The easiest contraceptive to use correctly is a long-term solution like the IUD, which is the most popular modern contraceptive in Asian countries, but condoms and oral pills, which are most popular in European post-

Soviet countries, are harder to use correctly and are more prone to human error (Trussell, 2009). The use of both oral pills and male condoms was moderately correlated with abortion rate, while the use of IUD was not.

Possible explanations for Russia's high abortion rate. After all this research, I can finally provide some explanations for the persistently high abortion rate in Russia compared to other post-Soviet countries for most years. One of the most objective, but hard to quantify, reasons that Russia has the highest abortion rate for most years between 1985 and 2018 is because Russia is the only country to report miscarriages in the same statistic as elective induced abortions (Lipman & Sakevich, 2019). As other countries separate those indicators, this inflates Russia's abortion rate compared to other post-Soviet countries.

Another objective and this time statistically measurable, reason for Russia's comparatively high abortion rate is its mix of most popular methods of contraception. Russia has the highest rate of rhythm method use among all post-Soviet countries. Among all specific methods of contraception, high use of rhythm method is mostly strongly correlated with high abortion rate. Russia also has the highest rate of male condom use among all post-Soviet countries, which is moderately correlated with high abortion rate.

Additionally, Russia has no law or policy on sex education, even though it was proposed in 1994 (United Nations, 1999). There is no standardized teaching on contraception and safe sex and basically no opportunities for sex ed outside of schools[26],

[26] Most often, NGOs or international aid agencies set up such educational campaigns.

which exists in other European post-Soviet countries. A survey study showed that most Russian people learn about contraception and safe sex from their friends and not from a healthcare professional or even a parent (Vishnevsky et al., 2017).

On top of being generally uneducated on contraception, many people in Russia report having no trust in modern contraception, specifically the IUD and oral birth control pills due to possible side effects (Vishnevsky et al., 2017). Finally, there is very limited domestic production of modern contraception (only male condoms) and no insurance coverage of any contraception in Russia, so it imports most of its supply of modern contraception, which makes those contraceptives more expensive for consumers. At the same time, abortion stays free of charge at state clinics (International Planned Parenthood Federation, 2012).

All these factors contribute to Russia's persistently high abortion rate, but they also show that **Russian women have low fertility awareness**. Even as they use modern contraception often, Russian women primarily opt for methods with high rates of human error, subsequently fail at preventing pregnancies and, thus, need abortions. **So, it is reasonable to argue that low fertility awareness leads to high prevalence of unwanted pregnancies and, thus, abortions. It is likely that a comprehensive sex education program could help reduce the abortion rate in Russia and raise the fertility awareness of its residents.**

Now, let us explore several hypothetical scenarios in the next chapter to see how introduction of comprehensive sex education can lower the prevalence of unintended pregnancies in a population without restricting legal access abortion.

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6: AGENT-BASED MODELING OF UNINTENDED PREGNANCIES

Introduction

As I answered the first driving question of my dissertation in the previous chapter, I take the focus away from post-Soviet countries here. In this chapter, I use what I learned from my research on post-Soviet countries and general literature review to build an adaptive agent-based model that policymakers worldwide, and specifically in the US, can use to make better policy decisions about abortion.

I put an emphasis on the US in this chapter for three main reasons. First, there are more data on contraception use and effectiveness in the US than in any other country, at least from public sources. Second, the recent US Supreme Court Decision to overturn women's legal right to abortion makes the second driving question of my dissertation especially relevant in this country at this point in history. Third, I showed in chapters 3 and 4 that arguments and ideas about abortion law often cross national borders, so the recent US Supreme Court ruling on abortion may lead to more governments worldwide attempting to do the same thing in the future.

As seen in previous chapters, even though Russia had the highest abortion rate for most years among all post-Soviet countries, there was a huge decline in Russia's abortion rate[27] and the average number of abortions per woman[28] without any significant changes in its abortion law (State Duma of Russian Federation, 2011; Supreme Council of Russian Federation, 1993). This dramatic decrease in total abortion rate and the average number of abortions per woman happened in the country with the highest prevalence of

[27] Russia's abortion rate went down from 115 in 1990 to 32 in 2010 (United Nations, 2022).
[28] The average number of abortions in a Russian woman's lifetime went down from 3 in 1990 to 1 in 2010 (Centers for Disease Control and Prevention, 2011).

abortion worldwide, the same country that Russian and foreign scholars say has an "abortion culture" (Denisov et al., 2012; Denisov & Sakevich, 2009; Karpov & Kääriäinen, 2005; Sadvokasova, 1969; World Health Organization, 1962). Therefore, it seems that the policy focus in all countries worldwide, including the US, should be on reducing the number of unintended pregnancies and not restricting abortions, which is what I explore in this chapter through agent-based modeling.

The purpose of this chapter is to answer the second driving question of this dissertation – **How is it possible to reduce the abortion rate of a population without restricting legal access to abortion?** Reducing the abortion rate of a population is, generally, a goal of many governments worldwide on national and regional levels. While some scholars found a reduction in US state-specific abortion rates from legal bans of abortion (Brown et al., 2020), it is likely that that reduction is due to women travelling out-of-state to get them or getting illegal abortions in-state that cannot be tracked (Chae et al., 2017; New, 2011; Shah & Åhman, 2010).

At the same time, there is an overwhelming amount of evidence from countries worldwide that abortion bans lead to higher rates of maternal and infant mortality, as well as infanticide, while the actual prevalence of abortion stays the same, but does not get captured by any official statistics (Avdeev & Troitskaia, 1999; Chae et al., 2017; Dreweke, 2015; Finer & Fine, 2013; Glenc, 1974; Henshaw et al., 1999; Hodes, 2016; Melese et al., 2017; Melgalve et al., 2005; Miroshnichenko & Styazhkina, 2012; Richards et al., 1985; Rossier, 2003; Sadvokasova, 1969)

Generally, high abortion rates also signal the prevalence of repeat abortions, some of which may be dangerous to women's health (Butler Tobah, 2022; Laanpere et al.,

2014) and some policymakers use that information as an argument against abortion being legal (Krutov & Leonov, 2005; McKeegan, 1993). Researchers found a link between multiple surgical abortions in a woman's lifetime and potential pregnancy complications, as it is possible to scar the lining of the uterus, though there was no link between multiple medication abortions and future pregnancy complications (Butler Tobah, 2022). As medication abortion account for over 51% of all induced abortions in the US and the safety of surgical abortions is generally high, the risk of complications is generally low (Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, 2022b).

Repeat abortions happen when a woman fails to prevent an unwanted pregnancy more than once and, thus, must seek an abortion again. Both medication and surgical abortions are not exciting adventures or relaxing spa-like procedures for these women to seek out repeatedly. Instead, they are often traumatic and highly emotional experiences, especially due to the stigma attached to abortion in many countries, the financial burden of abortion, and potential involvement of the male partner, other family members, or friends in the decision-making process (Kimport et al., 2011). Women's negative feelings and anxieties often peak before an abortion and dissipate in the days after it (Adler et al., 1990).

Still, several studies show that 95% of women who get abortions do not report feelings of regret or sadness after the procedure and maintain that they made the right decision several years after the abortion (Adler et al., 1990; Rocca et al., 2013).

So, we have now established four important points:

1. Many policymakers want to lower abortion rates of their constituents and often do that through restricting legal access to abortion.
2. Women who have unintended pregnancies seek out abortions regardless of its legality and are more likely to have complications and even die from unsafe illegal abortions.
3. Repeat surgical abortions, even in safe and sterile environments, may not be beneficial to individual woman's mental and physical health long-term.
4. An overwhelming majority of women who get abortions do not regret their decision years after the procedure.

Therefore, it is in everyone's best interest to reduce the prevalence of unintended pregnancies, as those are the direct cause of abortions. In the agent-based model, hereafter ABM, I explore different parameters and policies that could lead to a reduction in unintended pregnancies in a population.

The rest of the chapter has six sections. First, I discuss the conceptual foundation of my model, which is based on my findings from studying abortion in post-Soviet countries in the previous chapters of this dissertation and the general literature review. Second, I show the architecture of the model to explain the changes I made to it over time and how others can modify it for their needs. Third, I present the possible scenarios that the model can currently explore, justifying the selection of some of those scenarios for my BehaviorSearch experiments. After that, I discuss the results from all BehaviorSearch experiments to show how comprehensive sex education can decrease unintended pregnancies in a population. In the fifth section, I present a more detailed comparison of some relevant scenarios not captured by BehaviorSearch. Finally, in the conclusion to this chapter, I summarize my results, answer the second driving question of the dissertation, and provide some directions for future research with the ABM. **As in the previous chapter, the most important findings are in bold, just like this sentence, for the reader's convenience.**

The Conceptual Foundation of the Agent-Based Model

There are several concepts that are applicable to this model. In this section, I first define fertility awareness and ways of increasing it and then discuss evidence-based factors that lead to unintended pregnancy. Throughout the section, I mention some decisions I made while building the ABM, but the detailed model design and exact parameter settings I used are in the following section titled Model Architecture.

Fertility awareness and ways of increasing it. Based on findings from the previous chapters, I propose that low fertility awareness is the key driver of abortion, which is the foundational piece of my ABM. I define fertility awareness, hereafter FA, as the knowledge about one's own menstrual cycle, as well as knowledge about and trust in different contraceptive methods. This is similar to the usual definition of FA (Delbaere et al., 2020; Nouri et al., 2014; Swift & Liu, 2014), though, as the focus of this project is on preventing unintended pregnancies, my definition of FA specifically includes knowledge about and trust in contraception.

This expanded definition is somewhat novel, as very few studies on FA evaluate knowledge about contraception, according to a systematic review on FA and its determinants (Pedro et al., 2018). Even if a woman has access to all methods of contraception for free, she will only use the method(s) she knows about, and trusts[29] will work well for her individual needs (Frost et al., 2012; Sundstrom et al., 2018). This is consistent with existing research on contraceptive attitudes, specific method use, and unintended pregnancies, especially among adolescents and young adults (Frost et al., 2012; Guzzo & Hayford, 2018; Sundstrom et al., 2018).

Women with low FA may not know when they ovulate, have unprotected sexual intercourse, or use a contraceptive method incorrectly more often than women with high FA (figure 6.1). In turn, that results in more unintended pregnancies and, thus, abortions among women with low FA than women with high FA (Frost et al., 2012). It is unrealistic to only use "high" and "low" as measures of FA, so I implemented a scale for FA in the ABM (figure 6.1).

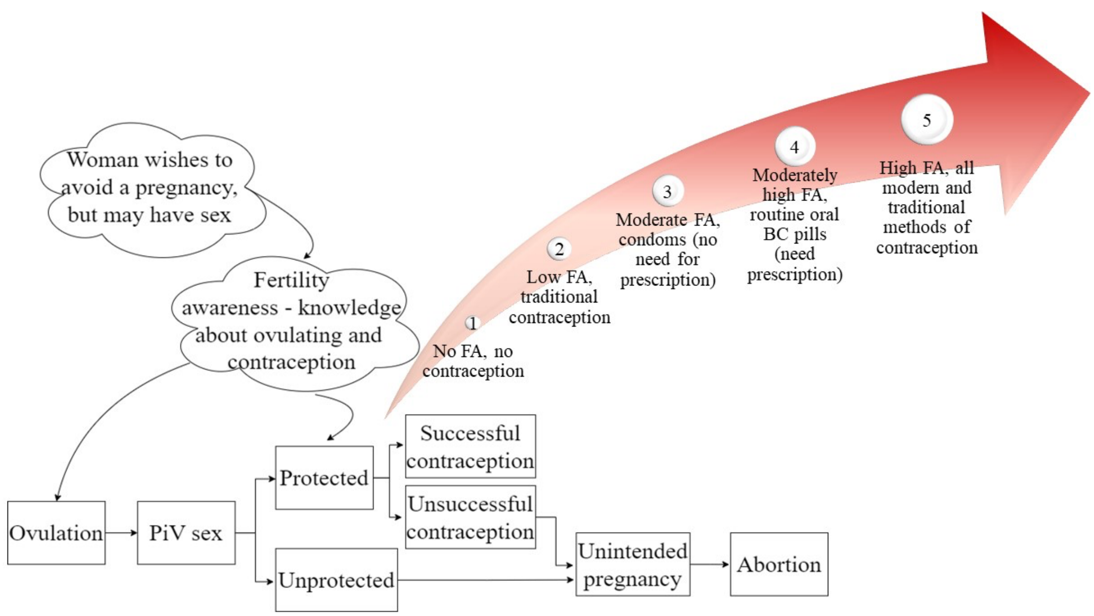

Figure 6.1. The concept of fertility awareness and its effect on the biological pathway to abortion.

[29] Recall from Chapters 2 and 5 that women in Russia and most other post-Soviet countries use oral contraceptive pills at relatively low rates, usually below 10%, which could be related to the negative public letters the USSR Ministry of Health disseminated about those contraceptives in 1980s and/or the general mistrust in modern contraception.

So, how does one raise their FA? I explored four main options in the ABM – aging, sex education, pre- and/or post-abortion contraceptive counseling, and learning from peers. Aging is an important factor in FA, especially for women. As women age, their fertility awareness increases, while their fertility itself decreases (Jones et al., 2012; Swift & Liu, 2014). This means that older women who wish to avoid a pregnancy are more likely to use contraception correctly than younger women, as they are simply more experienced at preventing a pregnancy, but they also have a smaller chance of getting pregnant than younger women due to fewer viable eggs remaining in their ovaries. Additionally, several studies in various countries found that women have higher fertility awareness than men (Delbaere et al., 2020; Nouri et al., 2014; Pedro et al., 2018), so I excluded men from the ABM.

Sex education, as seen in the previous chapter, is a factor that increases FA of a population and, thus, reduces abortions. Among countries with similar fertility dynamics, countries with mandatory sex education in schools have statistically significantly lower abortion rates than the country without it (Appendix B tables 24B and 25B).

Scholars attribute this relationship to rational choice theory, as people who know more about human reproduction and the biology of pregnancy should rationally use this information to their advantage, whether their goal is to get pregnant or avoid a pregnancy (Oettinger, 1999; Potera, 2008; Saito, 1998). However, the quality of sex education varies among different countries, different locations in each country, different schools in each location, and even different teachers in each school (Pazol et al., 2015). Therefore, an exploration of sex education of different qualities is imperative for the ABM.

Most countries, including the US, have some form of pre- and/or post-abortion contraceptive counseling, hereafter PACC, that allows a woman to select a contraceptive method before or after an abortion to avoid repeat abortions in the future. However, the quality of information, its accuracy and relevancy to the patient, and the way the healthcare professional delivers this information vary greatly from one clinic to another and some women may avoid this counseling or disregard the information from it altogether (Ceylan et al., 2009; Dehlendorf et al., 2014; Gould et al., 2013).

Therefore, multiple levels of quality of PACC are important to investigate in the ABM, including the one where women receive formal counseling, but do not learn from it. A systematic review of existing studies on contraceptive education in healthcare settings found that learning this information from a friendly healthcare professional in person or through an informational video was more successful at increasing people's trust in contraceptives and their prevalence of use of highly effective methods, like the IUD, than pamphlets that women can take home after a healthcare appointment without additional discussion with the healthcare provider (Pazol et al., 2015).

Recall from chapters 3 and 4 that governments of many post-Soviet countries mandate the exact language and information physicians must provide during PACC, which women usually receive in a written form and must sign, so it is likely that the PACC quality in those countries is low. Together, this information provides some conceptual basis for me to make a scale for the quality of PACC.

Finally, women can learn about their fertility from interactions with other women they trust, who may be more or less experienced at controlling their fertility. Scholars widely use social learning theory (Bandura, 1977) to discuss fertility behavior. Many studies found that having a successful pregnancy is "socially-contagious," as close friends and family members are more likely to get pregnant after a successful pregnancy of someone in their social circle (Balbo & Barban, 2014; Bernardi & Klärner, 2014; Lois & Arránz Becker, 2014; Montgomery & Casterline, 1996). There is even an ABM about the spread of fertility in a population based on social learning theory (Berndt et al., 2018).

However, there are few studies on social learning about contraceptive use or pregnancy prevention, and the ones that exist are outdated (Balassone, 1991; Hagenhoff et al., 1987; Hogben & Byrne, 1998). This may be due to contraceptive use being an intimate behavior that is not visible to other people, unless a person willingly shares this information. In contrast, a successful pregnancy is a highly visible behavior for everyone in a social circle. Still, as abortion and pregnancy prevention are behaviors related to fertility, some forms of social connection and learning are important for the ABM.

Factors affecting the probability of unintended pregnancy. In the ABM, I primarily explore the effect of contraceptive method mix in the population, but also include different rates of sexual intercourse for women in different age groups. Both factors influence the prevalence of unintended pregnancies and, thus, abortions.

In the previous chapter, we saw that the factors most strongly correlated with high abortion rates were percentages of women using specific contraceptive methods, such as rhythm method, oral contraceptive pills, and male condoms. Rhythm method is one of the most unreliable forms of contraception, as it requires high fertility awareness of the user to perform consistently, accurately[30], and correctly (Peragallo Urrutia et al., 2018). In the ABM, I explored not using contraception, as well as a total of ten different contraceptive methods – two traditional (rhythm and withdrawal) and eight modern methods (male condom, routine oral pill, contraceptive patch, contraceptive injection, contraceptive ring, contraceptive implant, IUD, and emergency oral pill). I chose these specific methods, as they are the most popular worldwide and there are robust data on their use and effectiveness (United Nations Population Division, 2019; World Health Organization, 2020).

Researchers have studied contraception for decades, so there are evidence-based estimates of effectiveness for each contraceptive method worldwide (Peragallo Urrutia et al., 2018; World Health Organization, 2020) and in the US specifically (Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, 2022a; Guttmacher Institute, 2020; Planned Parenthood, 2022; Trussell, 2009, 2014). Those effectiveness rates refer to the probability of a pregnancy in one year of consistent use of a specific method as primary and/or only contraception. Therefore, each tick of the ABM simulates one year and assumes that each agent only uses one contraceptive method that year.

All contraceptive methods have different effectiveness rates with perfect use and typical use (Guttmacher Institute, 2020). For the purposes of this project, only typical use effectiveness is relevant, as the purpose is to simulate normal human behavior. Most contraceptive methods have high rates of effectiveness (above 80%), even with typical

[30] A woman relying solely on the rhythm method must monitor her body temperature and vaginal discharge daily and can only use the method accurately after at least three months of collecting and analyzing the temperature and discharge data.

use, which means that they have low rates of failure and resulting unintended pregnancy. Still, the individual annual low risk of unintended pregnancy leads to a cumulative high risk of unintended pregnancy for an individual woman in her lifetime and the cumulative high risk of unintended pregnancies in a population as a whole, if most women use methods with less than 99% effectiveness (Trussell, 2014).

Additionally, contraceptive switching or discontinuation of use are common practices among all women for various reasons (Brunner Huber et al., 2006). Researchers in the US found that annually between 40 and 60% of American women switch to a different method of contraception or discontinue the use of their preferred method of contraception (Grady et al., 2022). However, that study included women who stop using contraception with the goal to get pregnant, which is outside the scope of this project, and women who stop using a contraceptive method or switch to a different one without the intention to get pregnant. There are also women who use one contraceptive method throughout their fertile years, as it works for them every time. Therefore, it is important to include the concept of contraceptive switching to the ABM and implement a scale for probability of switching.

Women of different ages have different probabilities of having sexual intercourse. Technically, women who are married or live with a partner, are statistically more likely to have sexual intercourse and get pregnant than single women (Barr & Marugg, 2019; Edwards & Booth, 1976). However, married women are also more likely to go through with a pregnancy, even if it is unintended, than single women (Barr & Marugg, 2019; Chae et al., 2017). Because of this and the fact that the purpose of the model is to investigate unintended pregnancies that lead to an abortion, I did not include the concept of marriage in the ABM.

Instead, I used age-specific probabilities of sexual intercourse for three groups of women – teenagers, young adults, and adults. I define teenagers as those between the ages of 15 and 17 years old, young adults as women between 18 and 29, and adults as women between the ages of 30 and 49. In the ABM, only agents (symbolizing women) between the ages of 15 and 49 can have sexual intercourse and get pregnant, as that is the standard reproductive age range (United Nations Population Division, 2019).

ABM Design and Architecture

Model goal and overview. In every country, there are women of all ages who wish to avoid a pregnancy for various reasons, but still have sexual intercourse with male partners (Chae et al., 2017; Glenc, 1974; Hodes, 2016; Laanpere et al., 2014). Imagine if we took all those women and isolated them from all other people[31] in the society to perform a cohort study on their prevalence of unintended pregnancies over the course of 50 years. This is exactly what the ABM simulates – a society of women of various ages, all of whom have a shared goal of preventing a pregnancy, but some may participate in sexual intercourse with men (outside of the model) and risk getting pregnant each year.

This model presents policymakers with a sample population that would be most affected by abortion bans, as aforementioned women would likely seek abortions regardless of abortion legality, which can be dangerous for their health (Melese et al.,

[31] While men are not in the ABM explicitly, they exist implicitly, as any woman who has intercourse must have it with a man to risk getting pregnant.

2017; Richards et al., 1985; Shah & Åhman, 2010). Additionally, I set up the ABM code in a way that allows users to customize all parameters to simulate a real population or explore the effects of different parameters on the model outcome – the cumulative number of abortions[32] at the end of the simulation (Appendix C).

The goal of the ABM is to test the effects of various demographic and policy conditions on the total number of abortions and find a combination of settings that lowers that number in a population. All agents in the ABM simulate women between the ages of 0 and standard life expectancy of the population, currently set at 80 years old, but only agents of reproductive age (15–49 years old) can participate in sexual intercourse and have an unintended pregnancy. Agents outside of the reproductive age range participate in the ABM passively, as they may be linked to one or more agents aged 15–49 and influence their FA level through social learning. Additionally, the different versions of the "setup" code allow the model user to select a level of sex education and/or PACC for the simulation. At the end of each tick, agents who failed to prevent a pregnancy may increase their FA level by various methods of learning.

Decisions and assumptions. There were many decisions and assumptions I had to make to build the ABM. The main ones were about the basic setup of the model, initial FA levels and their effect on contraceptive choice, dynamics of FA spread and learning in

[32] In this chapter, I use the total number of abortions instead of the abortion rate, as each one of my simulations has the same number of agents and age distribution. Abortion rate is only useful to compare abortion statistics among populations of different sizes, so calculating it would just add unnecessary complexity.

the model, population distribution by age, and age-specific probabilities of having sexual intercourse.

The basic setup of the ABM. I first had to decide what program to use for my modeling experiments and what factors to implement into the code. I used NetLogo to write the code of the model and test it, as it is the most user-friendly software for beginners with ABM (Wilensky, 1999). Additionally, because of the importance of social learning theory in fertility research and the hidden nature of contraceptive use, I decided to still use a network to connect the agents in the ABM but keep the average number of linked individuals low. This is because I assume that contraception, pregnancy prevention, and abortion are not common topics of conversations among friends or even family members due to the existing stigma in many cultures against premarital sex, abortion, and contraception use in general (Al-Matary & Ali, 2014; Khorfan & Padela, 2010; Kumar et al., 2009; Norris et al., 2011).

For the network code I used Forrest Stonedahl's and Uri Wilensky's "Virus on a Network" code exactly (Stonedahl & Wilensky, 2004), but set the average node degree, or the average number of linked agents in the same social network at 3. That results in few connections among agents, which seems most realistic to me in the context of contraceptive use and pregnancy prevention (figure 6.2).

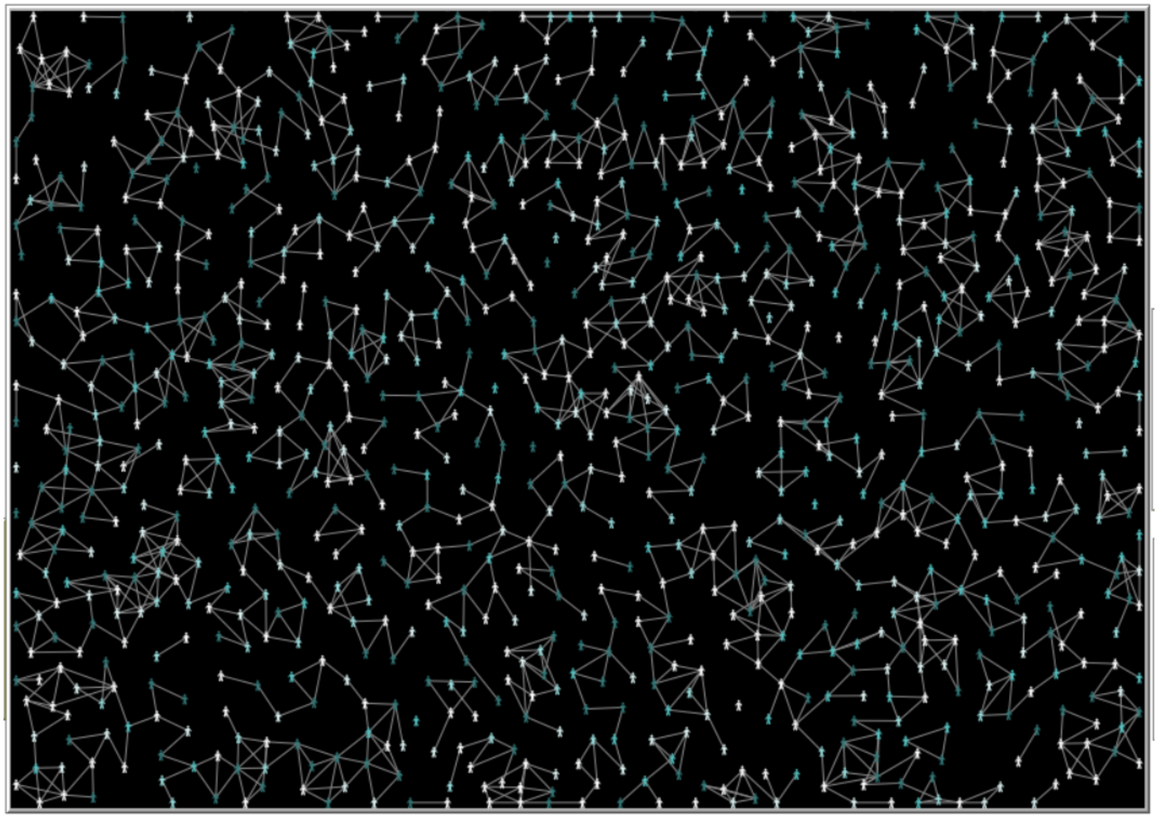
Figure 6.2. Visual interface of the ABM and the links between agents (color = FA level).

Fertility awareness levels and their effect on contraceptive choice. Next, I had to define the levels of FA and specify how each level affects the probability of having an unintended pregnancy. I decided to introduce five qualitatively grounded and relative FA levels to the ABM:

1. **No awareness**: At this level agents do not know about their fertility or the existing methods of contraception. They do not use any contraception when they have sex, so they have the highest likelihood of getting pregnant.
2. **Some awareness**: Agents know about and may use traditional methods of contraception, which often fail. Two most common options for traditional contraception are withdrawal and fertility tracking (rhythm method).

3. **Moderate awareness**: Agents know about and may use forms of contraception that they can buy in pharmacies or other stores without a prescription. These are primarily male condoms and emergency contraception pills[33].
4. **Moderately high awareness**: Agents may use oral pills, but this requires getting a prescription from a healthcare professional.
5. **High awareness**: Agents may use any type of contraception, including highly effective long-term solutions like IUDs, implants, or patches.

After that, I needed to code the effectiveness rates of preventing pregnancy for different contraceptive methods with typical use. Below is a list of sources I used followed by a summative table (table 6.1) of contraceptive effectiveness from those sources and the effectiveness percentages I implemented in the ABM, along with an explanation of my decision for each method:

1. World Health Organization (World Health Organization, 2020)
2. Guttmacher Institute (Guttmacher Institute, 2020)
3. Centers for Disease Control and Prevention (Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, 2022a)
4. Planned Parenthood (Planned Parenthood, 2022)
5. *Choosing a contraceptive: Efficacy, safety, and personal considerations* (Trussell, 2009, 2014; Trussell & Guthrie, 2007)

[33] When I did the analysis, I grouped emergency contraception pills (plan B) with FA level 5, but I invite future scholars to implement it into FA level 3, as one can buy a plan B pill in the pharmacy, like condoms.

Table 6.1

Contraceptive Methods and Their Effectiveness at Preventing a Pregnancy with Typical Use in One Year of Consistent Use of Each Method as the Only Contraception

Method	Effectiveness in literature	Effectiveness in ABM	Notes/explanation of selected effectiveness for ABM
No contraception	15-85%	50%	This varies based on a woman's and her partner's age, health status, as well as intercourse frequency and timing. The higher effectiveness is in older women who have intercourse infrequently, while the lower one is in younger healthy women who have intercourse frequently, often with the goal of getting pregnant[34]. 50% is the average.
Withdrawal	73-80%	78%	This varies based on the male partner's skills at withdrawal and the population included in the study. 76.5% is the average, but many more sources cite 80% effectiveness than 73%, so I used 78% for the ABM.
Rhythm method (fertility tracking)	66-85%	76%	This varies based on the consistency and accuracy of method use. 75.5% is the average, so 76% is the rounded estimate for the ABM.
Condom	79-87%	82%	The values from the literature include both male and female condoms. Typically, male condoms are much more popular and have higher effectiveness than female condoms. However, the effectiveness of the male condoms is based on the skillful and willing cooperation of the male partner. Therefore, while the average value was 83%, I used 82% for the ABM to account for both types of condoms and occasional male un-cooperation.

[34] Data on effectiveness of no contraception use are not separated by intended and unintended pregnancies in any source. According to rational choice theory, most people who use no contraception and have frequent intercourse want to get pregnant, so the lower estimate of no contraception use effectiveness at pregnancy prevention is skewed heavily by the large proportion women with an intention to get pregnant.

Routine oral contraceptive pills	91-93%	91%	I used the lower estimate for the ABM, as it was more common in the literature and included all types of oral contraceptives.
IUD	99.0-99.3%	99%	The difference between the lowest and highest estimates in the literature was very small, so I rounded the value to 99% for the ABM.
Contraceptive patch	93%	93%	All sources have the same estimate.
Contraceptive injection	97%	97%	All sources have the same estimate.
Contraceptive implant	99-99.5%	99%	The difference between the lowest and highest estimates in the literature was small and most sources cited 99%, so I used 99% for the ABM.
Contraceptive ring	92-93%	93%	The difference is small, and most sources used 93%, so I used the same.
Emergency contraception pill (plan B)	75-99%	87%	This varies based on the number of days after unprotected intercourse the pill was taken. It is 99% effective on the first day, but that decreases to 75% by the fifth day. After five days, it is no longer effective. 87% is the average and the ABM assumes that anyone using this method does so within the first five days of intercourse.

Based on the qualitatively grounded and relative levels of FA and their relationship to availability of specific contraceptive methods, I originally tested two scenarios for how the FA level affects individual contraceptive choice (figure 6.3).

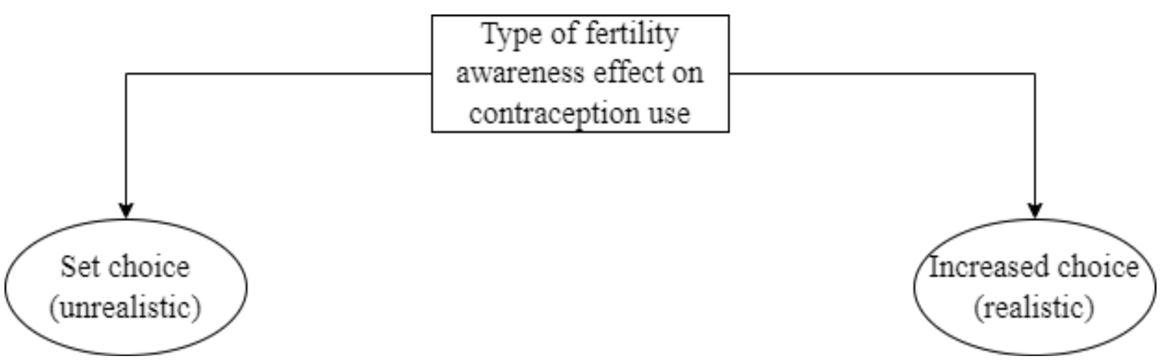

Figure 6.3. Original choice options for the ABM.

In "set choice," agents only have access to the contraceptives available at their level of FA, while in "increased choice" scenarios agents at each level of FA have access to contraceptive methods specific to that level and all the ones below it (table 6.2). This means that "increased choice" is much more realistic than "set choice," as in the real world people are not subject to using only one method of contraception based on how much they know about contraception. In fact, the more they know about contraception, the more options they have, which is what the "increased choice" simulates well.

Table 6.2

Contraceptive Methods and Their Failure Rates (100% - Effectiveness at Preventing a Pregnancy with Typical Use) for "Set Choice" and "Increased Choice" at Each Level of Fertility Awareness

FA level	Set choice		Increased choice	
	Available methods	Contraceptive failure rate (one year of typical use)	Available methods	Contraceptive failure rate (one year of typical use)
1	None, unprotected	50%	None, unprotected	50%
2	Withdrawal	22%	Unprotected, withdrawal, rhythm method	22-50%
3	Condoms	18%	Unprotected, withdrawal, rhythm method, condoms	18-50%
4	Oral BC pills	9%	Unprotected, withdrawal, rhythm method, condoms, routine oral BC pills	9-50%
5	IUD	1%	Unprotected, withdrawal, rhythm method, condoms, oral BC pills, emergency oral pills, contraceptive patch, ring, injection, implant, IUD	1-50%

Ways of FA spread and learning. After deciding on the levels of FA and their relationship to contraceptive methods of varied effectiveness, I explored four scenarios for setting up the initial FA level distribution, or spread for all agents at the start of the simulation (figure 6.4).

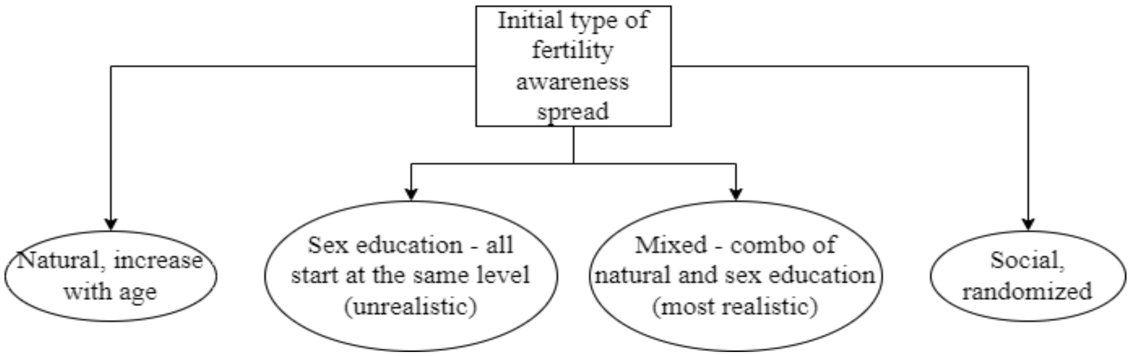

Figure 6.4. Types of initial FA distribution available in the ABM.

Each of the initial types of FA distribution simulates a distinctly different society, so only one type of initial FA distribution is possible per simulation. The "natural" and "social" scenarios simulate societies with no sex education. The "natural" scenario simulates learning through experience and makes all agents add 1 to their FA level every 10 years, which means that all agents can only achieve FA level 5 by age 50, when they age out of the reproductive age range, with no other external influences on their FA. The "social" scenario assigns random FA levels to all agents, regardless of their age. This scenario is useful to compare the results of all other scenarios to, as it is fully randomized, and it is also the best way to test the network effect of the ABM.

"Sex education" and "mixed" scenarios include some form of sex education, which the user of the model can adjust between levels 1 and 5. Note that only one level of sex education is possible per simulation, so running five total simulations (one for each level of sex education with all other settings kept constant) allows for a comparison of different levels of sex education in “sex education” and “mixed” scenarios. I chose to use five levels of sex education to distinguish the topics discussed in each type of sex education and the general quality of such education, as well as to the sex education levels to the FA level scale (table 6.3).

Table 6.3

Sex Education (Sex Ed) Levels in the ABM

FA level	Sex ed level	Explanation
1	1	This sex ed level simulates abstinence-based sex ed, which does not teach anything about contraception, so, logically, people who get this education will not know about their fertility or possible methods of preventing a pregnancy.
2	2	This sex ed level simulates some basic sex ed, which can fall under anatomy courses in high school. It teaches people about the concept of fertility and the anatomy of the human body, so, logically, people who get this education would be able to figure out how to use traditional methods of contraception.
3	3	This sex ed level simulates average sex ed. It teaches people about safe sex and the possibility of getting a sexually transmitted infection (STI), so, logically, people who get this education are more likely to use condoms to prevent STIs.
4	4	This sex ed level simulates a moderately comprehensive sex ed curriculum. It teaches people about fertility, sexual health, and pregnancy prevention. Logically, people who get this education are more likely to select an effective method, like oral pills, even if that requires a doctor’s visit, as they know more about their fertility and sexual health than people with lower quality sex ed.
5	5	This sex ed level simulates the most comprehensive sex ed curriculum, which discusses all methods of contraception in detail, including their pros and cons of different methods for people with various health conditions. According to the rational choice theory, people who know the most about pregnancy prevention have the lowest likelihood of getting pregnant unintentionally, as they can use that knowledge to make decisions about contraception.

The “mixed” scenario is the most realistic for countries with some form of sex education, as it combines the natural increase of FA with age and the level of sex education. The “sex education” scenario is the least realistic, as it is impossible for everyone in the society to hold the same knowledge about fertility and pregnancy prevention based on formal education at all ages. Below is a summative table with the specifics of how each scenario affects the initial FA distribution of the population (table 6.4).

Table 6.4

Agents Assigned to Each FA Level in the ABM Based on the Starting Scenario

FA level	Agents assigned to each level at the start of the simulation (sim)			
	Natural	Sex ed (only 1 sex ed level per sim)	Mixed (only 1 sex ed level per sim)	Social
1	All aged <= 19	All agents	All aged <= 19	Random agents
2	All aged 20-29	All agents	All aged 20-29, all other agents in sims with sex ed = 2	Random agents
3	All aged 30-39	All agents	All aged 30-39, all other agents in sims with sex ed = 3	Random agents
4	All aged 40-49	All agents	All aged 40-49, all other agents in sims with sex ed = 4	Random agents
5	All aged 50+	All agents	All aged 50+, all other agents in sims with sex ed = 5	Random agents

A final decision about FA levels concerns possible learning mechanisms after an unintended pregnancy. I explored three types of learning after an abortion (figure 6.5). “Abortion learning” simulates PACC of various qualities. “Social learning” allows for randomization in the model, as the agents can adopt the FA level of one of the other agents in their network that avoided a pregnancy that tick. Finally, “no learning” simulates societies without formal PACC. In scenarios with “increased choice” and “no learning" agents select a different contraceptive based on their existing FA level. Once again, only one learning scenario is possible per simulation.

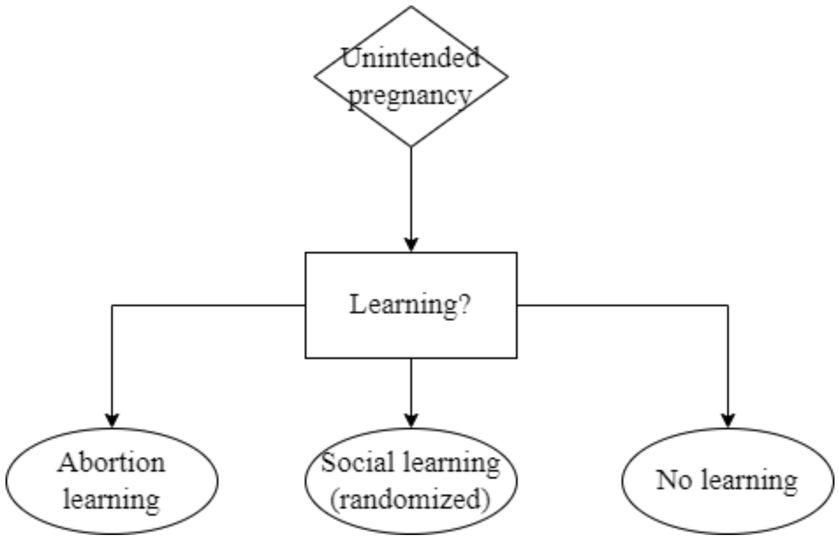

Figure 6.5. Types of learning after an abortion tested in the ABM.

As with sex education, PACC can vary in quality and effectiveness. Therefore, I implemented a scale between 0 and 4 to simulate different levels of PACC quality as "abortion learning levels" in the ABM (table 6.5).

Table 6.5

Levels of Pre- and/or Post-Abortion Counseling Quality (Abortion Learning Levels) and Their Effect on an Agent's Individual FA Level in the ABM

Abortion learning level	Effect on FA	Explanation
0	None	This level simulates PACC of very low quality, which the woman does not learn anything from. This can be a very long paper a woman has to sign without reading or a physician's speech about morality of abortion, which often does not discuss contraception and simply focuses on abstinence (similar to sex ed level 1).
1	+1	This level simulates PACC of low, but better quality, as a woman can learn about at least two[35] new methods of contraception.
2	+2	This level simulates average PACC, as a woman can learn about at least three new methods of contraception.
3	+3	This level simulates above-average PACC, as a woman can learn about at least four new methods of contraception.
4	+4	This level simulates the highest quality PACC, which is quite effective at preventing repeat abortions. It focuses on various methods of contraception in an informative, accessible, and friendly way to allow women to make a choice among all available contraceptives based on their health status and personal preferences.

Population age distribution. Next, I had to decide how to differentiate the agents by age. Every country/state/city has a different population distribution, so it is important to define the proportion of people who fall into each age group early on. I used the cumulative sample worldwide data for normal population distribution (Ritchie & Roser, 2019) for all simulations (table 6.6), but users can easily adjust these parameters to fit a specific population. According to the population distribution below, 25% of all agents in the model are under 15 years of age, so they cannot participate in the ABM actively until they reach 15 years old, 47.25% of all agents are in the reproductive age range and can

[35] Logic – at the lowest FA level 1, agents after an abortion reach FA level 2. This means they learn about two traditional methods – withdrawal and rhythm method. Same logic applies to all following explanations.

participate in the model immediately, while the remaining 27.75% of all agents passively participate in the model for its entire duration

Table 6.6

Population Distribution by Age in the ABM

Age group	Percent of all agents in this age group
14 years old or younger	25%
15-19 years old	8%
20-24 years old	8%
25-29 years old	6.25%
30-34 years old	6.25%
35-39 years old	6.25%
40-44 years old	6.25%
45-49 years old	6.25%
50-54 years old	6.25%
55-59 years old	6.25%
60-65 years old	6.25%
Over 65 years old	9%

Age-specific probability of intercourse. As I chose to exclude the concept of marriage from the ABM, I also had to code age-specific probabilities of sexual intercourse (figure 6.6). In the real world, some people in every age group have sex each year and some do not, people in different age groups have different probabilities of having sex, and even people of the same age have different probabilities of having sex in different countries. For example, in most developed countries between 40 and 60% of teenagers have had sex at least once before turning 18 years old (Martinez & Abma, 2015; United Nations Population Division, 2020). However, that number is much lower (1-5%) in developing countries with strong cultural norms that usually stem from the prevalence of religion (United Nations Population Division, 2020).

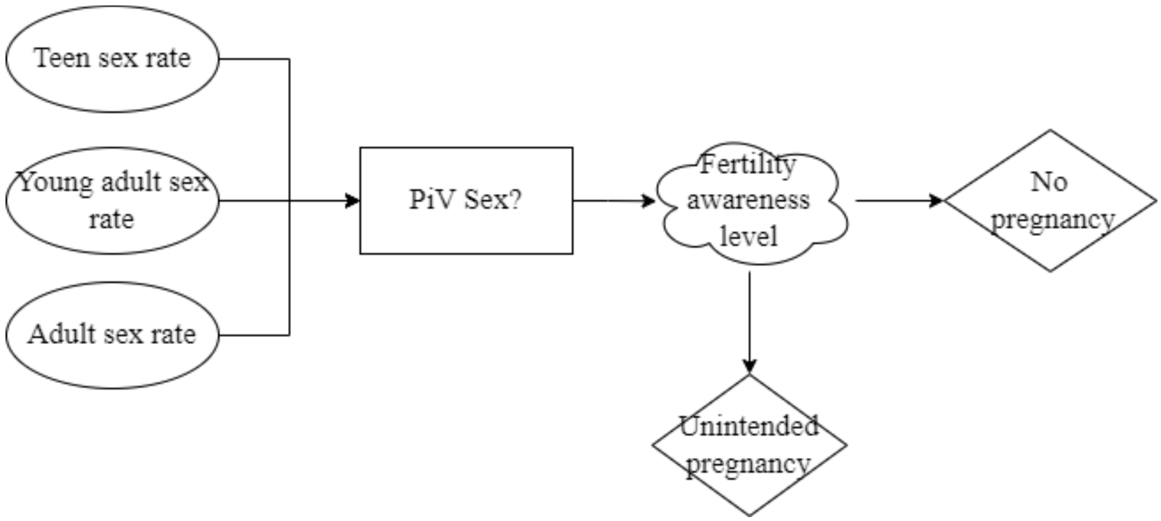

Figure 6.6. Age groups in the ABM.

Additionally, there are not much data on annual rates of sexual activity for specific age groups in adulthood, as marriage, sexual pleasure, discomfort, and habit influence individual frequency of sexual intercourse and scholars are more interested in fertility outcomes of adult populations than their annual intercourse probability (Thirlaway et al., 1996). However, an analysis of the US national representative survey suggests that at least 80% of women aged between 18 and 24 had intercourse at least once in the last year, and that percentage is closer to 100% in women between the ages of 25 and 44 (Ueda et al., 2020). An earlier survey study found that only 71% of women above the age of 40 had sex annually in the US (Addis et al., 2006), while the authors of a widely-used mathematical simulation of fertility outcomes in the US called FamilyScape 3.0 used a value of 80% for annual and monthly sexual activity of all married adult women (Thomas et al., 2016).

Based on the information above, individual probability of sexual intercourse in women of the same age can vary by their culture and other external circumstances, so I set up an adjustable scale to allow a change in these parameters in the ABM. I only used one set of parameters for age-specific intercourse probability for all experiments (table 6.7), but I invite future scholars to experiment with these parameters or adjust them based on the known dynamics in their population of interest.

Table 6.7

Current Parameters for Intercourse Probability in Each Relevant Age Group

Age group	Probability of intercourse	Explanation
15-17, teenagers	50%	Average of 40% and 60% in developed countries
18-29, young adults	80%	Value from a US representative survey
30-49, adults	85%	Average of 100% and 71%, as reported by two different studies

Full ABM architecture. The full architecture of the model, which combines all the pieces presented previously is below (figure 6.7).

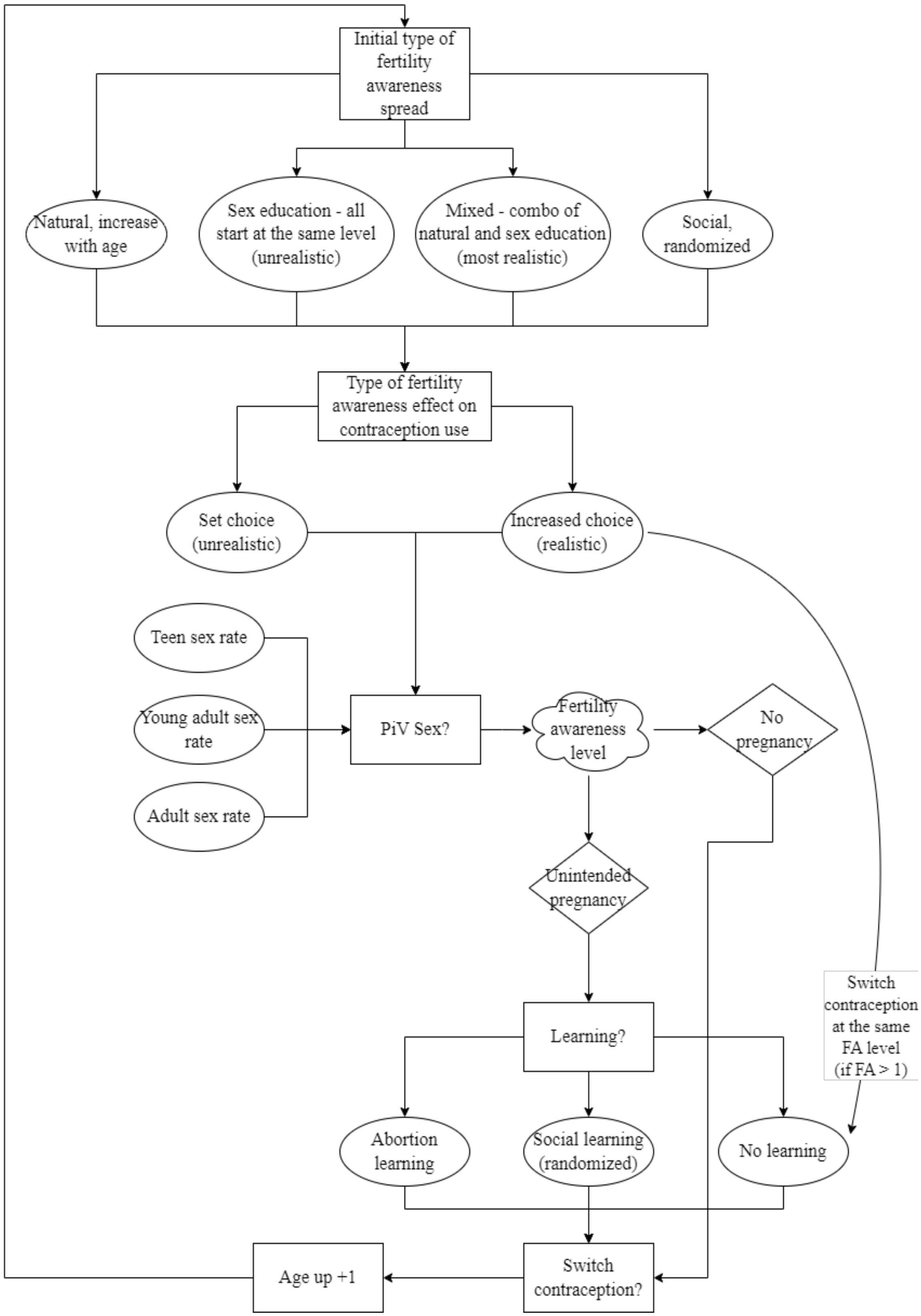

Figure 6.7. Full ABM architecture.

ABM code and interface that execute its architecture. I built the ABM in NetLogo, so there are three distinct parts to the model – its code, description, and interface. I initially wrote the code in spring 2022, edited it thirteen times until spring 2023 and completed a series of BehaviorSpace and BehaviorSearch experiments with each edit. BehaviorSpace is a tool within NetLogo that allows for "parameter sweeping" or a systematic parameter variation in an ABM (Tisue & Wilensky, 2004). BehaviorSearch is an external software, which comes with the NetLogo package and allows for calibration of the ABM to achieve a specific goal (Thiele et al., 2014). In this case, that goal is the lowest possible total number of abortions at the end of the simulation. After thirteen revisions, the ABM seems to do exactly what I intended for it to do, so I only discuss the experiments from its latest version, but there is still an immense amount of room for improvements in this ABM.

The current ABM interface has a monitor in the center, which is called the "world" where all agents and their links to other agents are visible. The "world" wraps around both vertically and horizontally, which means that agents on the opposite edges of the screen are actually right next to each other and may connect via network links. I set the size of the "world" to 50x35, as that was the size that fit best on my computer screen. I invite future scholars to experiment with these settings for the "world," as I did not perform any experiments on "worlds" of different sizes or "worlds" with no horizontal and/or vertical wrapping.

The ABM interface also includes scales for all parameter settings I kept constant on the left side of the monitor and all parameters I varied on the right side (figure 6.8).

The left side also has buttons for “setup,” “go,” and “go once.” Model users must press “setup” every time after changing any of the parameters on the left or the right of the “world,” which allows the ABM to reset the new settings before starting a new simulation. The “go” button starts the simulation and allows it to proceed until completion (50 ticks). The “go once” button allows users to see the model progress one tick/year at a time. These are standard buttons to include in an ABM (Tisue & Wilensky, 2004; Wilensky, 1999).

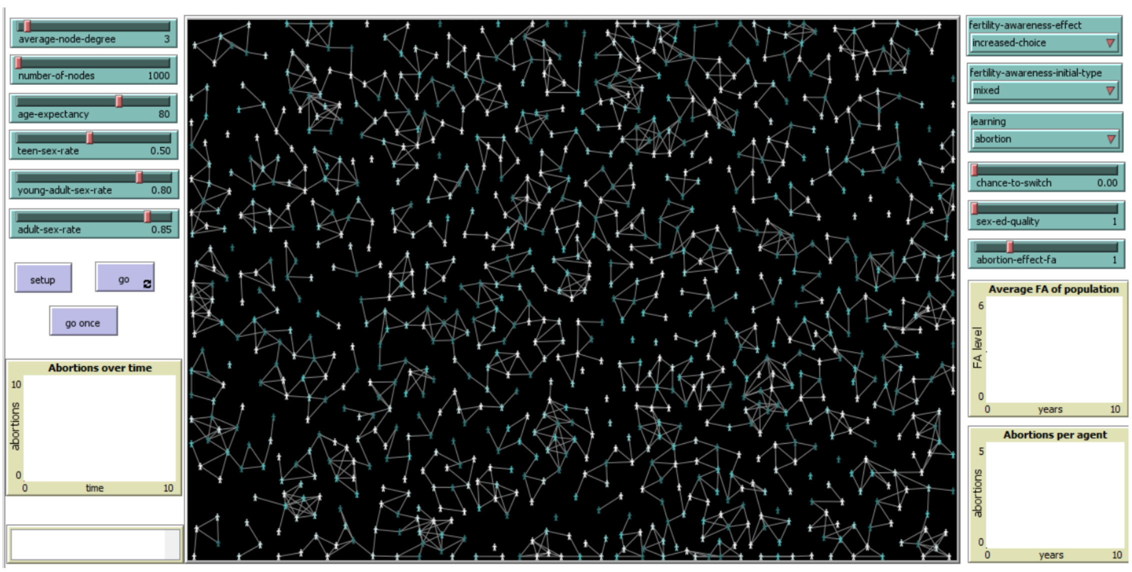

Figure 6.8. ABM interface – setup.

Every tick symbolizes one year and many events happen in the model each tick. At the start of each simulation, all agents start with some initial level of FA, which is distinguished by different colors of the agents in the ABM (figure 6.8). The lighter the color of the agent, the lower its FA level, so white agents have FA level 1. Conversely, the darker blue agents have higher FA. That initial level of FA can be the same for all agents or different, based on the initial scenario (table 6.4) chosen in the second selection panel titled “fertility-awareness-initial-type” on the right side of the “world” (figure 6.8).

Next, a specified percentage of random agents in each age group engage in sexual intercourse (table 6.7). When an agent had an unintended pregnancy, that agent turns red for visibility of the model user (figure 6.9). The agents that fail to prevent a pregnancy may learn more about their fertility after an abortion, based on the learning scenario chosen in the third selection panel titled “learning” on the right side of the “world.” Additionally, there are three monitors on the interface (figure 6.9) that track important outcomes throughout the simulation – abortions each tick (only monitor on the left), average FA level of the population (top monitor on the right) and average number of abortions per agent (bottom monitor on the right).

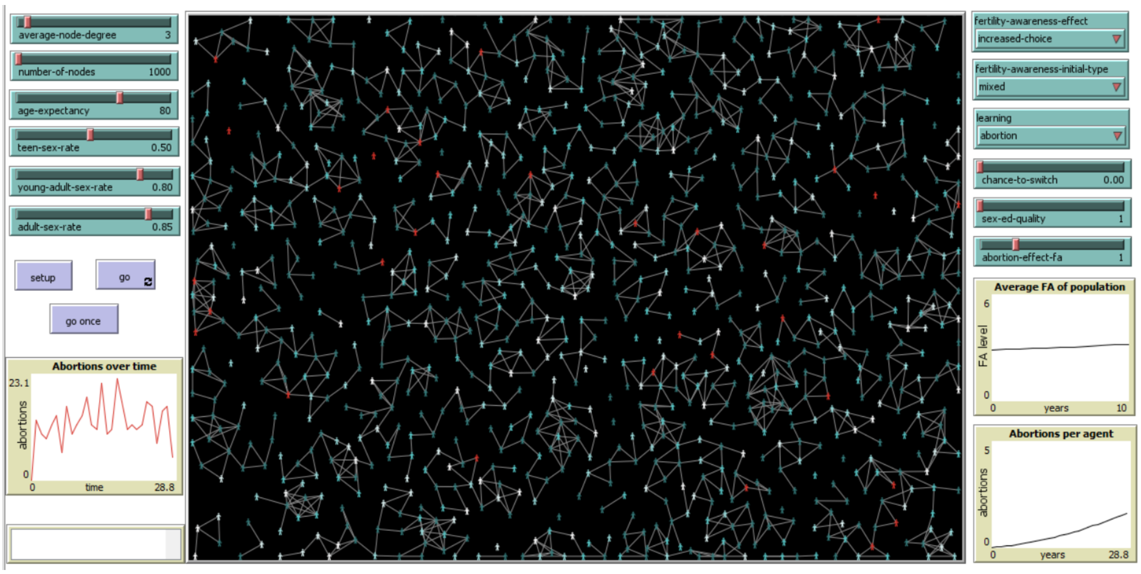

Figure 6.9. ABM interface – simulation in progress.

At the end of each tick, a specified percentage of random agents may switch their contraception, if contraceptive switching is above zero on the first scale bar titled “chance-to-switch” on the right of the “world” (figure 6.9). **The current code for contraceptive switching simply allows the selected percentage of random agents to switch their FA level to the FA level of one of the other agents in their network,**

regardless of whether either of the agents avoided a pregnancy that tick. This adds complexity and randomness to the ABM. However, the simplicity of the current switch code and its reliance on FA levels makes this part of the model less realistic than the rest, at least in "increased choice" scenarios. In those scenarios, switching to a specific contraceptive method instead of switching the FA level would be most realistic, so changing that part of the code is a useful future improvement.

Finally, all agents age by one year each tick, which makes the simulation stop after 50 ticks each time, as that is when the youngest agent at the start of the simulation ages out of the reproductive age range, so no more unintended pregnancies and, thus, abortions can occur. Finally, there is a small text box at the bottom left corner, which records the total number of abortions at the end of each simulation (figure 6.10).

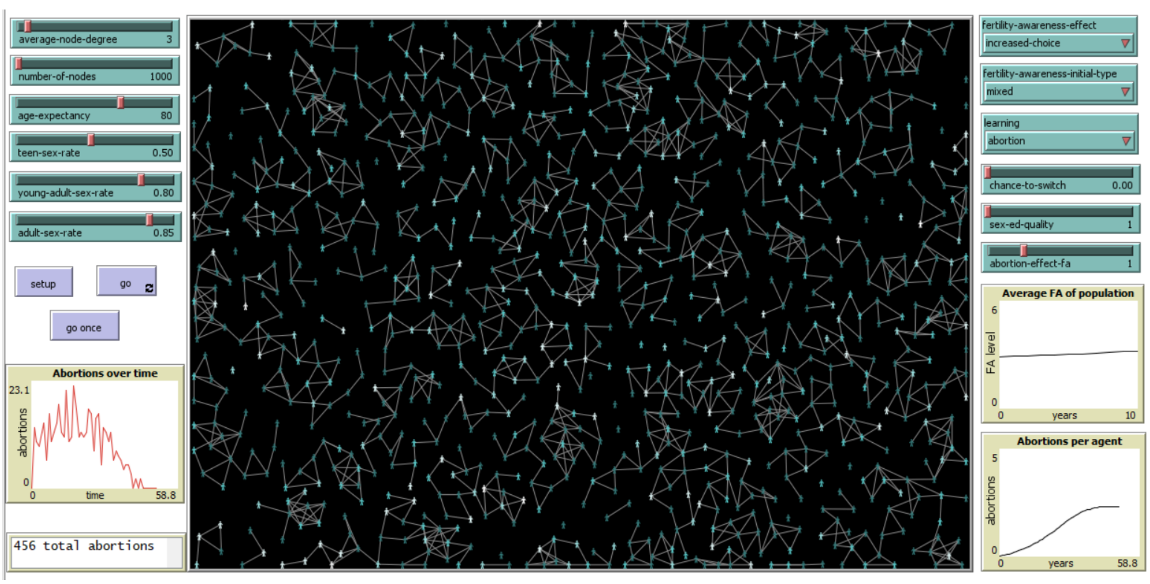

Figure 6.10. ABM interface – completed simulation at 50 ticks.

Possible Scenarios to Explore in the ABM

With all customizations explained above, there are hundreds of possible scenarios to explore in the ABM. My first experiment focused on distinguishing "set choice" scenarios from "increased choice" and testing whether the ABM parameters were sensitive to population size. I found that the model parameters were not sensitive to population size (figure 6.11), so all following experiments only included a population of 1,000 agents to conserve computational time, energy, and space, as the longest part of the model is the setup of the network, which is significantly more time consuming at 10,000 agents than 1,000. Additionally, "increased choice" scenarios always resulted in slightly higher number of total abortions and a somewhat higher average number of abortions per agent than "set choice" scenarios (figure 6.11). That is logical, as agents in "increased choice" scenarios still have a chance to not use contraception even at FA level 5, while in set choice all agents at FA level 5 only use the IUD, which is 99% effective at preventing a pregnancy.

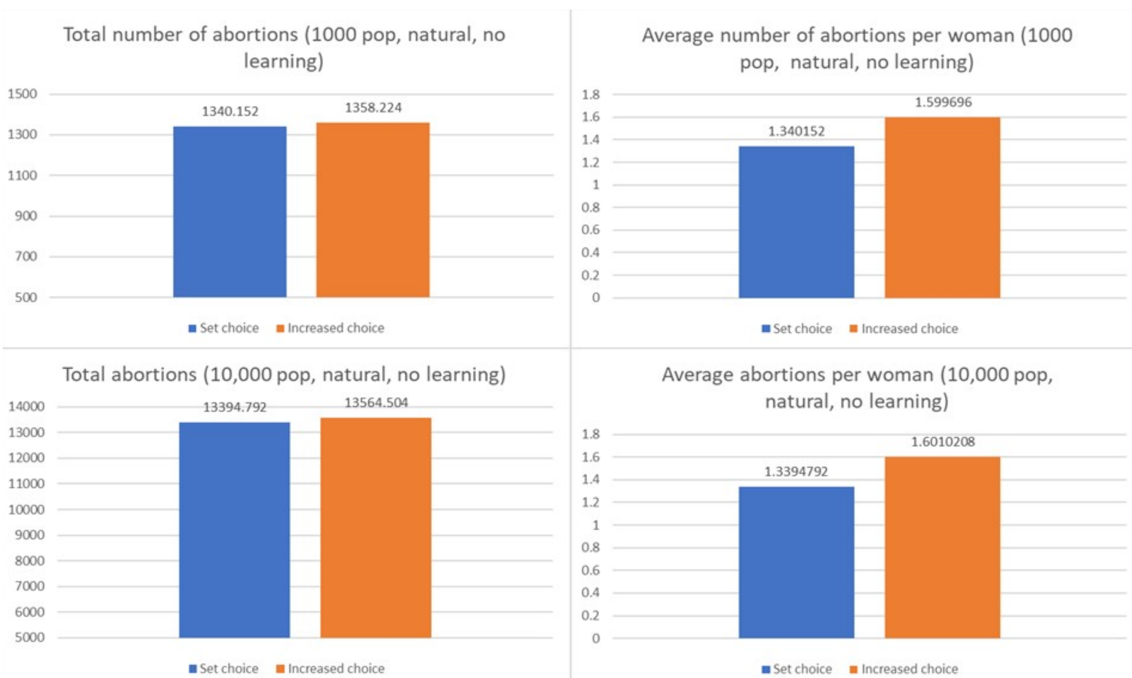

Figure 6.11. Total number of abortions and average number of abortions per agent in "set choice" vs. "increased choice" at 1,000 and 10,000 agents.

As the difference in the number of total abortions between "set choice" and "increased choice" scenarios was not significant and "set choice" is a not a realistic scenario in general, all future experiments focused on "increased choice" only. Still, that resulted in a total of 336 scenarios for comparison (table 6.8).

Table 6.8

Possible Scenarios for "Increased Choice" Only in the ABM

Number of possible scenarios	Fertility awareness spread type	Learning	Switch?
1	Natural	None	None
3	Natural	None	Yes (10, 30, 50%)
5	Natural	Abortion (0, 1, 2, 3, 4)	None
15	Natural	Abortion (0, 1, 2, 3, 4)	Yes (10, 30, 50%)
1	Natural	Social	None
3	Natural	Social	Yes (10, 30, 50%)
5	Sex education (1, 2, 3, 4, 5)	None	None
15	Sex education (1, 2, 3, 4, 5)	None	Yes (10, 30, 50%)
25	Sex education (1, 2, 3, 4, 5)	Abortion (0, 1, 2, 3, 4)	None
75	Sex education (1, 2, 3, 4, 5)	Abortion (0, 1, 2, 3, 4)	Yes (10, 30, 50%)
5	Sex education (1, 2, 3, 4, 5)	Social	None
15	Sex education (1, 2, 3, 4, 5)	Social	Yes (10, 30, 50%)
5	Mixed (sex ed 1, 2, 3, 4, 5)	None	None
15	Mixed (sex ed 1, 2, 3, 4, 5)	None	Yes (10, 30, 50%)
25	Mixed (sex ed 1, 2, 3, 4, 5)	Abortion (0, 1, 2, 3, 4)	None
75	Mixed (sex ed 1, 2, 3, 4, 5)	Abortion (0, 1, 2, 3, 4)	Yes (10, 30, 50%)
5	Mixed (sex ed 1, 2, 3, 4, 5)	Social	None
15	Mixed (sex ed 1, 2, 3, 4, 5)	Social	Yes (10, 30, 50%)
1	Social	None	None
3	Social	None	Yes (10, 30, 50%)
5	Social	Abortion (0, 1, 2, 3, 4)	None
15	Social	Abortion (0, 1, 2, 3, 4)	Yes (10, 30, 50%)
1	Social	Social	None
3	Social	Social	Yes (10, 30, 50%)

I performed a comprehensive BehaviorSpace experiment for all scenarios above and repeated each one 500 times. BehaviorSpace simply counts the number of simulations[36] based on the number of possible combinations of parameters (table 6.9). Therefore, even though simulations with "natural" and "social" initial FA spread type do not involve any "sex ed" levels and scenarios with "no learning" or "social learning" do not involve any levels of "abortion learning," BehaviorSpace still runs those simulations with all possible inputs for sex ed and abortion learning levels. This results in a total of 600,000 simulations for "increased choice" only, which takes over 50 hours of computational time.

Table 6.9

Possible Scenarios and Total Simulations in Behaviorspace for "Increased Choice" Only in the ABM

Variable	Scenarios explained	Number of possible scenarios
Type of FA spread	Natural, mixed, sex ed, social	4
Sex ed quality	1, 2, 3, 4, 5	5
Abortion learning quality	0, 1, 2, 3, 4	5
Contraceptive switching	0, 10%, 30%, 50%	4
Learning type	Abortion, none, social	3
Total number of simulations	Multiply all possible scenarios (4x5x5x4x3)	1,200
Total number of simulations, repeated 500 times	1,200x500	600,000

[36] A simulation is a single run of the ABM with specific set of parameters, while a scenario defines the parameters used in the simulation. Users can run simulations many times to get an average result for a specific scenario.

BehaviorSearch Experiments and Results – Searching for the Best Scenario

While I have the data for all 600,000 simulations from the BehaviorSpace experiment, the goal of this chapter is to explain the combination of parameters that leads to the lowest number of unintended pregnancies and, thus, abortions in the population. Therefore, I used BehaviorSearch to find that combination among all possible scenarios before doing any other analyses with BehaviorSpace data.

It was important to distinguish scenarios with and without contraceptive switching, as that adds randomization to the model. While I originally planned to test values between 0 and 50% for contraceptive switching, I allowed BehaviorSearch to test all values between 0 and 100% to see how random switch can affect the model. Recall from earlier in this chapter that the code for contraceptive switching is related to FA levels and not specific methods of contraception. I performed ten total BehaviorSearch experiments (five for scenarios with switching and five without) in a strategic order (figure 6.12).

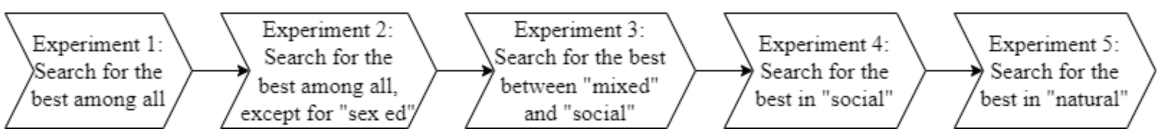

Figure 6.12. The logic of BehaviorSearch experiments to find the combination of settings that leads to the lowest total number of abortions at the end of the simulation.

First, I searched for the best scenario among all possible scenarios. Second, I removed all scenarios with the initial type of FA distribution that led to the lowest number of abortions in the first experiment and compared the remaining scenarios. The first experiment always resulted in the "sex ed level 5" being the best as that is the most unrealistic way of initial FA distribution in a population, while the remaining ones ("mixed," "social," and "natural") are somewhat realistic. So, I searched for the best one among them.

Third, I searched for the best combination of settings between "mixed" and "social" scenarios to see if the "mixed" scenario, which is the most realistic is better than a completely random model setup. Lastly, I searched for the best combination of parameter settings in "social" and "natural" scenarios separately, as those do not involve any sex education and can help understand the effect of different learning mechanisms after an abortion in societies without sex education.

Lowest number of total abortions in scenarios with and without contraceptive switching. The results of different BehaviorSearch experiments for all simulations without contraceptive switching are in table 6.10 and the results for all simulations with contraceptive switching are in table 6.11.

Table 6.10

Behaviorsearch Results for "Increased Choice" Only in the ABM, No Contraceptive Switching

Exp	Initial FA spread scenarios included	Best initial FA type	Sex ed level (quality)	Best learning type	Abortion learning level (quality)	Total number of abortions at 50 ticks
1	Mixed, natural, sex ed, social (all)	Sex ed	5	Abortion	3	177.9
2	Mixed, natural, social (all but sex ed)	Mixed	5	None	N/A	178.3
3	Mixed and social	Mixed	5	None	N/A	179.4
4	Social	Social	N/A	Abortion	4	200.2
5	Natural	Natural	N/A	Abortion	4	209.2

Table 6.11

Behaviorsearch Results for "Increased Choice" Only in the ABM, All Levels Contraceptive Switching Allowed

Exp	Initial FA spread scenarios included	Best initial FA type	Sex ed level (quality)	Best learning type	Abortion learning level (quality)	Chance to switch	Total number of abortions at 50 ticks
1	Mixed, natural, sex ed, social	Sex ed	5	None	N/A	60%	163.6
2	Mixed, natural, social	Mixed	5	None	N/A	40%	194
3	Mixed and social	Mixed	5	None	N/A	90%	177.4
4	Social	Social	N/A	Abortion	4	40%	201.1
5	Natural	Natural	N/A	Abortion	4	40%	210.7

Experiment 1. Among all possible scenarios with and without contraceptive switching, the scenario with initial FA spread type "sex ed level 5" results in the lowest number of abortions (tables 6.10 and 6.11). This is a logical, but not a realistic scenario, as all agents start the simulation at the highest possible level of fertility awareness.

Note that any scenario with a "mixed" initial FA type also includes sex education. Therefore, a "mixed" initial FA type scenario with "sex ed level 5" is just as unrealistic as the "sex ed level 5" initial FA type, if not more. That is because agents in the "mixed" scenarios also start at FA level 5 but then continue to increase[37] their FA level every ten ticks due to the natural learning about fertility with age.

[37] I set up the ABM code in a way that any FA level above 5 simply makes the agents behave as if they are at FA level 5, as that is the highest programmed FA level in the model.

Therefore, it is slightly surprising that a scenario with "mixed" initial FA type and "sex ed level 5" does not outperform the scenario with "sex ed level 5" initial FA type with or without contraceptive switching. **Still, in scenarios with no contraceptive switching, the "sex ed level 5" and "mixed" initial FA type scenarios both lead to very similar values for the lowest possible number of abortions in the population, so the reason the "sex ed level 5" initial FA type always outperformed the "mixed" initial FA type with the same sex ed level may be due to pure chance, as both have equally high starting FA for all agents** (177.9 vs. 178.3, table 6.10).

There are notable differences between scenarios with and without contraceptive switching, even when it comes to the first experiment. Among all scenarios without contraceptive switching, "abortion learning level 3" contributes to the lowest number of abortions, while in scenarios with contraceptive switching "no learning" and 60% chance of contraceptive switching lead to the lowest number of abortions. The total number of abortions at the end of the simulation is lower with random contraceptive switching than without it (163.6 vs. 177.9). **This means that random contraceptive switching <u>(currently this means FA level switching)</u>, which is a network effect, is an important factor that affects the ABM dynamics and should be investigated further in the future.**

Experiment 2. Among remaining scenarios (excluding all "sex ed" initial FA spread type scenarios), a scenario with "mixed" initial FA spread type, "sex ed level 5," and "no learning" results in the lowest number of abortions both with and without contraceptive switching (tables 6.10 and 6.11). This is also a logical and unrealistic scenario, as explained above. **Still, together the first two experiments show that the highest quality of comprehensive sex education leads to fewest unintended pregnancies and, thus, abortions in the population.**

However, in contrast to experiment 1, in experiment 2, random contraceptive switching of 40% results in higher total number of abortions than the same scenario without contraceptive switching (194 vs 178.3). **Therefore, it is likely that random contraceptive switching can be both beneficial and disadvantageous when it comes to lowering the total number of abortions in a population, so it is likely a truly random effect in the ABM.**

Experiment 3. Among all “mixed” and “social” initial FA type scenarios, the scenario with the “mixed” initial FA type, “sex ed level 5,” and “no learning” results in the lowest number of abortions both with and without contraceptive switching (tables 6.10 and 6.11). The goal of experiment 3 was to see if the “mixed” scenario, which I specifically built to be the most realistic representation of a society with some type of formal sex education, is better than a completely random model. **While at “sex ed level 5” the “mixed” scenario is better than the random “social” scenario, a further exploration of various levels of sex education within “mixed” scenarios in comparison to “social” scenarios is important to investigate.**

Comparing the results of experiment 3 for scenarios with and without contraceptive switching further supports the idea that random contraceptive switching is an important factor in the model, but it is likely much less important than sex education quality. Both experiments result in similar total abortions (177.4 with switching and

179.4 without), but the switching probability is 90%, which is the highest switching probability among all other experiments. This means that when contraceptive switching is allowed, 90% of agents switch their FA level randomly at the end of each tick. Since all agents at “sex ed level 5” start the simulation at the highest level of FA already, it does not matter how many agents switch their FA level with each tick, as they are at the highest possible level without the possibility of lowering it below 5.

Experiments 4 and 5. Among all “social” and “natural” initial FA type scenarios, “abortion learning level 4” results in the lowest number of abortions both with and without contraceptive switching (tables 6.10 and 6.11). This is logical, as “abortion learning level 4” is the highest possible learning level, which increases the agent’s FA level by 4, so even the agents at FA level 1 get assigned FA level 5 after one abortion. Both experiments with and without contraceptive switching result in similar total number of abortions (social: 200.2 without switch and 201.1 with switch; natural: 209.2 without switch and 210.7 with switch).

However, those values are still higher than results from all other experiments, all of which had below 200 total abortions (all but one below 180). **This means that while PACC of the highest quality is useful at reducing the total number of abortions, it is less useful than comprehensive sex education. This is because sex education covers the entire population, while all forms of PACC only cover those with at least one abortion.** Still, the effects of PACC of varied quality are important to investigate further in the next section of this chapter.

As seen in the paragraph above, both with and without contraceptive switching, the best "social" scenario results in fewer total abortions than the best "natural" scenario. **This means that a completely random initial FA distribution results in fewer abortions than "natural" progression of FA increase.** This is logical, as the only agents at FA level 5 at the beginning of simulation in the "natural" scenario are agents aged 50 and above, so they cannot participate in the model actively and all active participants do not reach FA level 5 without an abortion. In contrast, any agent may randomly get assigned a FA level 5 in the "social" scenario.

BehaviorSpace Results – Detailed Comparison of Some Scenarios

The previous section of this chapter showed two crucial points:

1. The highest level of sex education quality leads to the lowest number of total abortions among all scenarios.
2. The highest level of pre- and/or post-abortion contraceptive counseling (PACC) leads to the lowest number of total abortions in all scenarios without any sex education.

However, that section did not discuss the effects of any other levels of sex education or PACC quality on the total number of abortions in the ABM, the average FA level of the population, or the average number of abortions per agent in any scenarios. **Afterall, there are very few places in the world that have the highest quality sex education or PACC for all women, so learning more about the effects of sex education and PACC of lower qualities on the key ABM outcomes (total number of abortions, average FA**

level of the population, and the average number of abortions per agent) is important.

Based on the logic above and some conflicting findings about contraceptive switching in the previous section of this chapter, several questions remain to be answered in this section through visualization and simple analysis of the data from the 600,000 BehaviorSpace experiments. Specifically:

1. What differences exist among "mixed" scenarios with different levels of sex education and how do they compare to the "natural" and "social" scenarios?
    a. In terms of total number of abortions in the population
    b. Average FA level of the population at the end of the simulation
    c. Average number of abortions per agent by at the end of the simulation
2. Is there a statistically significant difference among the aforementioned (a-c) ABM outcomes in "mixed" scenarios with low sex education quality and "natural" scenarios without any sex education at all?
3. Is there a statistically significant difference among the ABM outcomes in "mixed" scenarios with low sex education quality and "social" scenarios, which do not have any sex education and assign FA levels to agents randomly?
4. Is there a statistically significant difference among the ABM outcomes in "natural" and "social" scenarios with low PACC quality and the same scenarios with no learning after an abortion?
5. How does random contraceptive switching affect the ABM outcomes in different scenarios?

Given that all questions above focus on the three ABM outcomes recorded in each of the 600,000 BehaviorSpace simulations, the rest of this section is divided into three respective parts – total number of abortions, average fertility awareness level of population, and average number of abortions per agent. In each of these subsections, I first discuss the results of simulations without PACC, then the ones with PACC and use some simple statistical tests throughout to further quantify the findings from the ABM.

Total number of abortions. In all realistic scenarios without PACC, "social learning" results in higher number of total abortions than "no learning" (figure 6.13). This is logical, as the code for "social learning" currently allows agents that failed to prevent a pregnancy to adopt the FA level of one of the agents in their network that avoided a pregnancy. As the network size for each individual agent is quite low, some agents may not be connected to any other agents or connected to agents with low FA. **Among all scenarios with no PACC, those with "no learning" and "mixed sex ed level 2" and above have much lower total abortions than the rest of the scenarios** (figure 6.13). This supports the findings from the previous section of this chapter about the "mixed sex ed level 5" with "no learning" as the best scenario with the lowest total number of abortions.

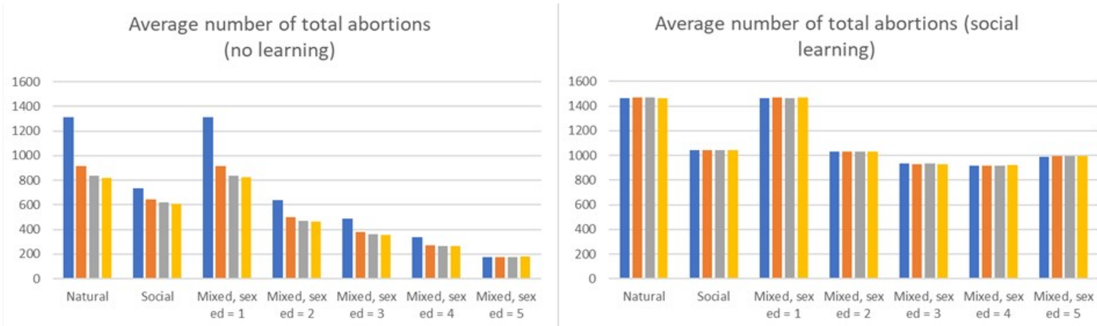

Figure 6.13. Total abortions in all realistic scenarios with “no learning” on the left and “social learning” on the right. The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30%, and yellow is 50%.

There is one notable difference in the effect of random contraceptive switching in scenarios with “no learning” and “social learning.” Small network size likely contributes to additional randomization of FA levels in simulations with “social learning,” which may counteract the randomness of contraceptive switching, so all scenarios of the same initial FA type (“natural,” “social,” and all “mixed”) with and without contraceptive switching have the same total number of abortions at the end of the simulation (figure 6.13, right side). In contrast, all but one (“mixed, sex ed level 5”) scenarios with “no learning” have higher total abortions without random contraceptive switching (blue line on figure 6.13).

This is logical, as in all scenarios with “no learning,” contraceptive switching is the only way for the agents to change their FA level, so it increases the probability of agents reaching higher FA levels during the simulation and, thus, their likelihood of using effective contraception. This is irrelevant for “mixed, sex ed level 5,” as all agents in that scenario start at FA level 5 or above, so the randomness of annual contraceptive switching at 10, 30, and even 50% of the population does not change the agents’ access to any contraceptive methods.

When it comes to scenarios with PACC, some more trends emerge**. First, the highest level of "abortion learning," which simulates the highest quality of PACC, results in the lowest number of abortions among all scenarios, which supports the findings from the previous section of this chapter** (figure 6.14, Appendix A figures 15A and 16A). However, in each set of simulations, "abortion learning level 2" and "abortion learning level 3" have very similar total number of abortions to "abortion learning level 4."

Additionally, "abortion learning level 1" results in much lower total abortions than "abortion learning level 0" in all scenarios. **This means that even low quality PACC, which allows women to learn about at least two new methods of contraception (even if they are just traditional methods) is better than no PACC or PACC of lowest quality, which does not lead to an increase in fertility awareness** ($p < 0.05$, Appendix B table 26B).

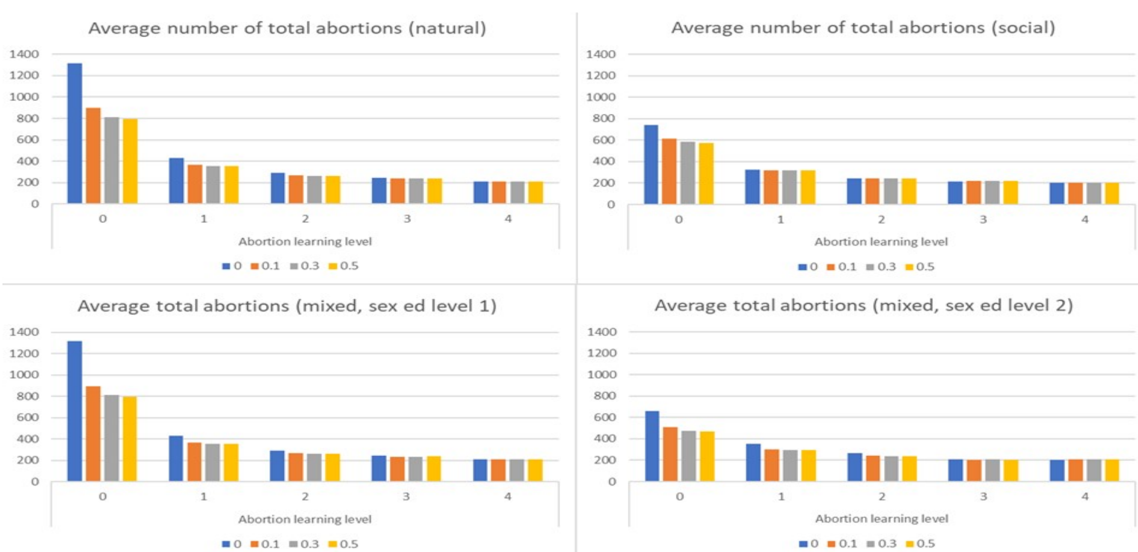

__Figure 6.14__. Total abortions in scenarios with "natural," "social," "mixed sex ed level 1," and "mixed sex ed level 2" initial FA spread types and "abortion learning." The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30%, and yellow is 50%.

Additionally, as seen on figures 6.13 and 6.14, all scenarios with "mixed, sex ed level 2" result in lower total number of abortions than all "mixed, sex ed level 1" scenarios with and without contraceptive switching. Recall from the ABM Architecture part of this chapter that "sex ed level 1" symbolizes abstinence-based sex education that does not teach people anything about contraception and "sex ed level 2" symbolizes very basic sex education, which only teaches people about the fertile functions of their bodies. This also explains the similarity in results for all experiments between the "natural" and the "mixed, sex ed level 1" scenarios, as neither scenario involves formal education about contraception. **This means that even the most basic sex education ("mixed, sex ed level 2") is better at preventing unintended pregnancies than abstinence-based sex education ("mixed, sex ed level 1") or no sex education at all** ($p < 0.01$, Appendix B table 27B).

Average number of abortions per agent. The second important outcome of the ABM is the average number of abortions per agent, as that corresponds to the number of repeat abortions in the population. As seen on figure 6.15, the average number of abortions per agent in the ABM follows the same trend as the total number of abortions in cases with no PACC. Contraceptive switching plays a small role in scenarios with "no learning," but has no effect in scenarios with "social learning." Average number of abortions per agent is lower in scenarios with "mixed, sex ed level 2" or above, with the lowest being the "mixed, sex ed level 5" and scenarios with "no learning" have lower average number of abortions per agent than scenarios with "social learning" for the same reasons as explained above.

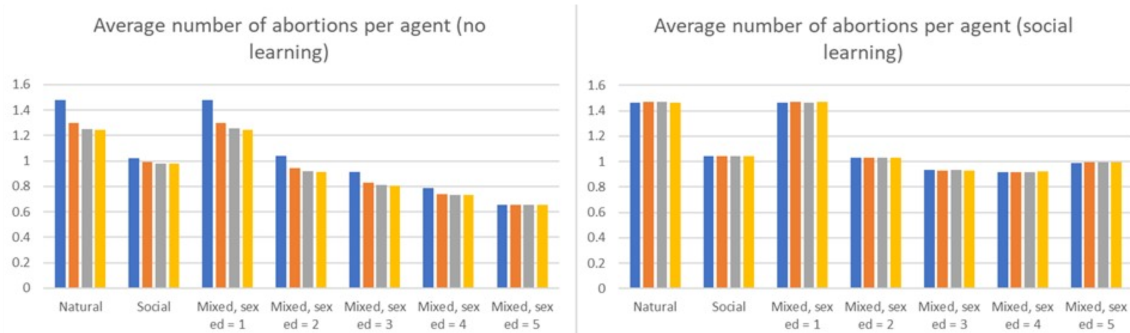

Figure 6.15. Average number of abortions per agent in all realistic scenarios with “no learning” on the left and “social learning” on the right. The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30%, and yellow is 50%.

Interestingly, in scenarios with “social learning” both the total number of abortions (figure 6.13) and the average number of abortions per agent (figure 6.15) are higher in “mixed, sex ed level 5” than “mixed, sex ed level 4.” I could not find a factor in the ABM code that would explain this, so I invite future scholars to further investigate the “social learning” in the ABM.

In scenarios with PACC of various qualities, random contraceptive switching had little to no effect on the average number of abortions per agent in most scenarios (figure 6.16). In scenarios with “natural” and “mixed, sex ed level 1” initial FA spread types, only simulations with “abortion learning level 0” result in the average number of abortions per agent below two, while all simulations with “social” and “mixed, sex ed level 2” result in an average below two. **This means that a completely random initial distribution of FA levels and basic sex education are better at preventing repeat pregnancies than abstinence-based sex education or no sex education at all** ($p < 0.01$, Appendix B table 28B).

Figure 6.16. Average abortions per agent in scenarios with "natural," "social," "mixed sex ed level 1," and "mixed sex ed level 2" initial FA spread types and "abortion learning." The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30%, and yellow is 50%.

There are few to no differences among the average number of abortions per agent in "mixed" scenarios at different "abortion learning" levels (figure 6.16, Appendix A figures 17A and 18A). **This further supports the idea that the quality of sex education is a more critical factor in the ABM that determines the total number of abortions and the average number of abortions per agent than the quality of PACC.** In fact, most scenarios with "abortion learning level 0" result in fewer abortions per agent than scenarios with "abortion learning level 1" ($p = 0.001$, Appendix B table 29B).

Average fertility awareness level of the population. This is the final important outcome of the ABM, as it shows whether the agents were able to learn and increase their FA level during the simulation. Recall from earlier in this chapter that the ABM code allows agents to increase their FA level beyond level 5 to track differences in learning, but all levels above 5 still allow agents to access the same contraceptives as FA level 5.

Among scenarios without PACC, those with “mixed, sex ed level 2” or above consistently result in higher average FA level of the population at the end of the simulation than “natural,” social,” or “mixed, sex ed level 1” scenarios (figure 6.17). This is consistent with all findings from earlier in this chapter. Additionally, contraceptive switch chance does not affect the average FA of the population in “no learning,” but in scenarios with “social learning,” simulations with no contraceptive switching (blue line) result in higher FA level. Therefore, the effects of contraceptive switching in scenarios with “no learning” require further investigation.

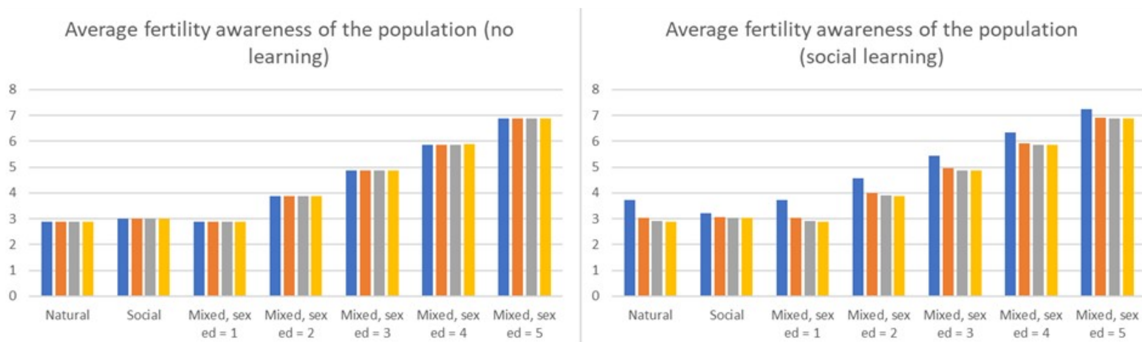

Figure 6.17. Average FA level of agents at the end of the simulation in all realistic scenarios with “no learning” on the left and “social learning” on the right. The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30%, and yellow is 50%.

Among scenarios with PACC, random contraceptive switching did not play a role in the average FA level of the population in any of the simulations, while the “abortion learning levels” did (figure 6.18, Appendix A figures 19A and 20A). **In all realistic scenarios, each increase in “abortion level” corresponds with an increase in population’s FA level, which supports the findings from the previous section of this**

chapter and means that higher quality PACC helps increase the fertility awareness of the population.

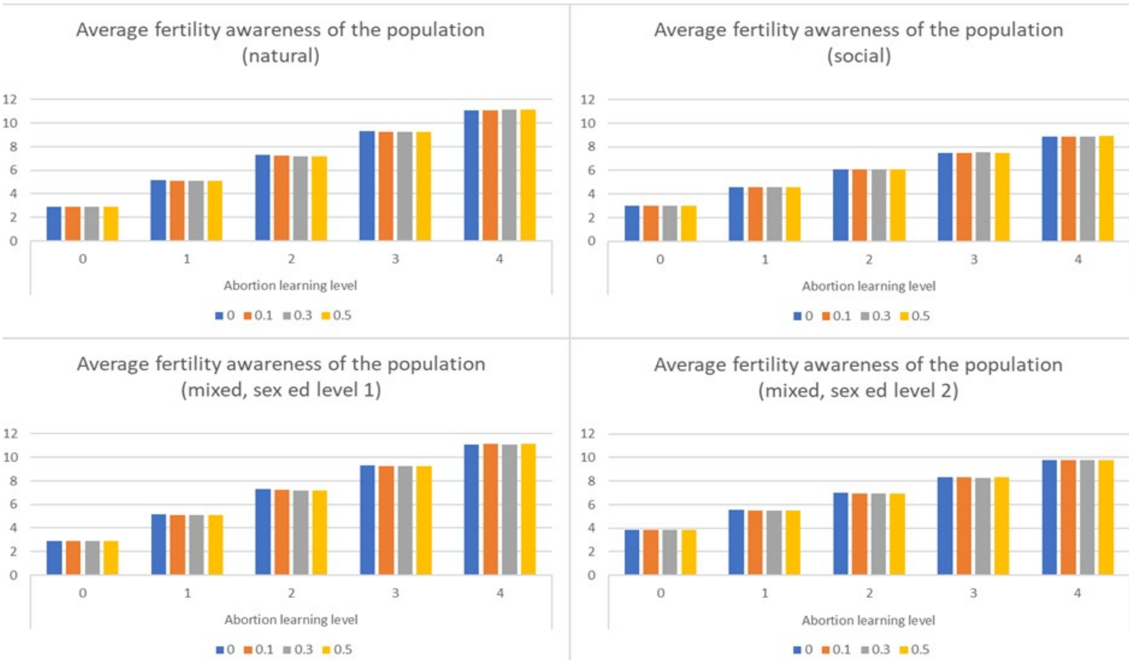

Figure 6.18. Average FA level of the population at the end of simulation in scenarios with “natural,” “social,” “mixed sex ed level 1,” and “mixed sex ed level 2” initial FA spread types and “abortion learning.” The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30%, and yellow is 50%.

However, in “mixed” scenarios, the differences in average FA level of the population at each “abortion learning level” gets smaller as the “sex ed level” increases (Appendix A figures 19A and 20A). Additionally, the average FA level in all simulations with “abortion learning level 0” is significantly lower than in simulations with “abortion learning level 1” ($p < 0.01$, Appendix B table 30B). **Together, these findings further support the point that while high quality PACC increases the FA level of the population and, thus, reduces the total number of abortions, sex education quality is more important in the ABM and likely in the real world, as well.**

Conclusion

Short summary of all findings in the ABM. Both BehaviorSearch and BehaviorSpace were useful tools in analyzing the effects on the ABM parameters on its outcomes. Through BehaviorSearch experiments, I found the best scenarios with the lowest possible total number of abortions. Those experiments showed that comprehensive sex education of the highest quality is the best policy measure that reduces the number of unintended pregnancies and, thus, abortions in a population. The experiments in scenarios without sex education showed that the highest quality of pre and/or post-abortion contraceptive counseling (PACC) is the best policy to reduce the total number of abortions in the population.

Through visualizing and statistically comparing the results of the BehaviorSpace parameter sweeping, I found that even basic sex education and PACC are better at reducing the total number of abortions and increasing the average fertility awareness of the population than abstinence-based sex education and uninformative low-quality PACC. Still, in all experiments where both sex education and PACC are available, the quality of sex education is more important than the quality of PACC in lowering the total number of abortions and increasing the average fertility awareness of the population.

The only unexpected finding concerns the differences between “abortion learning level 0” and “abortion learning level 1” in terms of the total number of abortions and the average number of abortions per agent. “Abortion learning level 0” simultaneously results in significantly higher total number of abortions in the population and lower average number of abortions per agent than “abortion learning level 1.” This is likely because agents can increase their FA level via PACC in scenarios with “abortion learning level 1," so while there are more abortions per agent, there are fewer total abortions in the population, as fewer agents have abortions throughout the simulation.

Novelty and adaptability of the ABM. Overall, these findings are consistent with the existing literature on the effects of comprehensive sex education and contraceptive counseling on the prevalence of unintended pregnancies in the population (Pazol et al., 2015; Potera, 2008; Saito, 1998). This is logical, as I used the existing literature and my own research findings from the previous chapters as the conceptual basis for the ABM. However, this is still the first ABM on abortion at the time of writing this manuscript, and my definition of fertility awareness and its relationship to contraceptive knowledge and use is novel. Additionally, the ABM code is set up in a unique way that allows the users to completely customize the model parameters to fit the population of their interest, as long as they have relevant data on that population. Specifically:

- Female population size
- Age distribution
- Age-specific sex rates
- Life expectancy
- Mix of most popular contraceptive methods in the population
- Quality of sex education (if any)
- Quality of post-abortion counseling (if any)

ABM limitations and future improvements. While the ABM currently performs as expected, there are several limitations to it and many potential improvements future scholars can make to make the model more realistic.

Likely the biggest limitation of the ABM is that it currently does not include any measures of contraceptive access, which are crucial to consistent contraceptive use in the real world. The main issues here are financial barriers to highly effective contraception for low-income people (Leeman, 2007; Secura et al., 2010) and unequal supply of modern contraception locally, especially in rural and low-income urban areas (Blystad et al., 2020; Boydell et al., 2020; Duran, 2017).

Future scholars can improve the ABM by transforming its current “world” to a map with known income and population distributions to add the socioeconomic variability to the model. On that map, they can also add known locations of pharmacies and healthcare facilities where contraceptive counseling exists and implement a price for every type of contraceptive, which would determine if an agent of a specific socioeconomic status can afford it.

The second biggest limitation of the ABM is that no new agents can be “born” into the model, so it only runs for 50 ticks, which is a very short time. If future scholars implement a code for adding new agents to the model and deleting agents who have reached the selected life expectancy, the users of the ABM can make changes to the ABM parameters while the simulation is in progress.

Currently, it is best to keep all values for all parameters constant, as the simulation is so short, and no new agents can get added. Because of that, a policy change like increasing/decreasing the quality of sex education or PACC while the simulation in progress is not currently possible. Allowing new agents to be “born” into the model and old agents to “die out” of the model would allow the ABM to run in perpetuity, which would allow making policy changes during the simulation. That would, in turn, make the interface more user-friendly and informative, as the users could see the effects of their policy changes on the monitors in the ABM interface in real time.

The next limitation is the fact that each tick of the model symbolizes one year. While that was intentional due to contraceptive effectiveness rates being based on annual use data, a more realistic approach would be to make each tick equal one month or even one day. That improvement would allow agents to engage in intercourse multiple times per year and the model users to add age-specific (or other) intercourse frequency into the model.

Additionally, some new links among agents and some new agent types can make the model more realistic and able to test various hypotheses outside the scope of this project. Specifically, adding the concept of marriage, generational (mother-daughter), and age-specific (friends of the same age) social links among agents would allow the users to test different hypotheses about unintended pregnancies in marriage, in generations of families, and among friends. Also, adding specific agents throughout the model that have a goal of decreasing or increasing the fertility awareness level of all other agents in their network can help test hypotheses about social learning and specific agent interactions.

Together, all these potential improvements can make the existing ABM much more powerful and realistic. Then, policymakers can use it to see in real time how their policy decisions affect the population. Finally, the ABM code is currently focused on abortion, but users can easily change that to a different sociobiological phenomenon, given the adaptability of the current code and all possible improvements.

After all these improvements, anyone can use the ABM to answer many new questions. However, I propose starting with two questions left unanswered in the existing version of the model. First, it is important to explore the effects of random contraceptive switching in more detail, as various measures of random switching do not result in different ABM outcomes for most scenarios in BehaviorSpace, but contraceptive switching was a core part of the BehaviorSearch experiments. So, is the random contraceptive switching truly random in all scenarios? If so, why do specific values appear in BehaviorSearch results, while all values in BehaviorSpace are the same?

Second, why do scenarios with "social learning" and "mixed, sex ed level 5" result in higher total number of abortions and higher average number of abortions per agent than "mixed, sex ed level 4" with the same type of learning? This is important to answer, as there should be no logical way for both total abortions in the population and the average number of abortions to be higher in a population with higher initial fertility awareness level.

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CONCLUSION

There are several key takeaway messages that stand out from all the work completed for this dissertation. First, there is so much richness in available data and methods to study abortion, that this can easily turn into a lifetime of academic work for interested scholars. What started as an investigation of abortion rate differences in the context of the same abortion law evolved into a comprehensive overview of fertility behavior in fifteen post-Soviet countries. In turn, that gave me enough understanding of how individual actions, like using different types of contraception, can lead to population-level outcomes, like abortion rates. So, I explored those relationships further by building an adaptive agent-based model (ABM) to test my hypotheses about the effectiveness of comprehensive sex education on the number of unintended pregnancies, and, thus, abortions in a population. All of this allowed me to answer both driving questions of my dissertation, but many more questions emerged for future work on abortion in various contexts.

So, let us start with the first driving question: **Given the common origin of national policies on abortion in all post-Soviet countries, why does Russia have the highest abortion rate for most years between 1991 and 2018, compared with the other fourteen post-Soviet countries?** To answer this question adequately, I first had to prove the common origin of the current abortion laws in post-Soviet countries (chapter 2) and compare the specifics of abortion law in each of the fifteen countries to quantify any differences among them (chapters 3 and 4). This work showed that as of 2022, all analyzed[38] post-Soviet countries maintain the same fundamental abortion laws that allow abortion upon request until 12 weeks of gestation. The main differences the individual governments made since 1991 concerned social indications for abortion until 22 weeks of gestation.

Next, I made visual and analytical comparisons of three of the four[39] proximate determinants of fertility, one of which is abortion (Bongaarts, 1978, 2015), to better understand the trends in fertility behavior in each post-Soviet country. I found that Asian and European post-Soviet countries have fundamentally different profiles of abortion seekers (chapter 5), and the governments have vastly different goals for fertility in their populations, so comparing Russia's abortion rate to an abortion rate of any of the Caucasus or South-Central Asian countries largely points to cultural and political[40] differences among those countries.

Still, across all post-Soviet countries, high rates of abortion were most closely correlated with the use of some specific methods of contraception, namely the rhythm method, oral contraceptive pills, and male condoms (chapter 5). All three of those methods have high rates of contraceptive failure (National Health Service of the United Kingdom, 2020; Trussell, 2009, 2014), especially among uneducated women and women with no formal training on the use of those methods (Bradley et al., 2019; Janevic et al., 2012). Russia has the highest rate of rhythm method (chapter 5, figure 5.32) and male

[38] Fourteen of fifteen post-Soviet countries. I excluded Turkmenistan from any abortion related analysis because it provided no data on abortion to the UN for any years and reduced the term limit for abortion upon request from 12 weeks to 5 weeks in 2015.
[39] I excluded lactational infecundability, or the inability to get pregnant while breastfeeding, as no data were available.
[40] The governments of Asian post-Soviet countries requested help with reproductive healthcare from international agencies like the UN or USAID to reduce their fertility rates, but governments of European countries did not.

condom use (Appendix A figure 13A) among all post-Soviet countries, including European ones (United Nations Population Division, 2019).

High prevalence of use of these unreliable methods of contraception can be related to the fact that Russia has no sex education (Vishnevsky et al., 2017; United Nations, 1999), which leads to women in Russia having low fertility awareness and, thus, suffering from more unintended pregnancies than women in other post-Soviet countries. Additionally, until 2018, the Russian government required hospitals to report induced abortions upon request in the same statistic as miscarriages, or spontaneous abortions, which inflated Russia's abortion rate compared to other post-Soviet countries (Lipman & Sakevich, 2019).

Together, several factors contribute to the relatively high abortion rate in Russia. Specifically, according to my findings, Russia has the highest abortion rate among all post-Soviet countries due to its abortion reporting standards, low fertility awareness of Russian women caused by absolute lack of sex education, and high rates of use of unreliable contraceptives.

There are many possible extensions of this work in the future. First, since Russia no longer tracks abortions in the same category as miscarriages, a future repeat of abortion rate comparison with new data is vital to understand how much miscarriages inflated Russia's abortion rate. An in-depth analysis of abortion law by a native speaker with access to national archives in each post-Soviet country will provide further context for this work, as I could not locate some documents and had to translate others. Additionally, a closer review of the relationship between abortion rates and specific contraceptive method use is imperative, as there were very limited data on specific method use for each country. Finally, scholars can perform many more in-depth comparisons of abortion rate dynamics in Russia and other countries, such as Poland or the United States to see how and when specific ideas about abortion law crossed national borders and affected national abortion policies.

Now, let us move on to the second driving question of this dissertation – **How is it possible to reduce the abortion rate of a population without restricting legal access to abortion?** This was important to answer, as I performed all this work from the United States at a time when the US Supreme Court overturned women's legal right to abortion (*Dobbs v. Jackson* (2022)), so I wanted to use what I learned from studying abortion dynamics in post-Soviet countries, all of which reduced their abortion rates without fundamentally restricting legal access to abortion, to make an adaptive agent-based model (ABM) for a broader use.

Specifically, the goal of the ABM was to create an artificial population that policymakers can experiment on to see the possible outcomes of policy changes related to abortion, as well as explore various dynamics in the population that may lead to high or low abortion rates[41]. This required me making a lot of assumptions outlined in the previous chapter, but I ultimately focused on sex education and pre- and/or post-abortion contraceptive counseling (PACC) and their role in preventing unintended pregnancies and, thus, abortions in a population (chapter 6).

Based on the results of the previous chapter, introduction of sex education drastically lowers the abortion rate of a population. There is an inverse relationship

[41] I used raw number of abortions instead of the abortion rate in all experiments, as all simulations had the same population size and age distribution, so calculating a rate was unnecessary and would only add a layer of complexity to the findings.

between the quality of sex education (starting fertility awareness level in the ABM) and the number of abortions in the population. This means that high-quality sex education lowers abortions in women who do not wish to get pregnant, which supports decades of research on the effect of comprehensive sex education on teenage pregnancies and other unintended pregnancies (Bright, 2008; Kivela et al., 2014; Mark & Wu, 2022; Marsiglio & Mott, 1986; Murphy, 2022; Oettinger, 1999; Potera, 2008; Saito, 1998; UNESCO, 2016).

My model also shows that low quality, or abstinence-based, sex education has very similar abortion dynamics compared to a scenario with no sex education at all, as it basically sets the fertility awareness of the entire population to the lowest possible level and only allows the agents to increase it via aging, PACC, or social interactions. This is also consistent with existing findings about the increased adolescent fertility and abortion rates following abstinence-based sex education (Stanger-Hall & Hall, 2011).

Additionally, there is ample statistical evidence in the ABM that even the most basic sex education, which simply discusses anatomy and the fertile function of the human body, is better at preventing unwanted pregnancies than abstinence-based sex education. Similarly, PACC of below average quality is statistically better than PACC of the lowest quality at reducing the total number of abortions in the population.

Finally, the ABM showed that sex education is better than PACC at preventing repeat abortions. This is logical, as sex education affects the entire population, while PACC only affects those who already had an abortion. Still, high-quality PACC is useful, especially in populations with no sex education or abstinence-based sex education.

Therefore, it is possible to reduce the abortion rate of a population without restricting legal access to abortion by introducing comprehensive sex education and high-quality post-abortion counseling and providing all residents with free or very cheap modern contraception. The last part is an important caveat in the ABM, as it currently assumes equal and unlimited access to all forms of contraception for all agents. This is not realistic, as contraceptive access, especially for modern contraceptives like an IUD or a hormonal implant, is highly variable based on an individual woman's socioeconomic status and location (Bradley et al., 2019; Janevic et al., 2012). Because of this, a further exploration of the model with a realistic simulation of contraceptive access is required.

Overall, through this dissertation, I systematically compared population fertility dynamics in fifteen countries to find out what leads to high and low abortion rates in the presence of the same abortion law. I then used my findings to make the first, to my knowledge, agent-based model on abortion dynamics in a population. **Finally, I can now make a recommendation to all policymakers who wish to lower the abortion rate of their constituents – introduce high-quality comprehensive sex education and expand access to modern contraceptives with low failure rates, like the IUD.**

Policymakers who are opposed to comprehensive sex education and insist on banning abortion for reasons that echo religious texts (Hensley & Washington, 2022), should consider learning something from equally, if not more, religious populations of Asian post-Soviet countries. Those countries experienced incredibly harsh economic downfall after the dissolution of the USSR, but still made evidence-based reproductive healthcare a priority by requesting aid from international agencies (Ahmedov et al., 2014;

Barrett & Buckley, 2007; Henry & Juraqulova, 2020; Ibraimova et al., 2011; Katsaga et al., 2012; Rechel et al., 2012; Verulava & Maglakelidze, 2017). The governments of those countries did not focus on sex education *de facto*, but they did import enough IUDs for that method to become the most common contraceptive for all women. An IUD lasts between three and ten years and prevents over 99% of unintended pregnancies, while only requiring one doctor's visit for an insertion and no additional maintenance, so it is a very easy-to-use method with very a low failure rate (Trussell, 2014).

If the USAID could afford to help fund reproductive healthcare in seven Asian post-Soviet countries in 1990s and 2000s (Dominis et al., 2018; Ibrahimov et al., 2010; Rechel et al., 2012), with over $45 million going solely to Azerbaijan's reproductive healthcare in rural communities between 1998 and 2005 (Holley et al., 2004), US state governments could certainly afford to make programs that supply their residents with highly effective contraceptives for free or a very low fee. This would help reduce unintended pregnancies and, thus, abortions.

The work from this dissertation added to the growing body of evidence that effective modern contraception use and comprehensive sex education decrease the abortion rate of a population. I hope that future scholars can use my dissertation to advance our understanding of fertility behavior and abortion dynamics in post-Soviet and other countries worldwide. I also hope that policymakers can use my model and evidence-based policy recommendation to make better decisions that affect people's lives in the future.

Additionally, in 2021, I designed and managed the creation of an online game titled ReproPro, which can serve as a source of comprehensive evidence-based sex education for those who do not have access to sex education through other means. ReproPro includes several parts that teach different things. There is a section on male and female reproductive anatomy, a section on meiosis in males and females, a section on fertilization, and two comprehensive decision-based pathways from gamete creation to various outcomes, including pregnancy and abortion, from the male and female perspective. I hope that this game will be available online soon, so many people worldwide can learn from it and avoid unintended pregnancies in the future.

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APPENDIX A

FIGURES

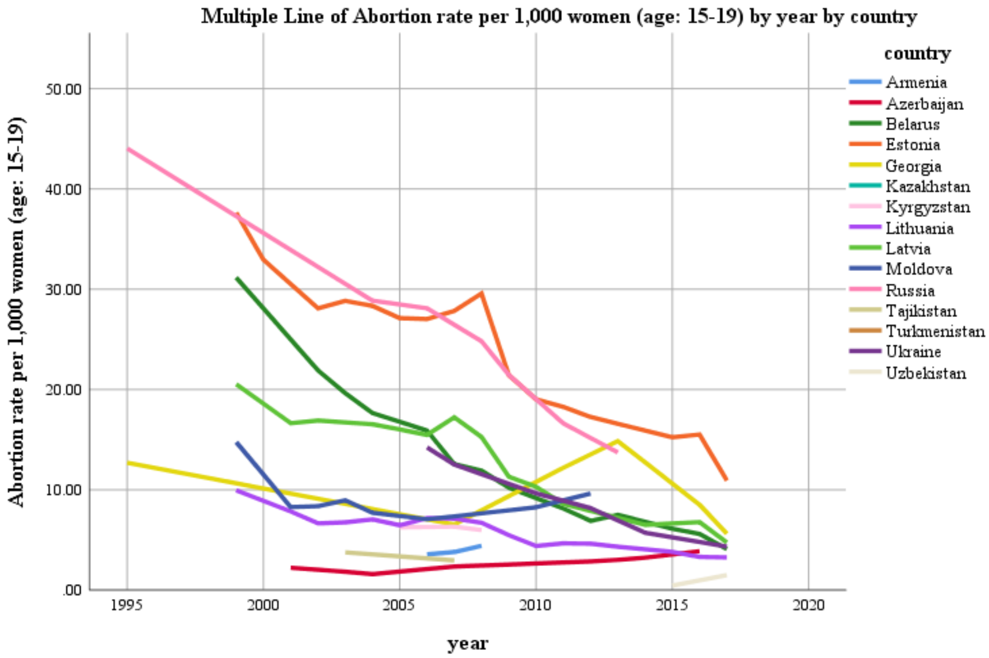

Figure 1A. Comparison of estimated abortion rates for women aged 15–19 between 1995 and 2018 (UN Demographic Yearbooks 2000–2018).

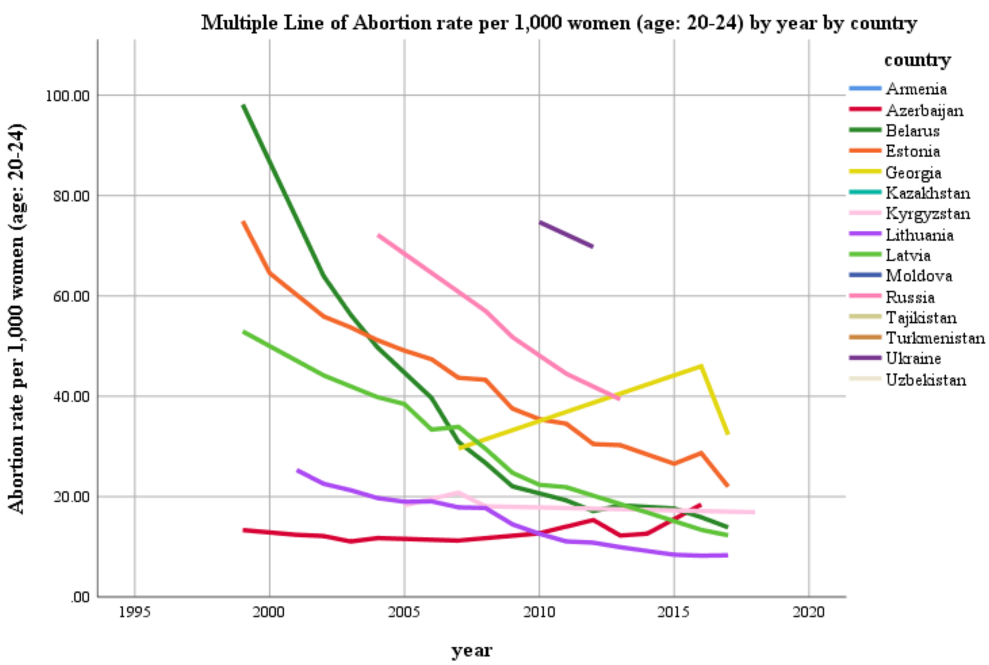

Figure 2A. Comparison of estimated abortion rates for women aged 20–24 between 1995 and 2018 (UN Demographic Yearbooks 2000–2018).

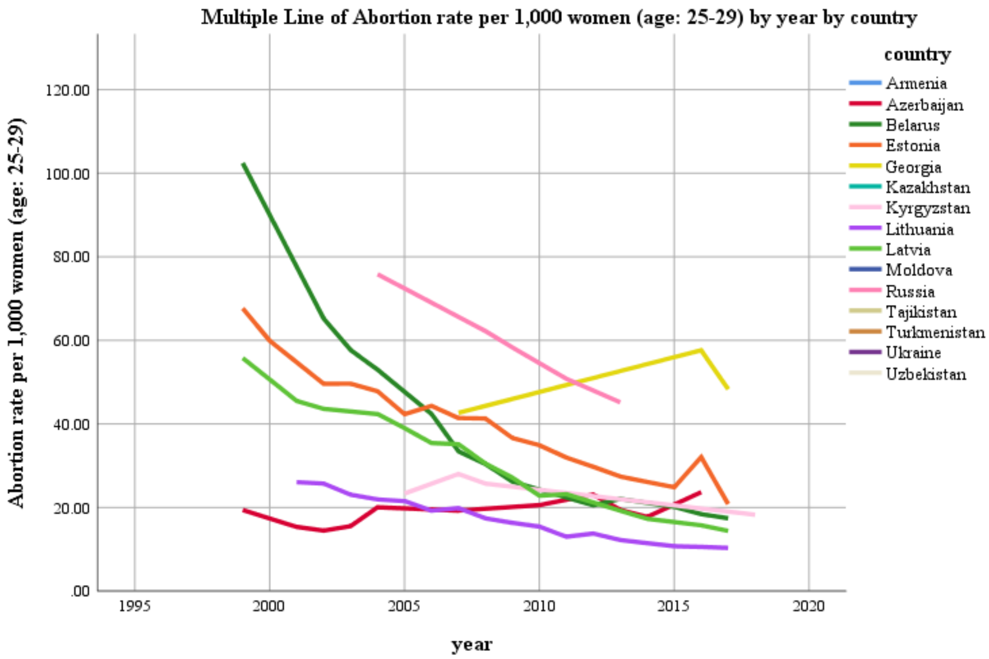

Figure 3A. Comparison of estimated abortion rates for women aged 25–29 between 1995 and 2018 (UN Demographic Yearbooks 2000–2018).

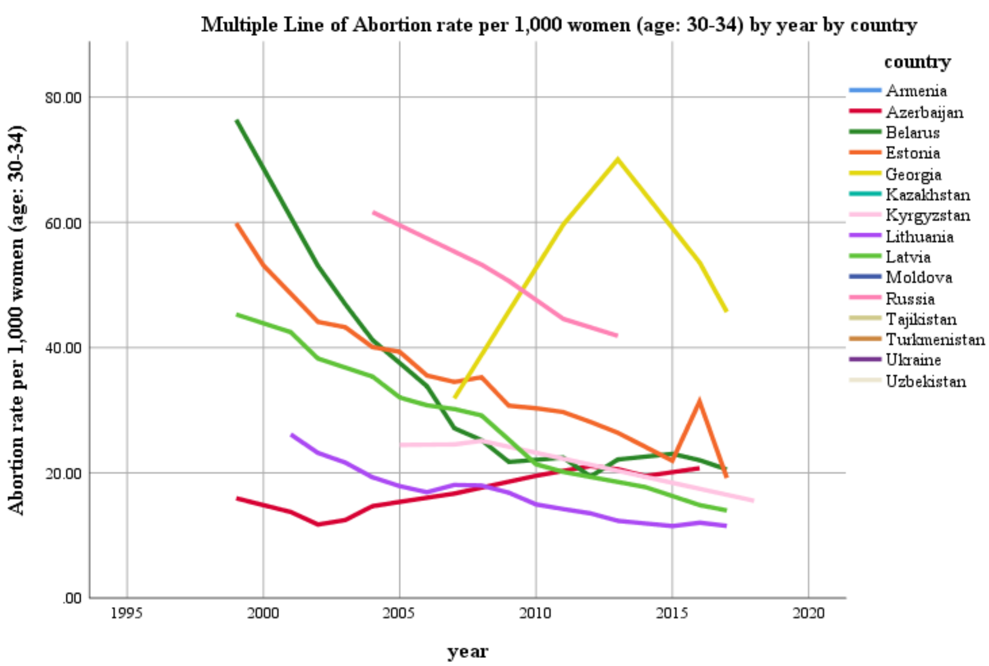

Figure 4A. Comparison of estimated abortion rates for women aged 30–34 between 1995 and 2018 (UN Demographic Yearbooks 2000–2018).

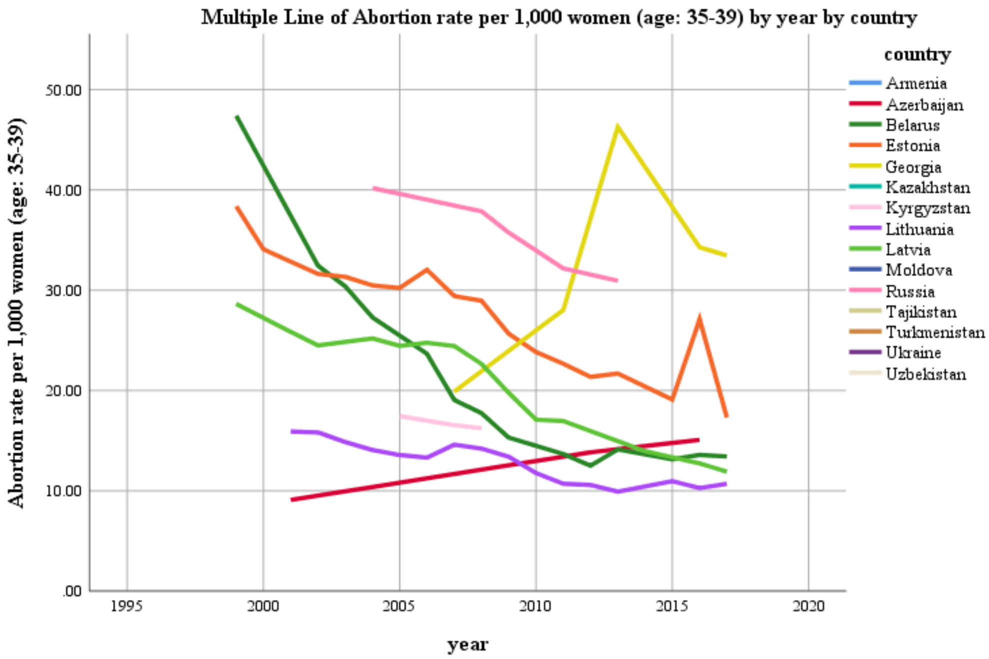

***Figure 5A*.** Comparison of estimated abortion rate for women aged 35–39 between 1995 and 2018 (UN Demographic Yearbooks 2000–2018).

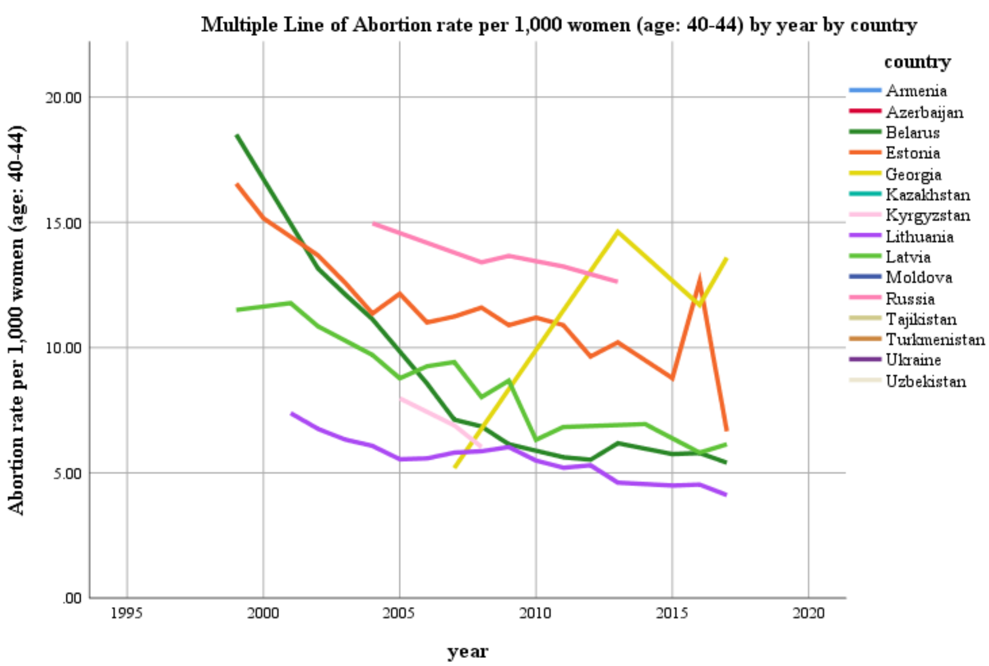

***Figure 6A*.** Comparison of estimated abortion rates for women aged 40–44 between 1995 and 2018 (UN Demographic Yearbooks 2000–2018).

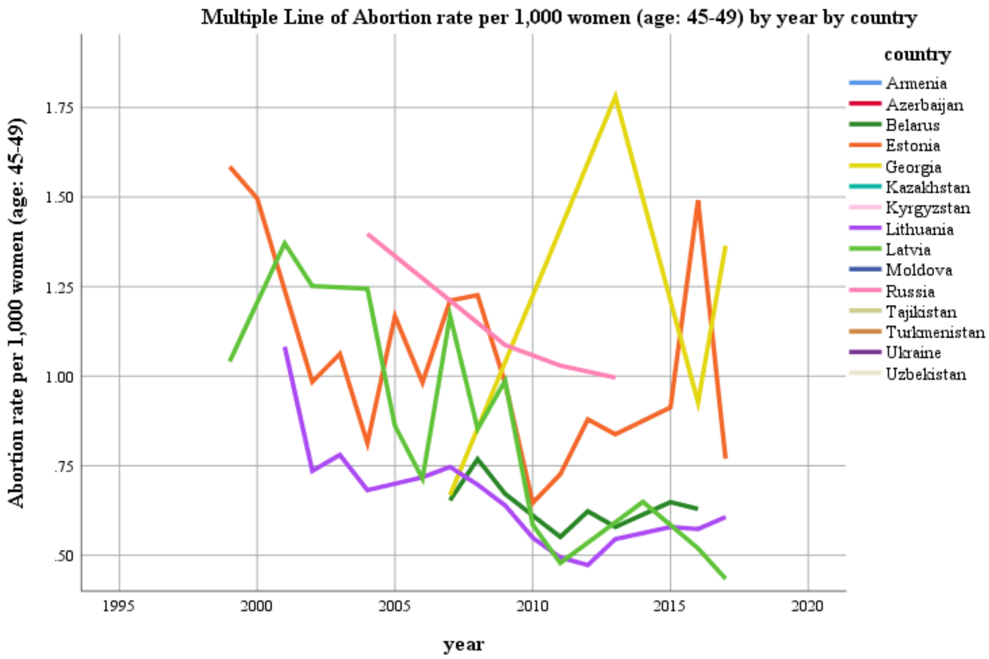

***Figure 7A*.** Comparison of estimated abortion rates for women aged 45–49 between 1995 and 2018 (UN Demographic Yearbooks 2000–2018).

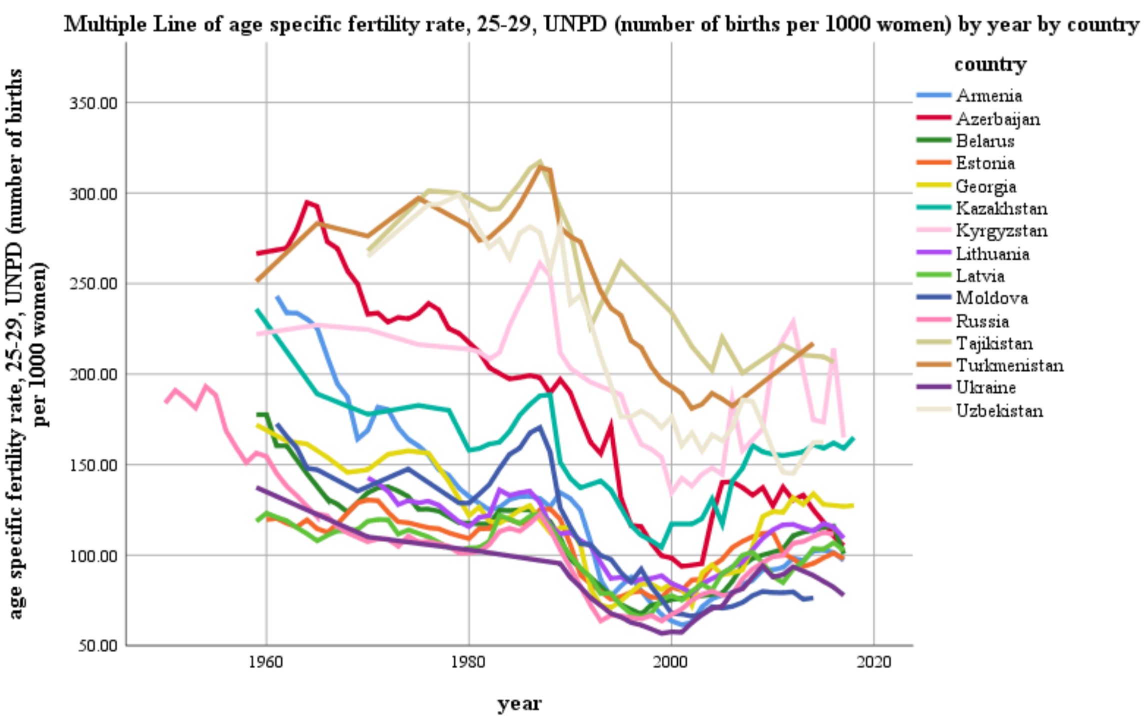

***Figure 8A*.** Comparison of recorded fertility rate for women aged 25–29 in post-Soviet countries between 1950 and 2019 (UNPD, 2019).

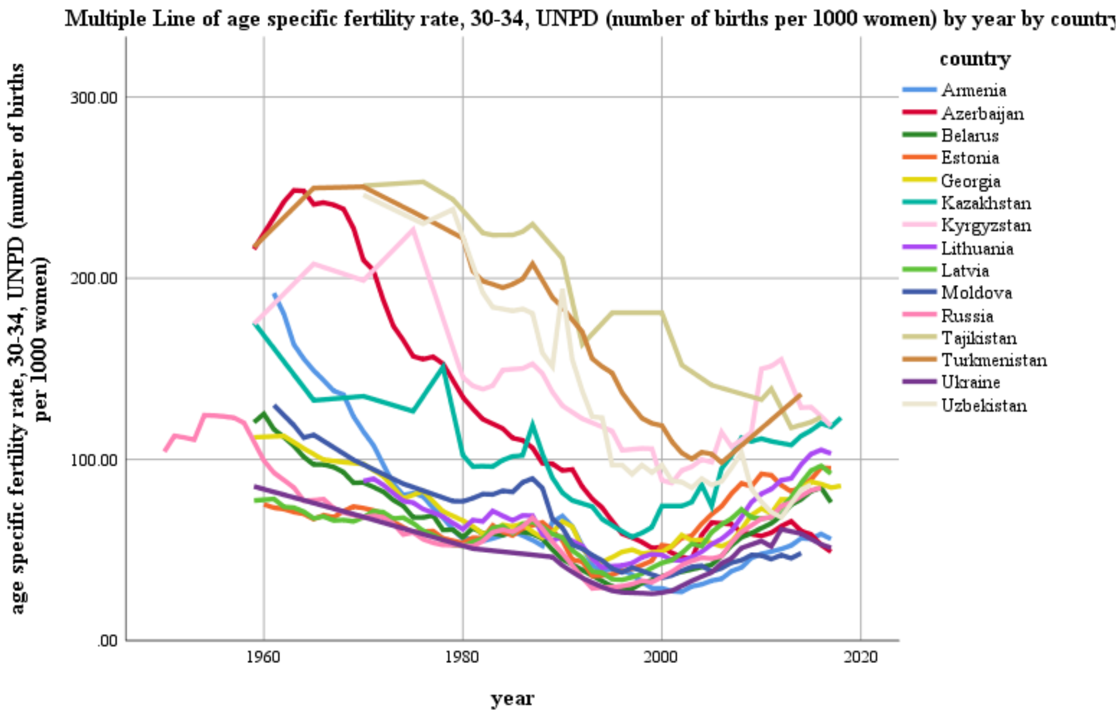

Figure 9A. Comparison of recorded fertility rate for women aged 30–34 in Post-Soviet countries between 1950 and 2019 (UNPD, 2019).

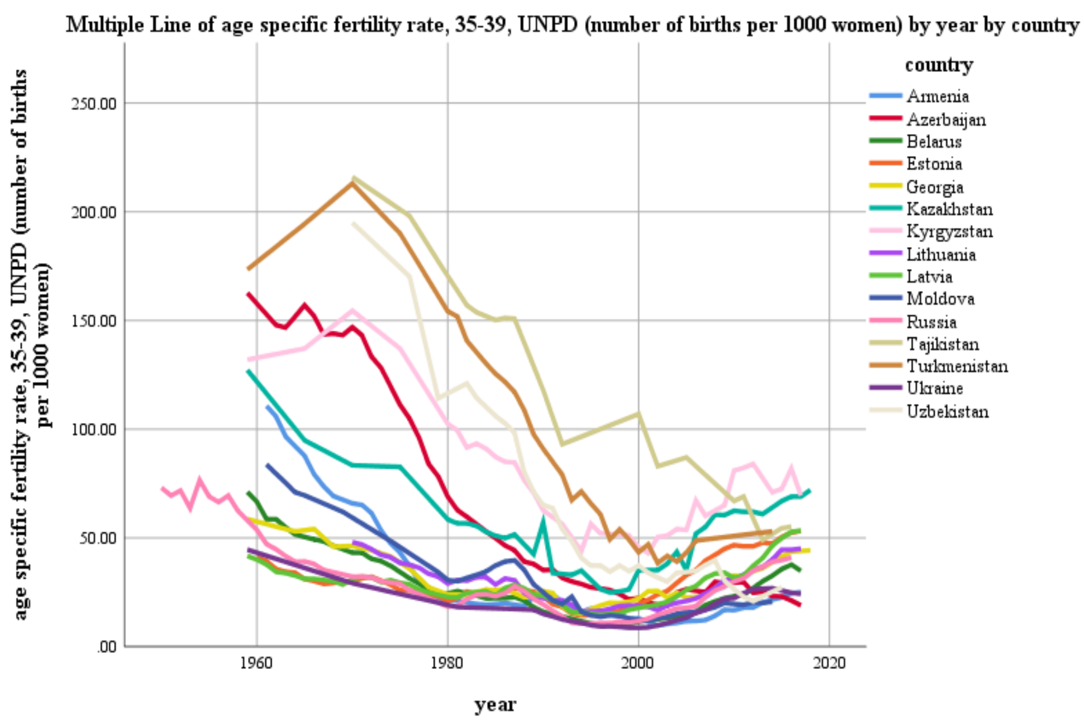

Figure 10A. Comparison of recorded fertility rate for women aged 35–39 in post-Soviet countries between 1950 and 2019 (UNPD, 2019).

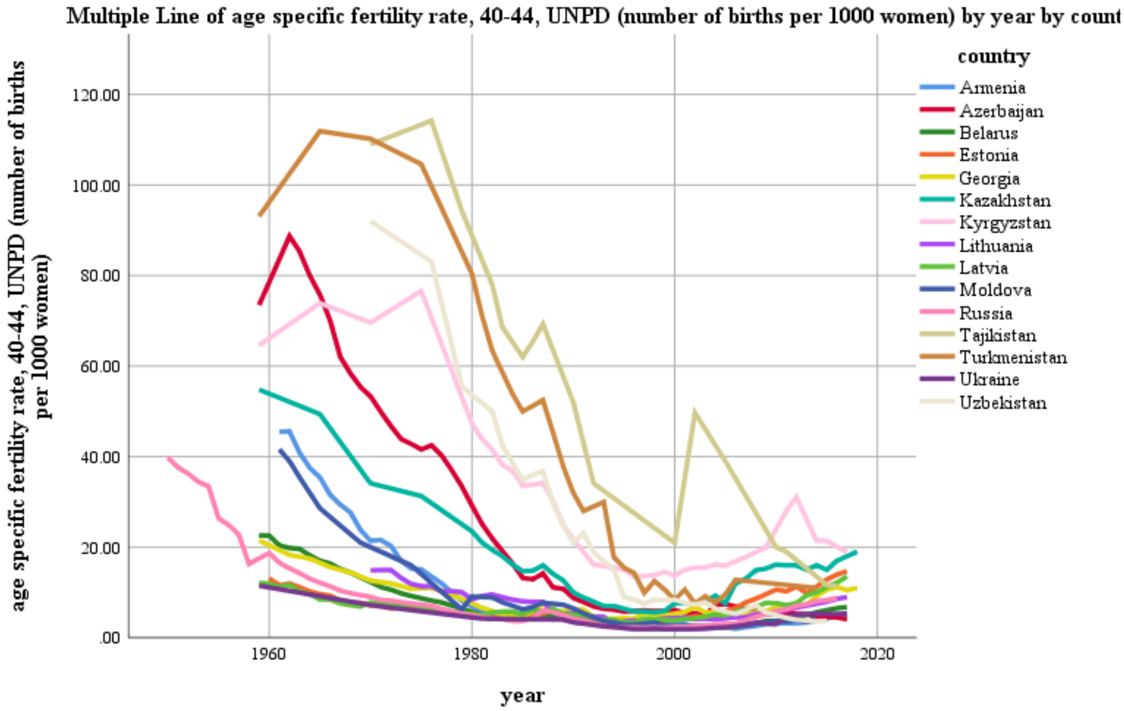

Figure 11A. Comparison of recorded fertility rate for women aged 40–44 in post-Soviet countries between 1950 and 2019 (UNPD, 2019).

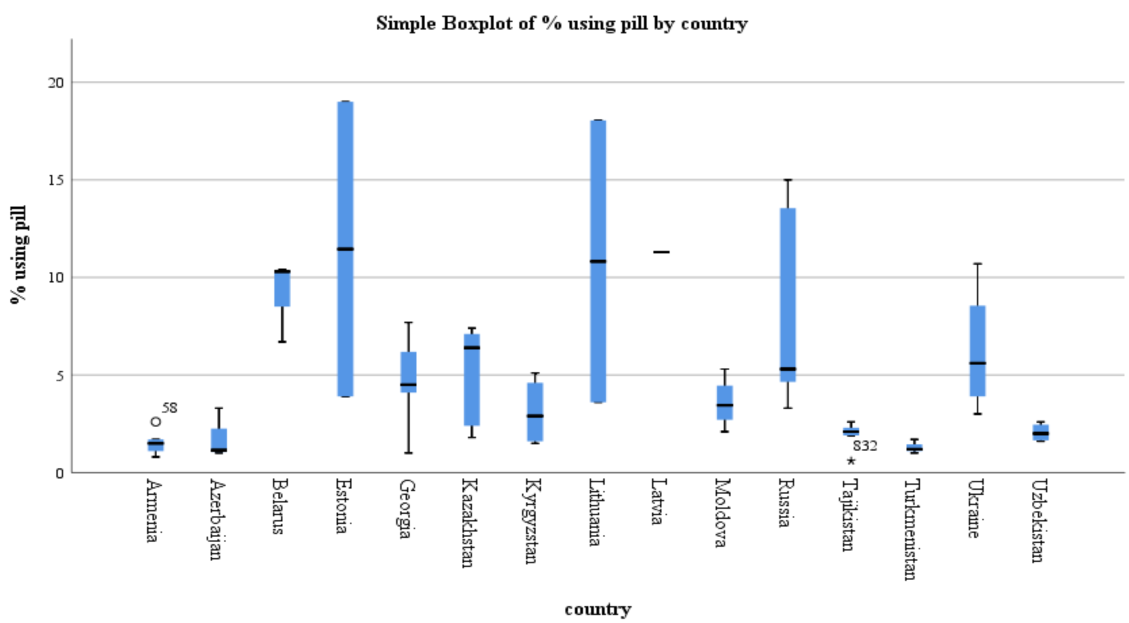

Figure 12A. Comparison of recorded % of all women of reproductive age who use hormonal oral pills as their primary method of contraception (UNPD, 2019).

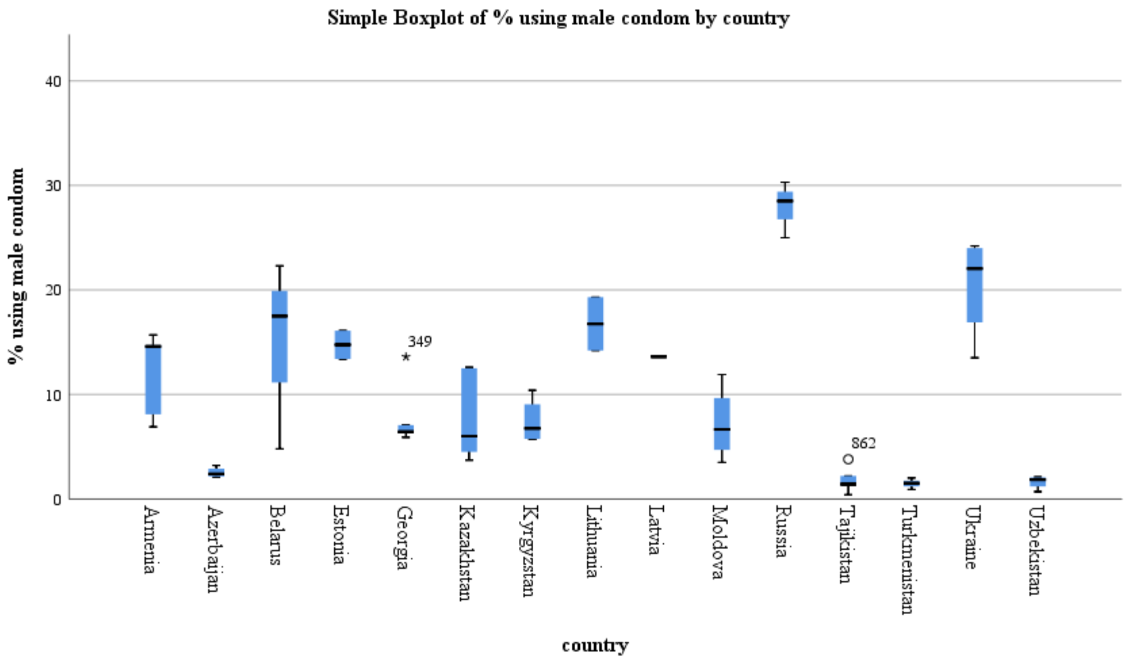

Figure 13A. Comparison of recorded % of all women of reproductive age who use male condoms as their primary method of contraception (UNPD, 2019).

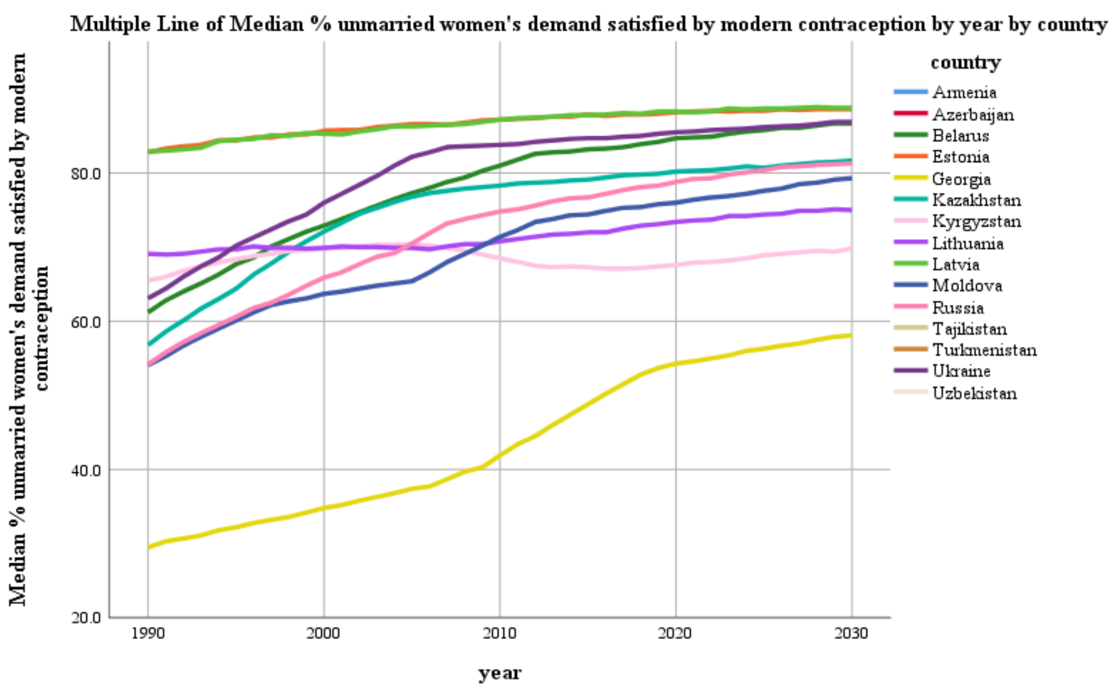

Figure 14A. Comparison of estimated and projected trends for % unmarried women of reproductive age whose demand is satisfied with modern contraception between 1990 and 2030 (UNPD, 2020).

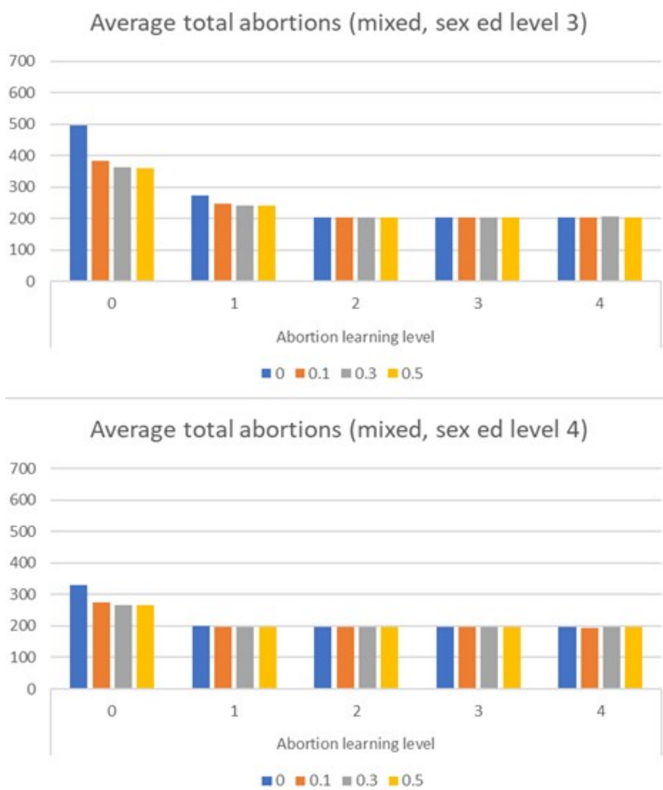

Figure 15A. Total abortions in scenarios with "mixed sex ed level 3" and "mixed sex ed level 4" initial FA spread types and "abortion learning." The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30% and yellow is 50%.

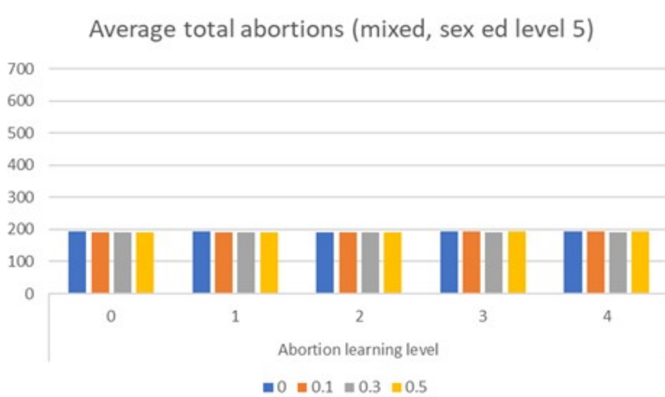

Figure 16A. Total abortions in scenarios with "mixed sex ed level 5" initial FA spread type and "abortion learning." The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30% and yellow is 50%.

Figure 17A. Average abortions per agent in scenarios with "mixed sex ed level 3" and "mixed sex ed level 4" initial FA spread types and "abortion learning." The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30% and yellow is 50%.

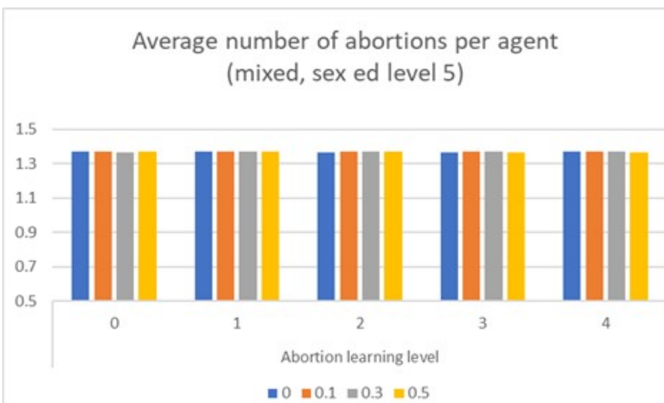

Figure 18A. Average abortions per agent in scenarios with "mixed sex ed level 5" initial FA spread type and "abortion learning." The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30% and yellow is 50%.

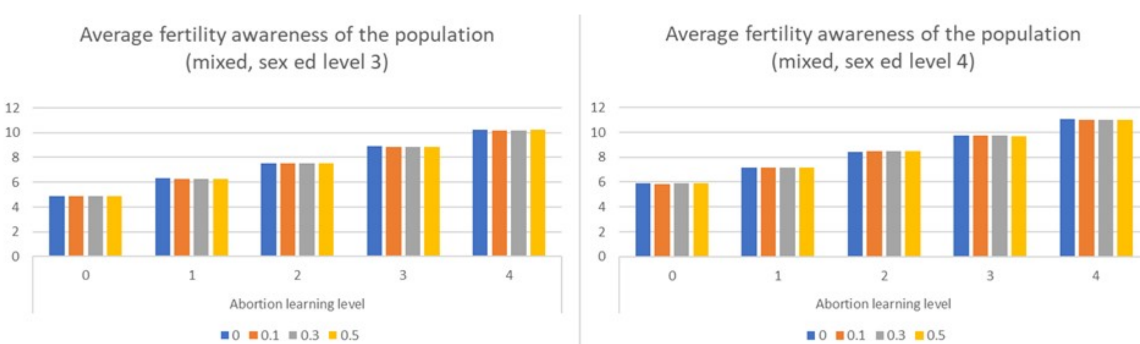

Figure 19A. Average FA level of the population in scenarios with "mixed sex ed level 3" and "mixed sex ed level 4" initial FA spread types and "abortion learning." The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30% and yellow is 50%.

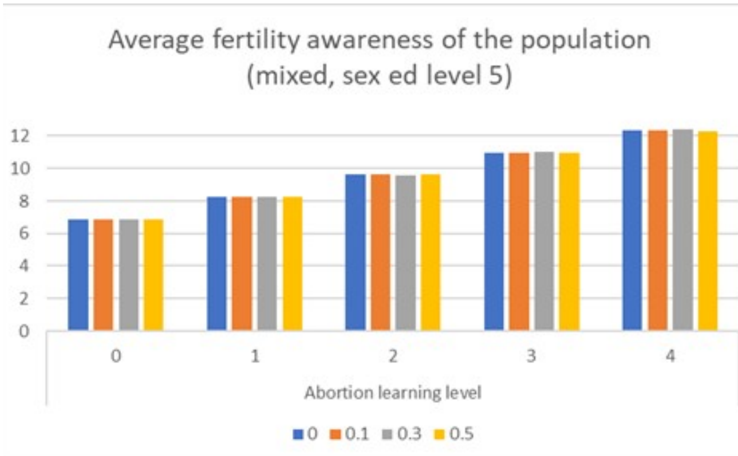

Figure 20A. Average FA level of the population in scenarios with "mixed sex ed level 5" initial FA spread type and "abortion learning." The colors correspond to the contraceptive switch chance – blue is 0%, red is 10%, gray is 30% and yellow is 50%.

APPENDIX B

TABLES

Table 1B

Correlation between the Number of Social Indications and Abortion Rate in 2017

	Number of social indications, latest year available	Abortion rate, 2018 or latest year available
Number of social indications, latest year available	1	
Abortion rate, 2018 or latest year available	-0.35775	1

Table 2B

One-Way ANOVA Results for TFR for All Post-Soviet Countries (Grouped by Region)

Groups	*Count*	*Sum*	*Average*	*Variance*		
South Central Asia	28	82.78043	2.956444	0.16627		
Caucasus	28	51.66139	1.84505	0.072093		
Baltics	26	38.80768	1.492603	0.029734		
Eastern Europe	27	38.66739	1.432125	0.036096		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	41.3475	3	13.7825	178.2742	4.6967E-41	2.691133
Within Groups	8.11762	105	0.077311			
Total	49.46512	108				

Table 3B

One-Way ANOVA Results for TFR for Baltic Countries

Groups	*Count*	*Sum*	*Average*	*Variance*
Estonia	22	33.14815	1.506734	0.027098
Lithuania	25	38.08165	1.523266	0.040516
Latvia	25	36.07844	1.443138	0.045033

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.088717	2	0.044359	1.167229	0.31729656	3.129644
Within Groups	2.622234	69	0.038003			
Total	2.710952	71				

Table 4B

One-Way ANOVA Results for TFR for Eastern European Countries

Groups	*Count*	*Sum*	*Average*	*Variance*
Belarus	17	25.204	1.482588	0.030409
Moldova	25	36.53335	1.461334	0.111299
Russia	21	30.1545	1.435929	0.048395
Ukraine	21	28.68075	1.36575	0.034872

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.156548	3	0.052183	0.865555	0.46255063	2.7187
Within Groups	4.823055	80	0.060288			
Total	4.979603	83				

Table 5B

One-Way ANOVA Results for TFR for South-Central Asian Countries

Groups	*Count*	*Sum*	*Average*	*Variance*		
Kazakhstan	23	54.9705	2.390022	0.119373		
Kyrgyzstan	22	64.572	2.935091	0.126072		
Tajikistan	17	67.62885	3.978168	0.335595		
Turkmenistan	17	53.275	3.133824	0.239761		
Uzbekistan	24	68.06246	2.835936	0.322955		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	25.86431	4	6.466076	28.92523	7.06906E-16	2.4645
Within Groups	21.90736	98	0.223545			
Total	47.77167	102				

Table 6B

One-Way ANOVA Results for TFR for Caucasus Countries

Groups	*Count*	*Sum*	*Average*	*Variance*		
Armenia	25	40.5155	1.62062	0.115607		
Azerbaijan	24	51.51843	2.146601	0.114866		
Georgia	23	40.632	1.766609	0.073991		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	3.582697	2	1.791348	17.54655	0.000000691	.129644
Within Groups	7.044291	69	0.102091			
Total	10.62699	71				

Table 7B

Correlation between WB Income Classification and TFR in 1991 and 2018

All in 1991	*WB*	*TFR*
WB	1	
TFR	-0.55062	1
All in 2018	*WB*	*TFR*
WB	1	
TFR	-0.37938	1

Table 8B

Correlation between TFR and Abortion Rate in 1990 and 2017

1990	*Abortion Rate*	*TFR*
Abortion Rate	1	
TFR	-0.37988	1
2017	*Abortion rate*	*TFR*
Abortion rate	1	
TFR	-0.04706	1

Table 9B

One-Way ANOVA Results for Proportion Married in Post-Soviet Countries

Groups	*Count*	*Sum*	*Average*	*Variance*
Caucasus	61	3881.742	63.63511	2.261317
Eastern Europe	61	3909.593	64.09169	13.87063
South-Central Asia	61	3986.006	65.34436	1.736689
Baltics	60	3453.186	57.5531	34.28583

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2187.34	3	729.1134	56.30343	1.44E-27	2.6424
Within Groups	3094.98	239	12.9497			
Total	5282.32	242				

Table 10B

Correlation between TFR and Proportion Married in 1990 and 2017

1990	*% married*	*Total fertility rate*
% married	1	
Total fertility rate	0.185699	1
2017	*% married*	*Total fertility rate*
% married	1	
Total fertility rate	0.501672	1

Table 11B

Correlation between Abortion Rate and Proportion Married in 1990 and 2017

1990	*% married*	*Abortion rate*
% married	1	
Abortion rate	0.397422	1
2017	% married	Abortion rate
% married	1	
Abortion rate	0.034223	1

Table 12B

Correlation between Abortion Rate and % of All Women of Reproductive Age Using Traditional Contraception in 1990 And 2017

1990	% all women using traditional contraception	Abortion rate
% all women using traditional contraception	1	
Abortion rate	0.223703	1
2017	% all women using traditional contraception	Abortion rate
% all women using traditional contraception	1	
Abortion rate	0.063592	1

Table 13B

Correlation between Abortion Rate and % of all Women Using Rhythm Method as Their Primary Contraceptive Method Including and Excluding Latvia

Latvia Included	% women using rhythm method as primary contraception	Abortion rate
% women using rhythm method as primary contraception	1	
Abortion rate	0.767843	1
Latvia excluded	% women using rhythm method as primary contraception	Abortion rate
% women using rhythm method as primary contraception	1	
Abortion rate	0.818427	1

Table 14B

Correlation between Abortion Rate and % of all Women Using Withdrawal as Their Primary Contraceptive Method Including and Excluding Latvia

Latvia included	% women primarily using withdrawal	Abortion rate
% women primarily using withdrawal	1	
Abortion rate	-0.1691	1
Latvia excluded	% women primarily using withdrawal	Abortion rate
% women primarily using withdrawal	1	
Abortion rate	-0.05258	1

Table 15B

Correlation between Abortion Rate and % af All Women of Reproductive Age Using Modern Contraception in 1990 and 2017

1990	% all women using modern contraception	Abortion rate
% all women using modern contraception	1	
Abortion rate	0.520104	1
2017	% married	Abortion rate
% married	1	
Abortion rate	-0.24749	1

Table 16B

Correlation between Abortion Rate and % of all Women Using Hormonal Oral Pills as Their Primary Contraceptive Method Including and Excluding Latvia

Latvia included	% of women using hormonal oral pill as primary contraception	Abortion rate
% women using hormonal oral pill as primary contraception	1	
Abortion rate	0.550522	1
Latvia excluded	% women using hormonal oral pill as primary contraception	Abortion rate
% women using hormonal oral pill as primary contraception	1	
Abortion rate	0.563852	1

Table 17B

Correlation between Abortion Rate and % of All Women Using Male Condoms as Their Primary Contraceptive Method Including and Excluding Latvia

Latvia included	% women using male condoms as primary contraception	Abortion rate
% women using male condoms as primary contraception	1	
Abortion rate	0.428717	1
Latvia excluded	% women using male condoms as primary contraception	Abortion rate
% women using male condoms as primary contraception	1	
Abortion rate	0.513125	1

Table 18B

Correlation between Abortion Rate and % of all Women Using IUDs as Their Primary Contraceptive Method Including and Excluding Latvia

Latvia included	% women using IUD as primary contraception	Abortion rate
% women using IUD as primary contraception	1	
Abortion rate	0.068378	1
Latvia excluded	% women using IUD as primary contraception	Abortion rate
% women using IUD as primary contraception	1	
Abortion rate	-0.05322	1

Table 19B

Correlation between Abortion Rate and % of All Women's Demand for Contraception Satisfied with Modern Methods in 1990 and 2017

1990	% Demand satisfied by modern contraception	Abortion rate
% Demand satisfied by modern contraception	1	
Abortion rate	0.41185	1
2017	% Demand satisfied by modern contraception	Abortion rate
% Demand satisfied by modern contraception	1	
Abortion rate	-0.25857	1

Table 20B

Geographic, Cultural, and Economic Characteristics of Post-Soviet Countries (UNPD, 2018; PI, 2012, WB, 2019).

Country name and ISO code	Geographic region	Geographic subregion	Most practiced religion	Income level
Armenia, ARM	Asia	Western Asia	Christianity (98.5%)	Upper middle
Azerbaijan, AZE	Asia	Western Asia	Islam (96.9%)	Upper middle
Belarus, BLR	Europe	Eastern Europe	Christianity (71.2%)	Upper middle
Estonia, EST	Europe	Northern Europe	Unaffiliated (59.6%)	High
Georgia, GEO	Asia	Western Asia	Christianity (88.5%)	Lower middle
Kazakhstan, KAZ	Asia	South-Central Asia	Islam (70.4%)	Upper middle
Kyrgyzstan, KGZ	Asia	South-Central Asia	Islam (88%)	Lower middle
Latvia, LVA	Europe	Northern Europe	Christianity (55.8%)	High

Lithuania, LTU	Europe	Northern Europe	Christianity (89.8%)	High
Moldova, MDA	Europe	Eastern Europe	Christianity (97.8%)	Lower middle
Russia, RUS	Europe	Eastern Europe	Christianity (73.3%)	Upper middle
Tajikistan, TJK	Asia	South-Central Asia	Islam (96.7%)	Low
Turkmenistan, TKM	Asia	South-Central Asia	Islam (93%)	Upper middle
Ukraine, UKR	Europe	Eastern Europe	Christianity (83.8%)	Lower middle
Uzbekistan, UZB	Asia	South-Central Asia	Islam (96.7%)	Lower middle

Table 21B

Correlation between % Married And % Religious People in Post-Soviet Countries in 2012

	% religious people	% married
% religious people	1	
% married	0.755057	1

Table 22B

Correlation between TFR and % of Religious People in Post-Soviet Countries in 2012

	% religious people	Total fertility rate
% religious people	1	
Total fertility rate	0.25636	1

Table 23B

Correlation between Abortion Rate and % of Religious People in Post-Soviet Countries in 2012

	% religious people	Abortion rate
% religious people	1	
Abortion rate	-0.24414	1

Table 24B

Results of Two-Sample T-Test Assuming Unequal Variances, Abortion Rates in Russia and Estonia, All Available Years

	Russia	*Estonia*
Mean	64.34365	44.2616
Variance	1453.709	521.0329
Observations	20	28
Hypothesized Mean Difference	0	
df	29	
t Stat	2.101781	
P(T<=t) one-tail	0.022187	
t Critical one-tail	1.699127	
P(T<=t) two-tail	0.044374	
t Critical two-tail	2.04523	

Table 25B

Results of Two-Sample T-Test Assuming Unequal Variances, Russia and Belarus, All Available Years

	Russia	Belarus
Mean	64.34364885	45.90935
Variance	1453.708643	733.3966
Observations	20	36
Hypothesized Mean Difference	0	
df	30	
t Stat	1.910956121	
P(T<=t) one-tail	0.032803733	
t Critical one-tail	1.697260887	
P(T<=t) two-tail	0.065607465	
t Critical two-tail	2.042272456	

Table 26B

Results of Two-Sample T-Test Assuming Unequal Variances in Total Abortions between All ABM Scenarios with "Abortion Learning Level 0" and "Abortion Learning Level 1," All Initial FA Spread Types, and All Switch Parameters Included

	Total abortions in "abortion learning level 0"	Total abortions in "abortion learning level 1"
Mean	685.3976667	320.1722667
Variance	77406.74423	3901.64297
Observations	82	82
Hypothesized Mean Difference	0	
df	89	
t Stat	11.59845725	
P(T<=t) one-tail	8.61124E-20	
t Critical one-tail	1.662155326	
P(T<=t) two-tail	1.72225E-19	
t Critical two-tail	1.9869787	

Table 27B

Results of Two-Sample T-Test Assuming Unequal Variances in Total Number of Abortions between All ABM Scenarios with "Mixed, Sex Ed Level 1" and "Mixed, Sex Ed Level 2" as Initial FA Spread Types, All Learning Types, and All Switch Parameters Included

	Total abortions in "mixed, sex ed level 1"	Total abortions in "mixed, sex ed level 2"
Mean	949.4035667	614.7628
Variance	220555.1431	98583.87067
Observations	80	80
Hypothesized Mean Difference	0	
df	138	
t Stat	5.298267615	
P(T<=t) one-tail	2.25607E-07	
t Critical one-tail	1.655970382	
P(T<=t) two-tail	4.51215E-07	
t Critical two-tail	1.977303542	

Table 28B

Results of Two-Sample T-Test Assuming Unequal Variances in Abortions Per Agent between All ABM Scenarios with "Mixed, Sex Ed Level 1" and "Mixed, Sex Ed Level 2" as Initial FA Spread Types, All Learning Types, and All Switch Parameters Included

	Average abortions per agent in "mixed, sex ed level 1"	Average abortions per agent in "mixed, sex ed level 2"
Mean	1.628757867	1.1784987
Variance	0.121535799	0.072046111
Observations	80	80
Hypothesized Mean Difference	0	
df	148	
t Stat	9.153246763	
P(T<=t) one-tail	2.06308E-16	
t Critical one-tail	1.655214506	
P(T<=t) two-tail	4.12615E-16	
t Critical two-tail	1.976122494	

Table 29B

Results of Two-Sample T-Test Assuming Unequal Variances in Abortions Per Agent between All ABM Scenarios with "Abortion Learning Level 0" and "Abortion Learning Level 1," All Initial FA Spread Types and All Switch Parameters Included

	Average abortions per agent in "abortion learning level 0"	Average abortions per agent in "abortion learning level 1"
Mean	1.657476467	1.8106921
Variance	0.042225905	0.132265679
Observations	82	82
Hypothesized Mean Difference	0	
df	128	
t Stat	-3.321412112	
P(T<=t) one-tail	0.000583751	
t Critical one-tail	1.656845226	
P(T<=t) two-tail	0.001167502	
t Critical two-tail	1.97867085	

Table 30B

Results of Two-Sample T-Test Assuming Unequal Variances in Average FA Level of the Population between All ABM Scenarios with "Abortion Learning Level 0" and "Abortion Learning Level 1," All Initial FA Spread Types and All Switch Parameters Included

	Average FA level in "abortion learning level 0"	Average FA level in "abortion learning level 1"
Mean	3.582553633	5.3957916
Variance	1.455416268	1.008240293
Observations	82	82
Hypothesized Mean Difference	0	
df	157	
t Stat	-10.46096255	
P(T<=t) one-tail	4.58437E-20	
t Critical one-tail	1.654617035	
P(T<=t) two-tail	9.16875E-20	
t Critical two-tail	1.975189163	

APPENDIX C

ABM CODE

```
globals [
  no-contraception-effectiveness
  withdrawal-effectiveness
  fertility-tracking-effectiveness
  condom-effectiveness
  pill-effectiveness
  iud-effectiveness
  cpatch-effectiveness
  injection-effectiveness
  implant-effectiveness
  plan-b-effectiveness
  ring-effectiveness
  abortion-rate
  abortion-number
  total-population
  abortionists
  teen-abortionists
  mean-age
  old-abortion-number
  new-abortion-number
]

turtles-own [
  old-age
  age
  fertility-awareness
  abortion-count        ; how many abortions an agent has had
  had-abortion?         ; true/false for abortion last tick
  contraceptive         ; current type of contraceptive the agent uses
  no-contraception?     ; not using any
  withdrawal?
  fertility-tracking?
  condom?
  pill?
  iud?
  cpatch?
  injection?
  implant?
  plan-b?
  ring?
]

to setup
  clear-all
```

```
  setup-nodes                    ;;; taken directly from "Virus on a network" by Uri
Wilensky (2008)
  setup-spatially-clustered-network    ;;; taken directly from "Virus on a network" by Uri
Wilensky (2008)
  setup-age-distribution
  if fertility-awareness-initial-type = "natural" [     ;;; one of setup options for fertility
spread, +1 every 10 years
    setup-fertility-awareness-natural ]
  if fertility-awareness-initial-type = "sex-ed" [      ;;; all ages start at the same fertility
awareness level chosen on the slider
    setup-fertility-awareness-sex-ed ]
  if fertility-awareness-initial-type = "social" [      ;;; all ages start with random fertility
awareness 1-5,
    setup-fertility-awareness-social ]
  if fertility-awareness-initial-type = "mixed" [
    setup-fertility-awareness-mixed ]
  if fertility-awareness-effect = "increased-choice" [  ;;; sets up the methods for the first
tick
    setup-increased-choice-initial-contraception ]
  set no-contraception-effectiveness 0.5
  set withdrawal-effectiveness 0.78
  set fertility-tracking-effectiveness 0.76
  set condom-effectiveness 0.82              ;;; user error is especially high for condoms
  set pill-effectiveness 0.91
  set iud-effectiveness 0.99
  set cpatch-effectiveness 0.93             ;;; new, changed from 0.99 for v.11 of the code
  set injection-effectiveness 0.97           ;;; new, changed from 0.99 for v.11 of the code
  set implant-effectiveness 0.99
  set plan-b-effectiveness 0.87
  set ring-effectiveness 0.93               ;;; new, changed from 0.99 for v.11 of the code
  set old-abortion-number 0
  reset-ticks
end


to setup-nodes                    ;;; taken directly from "Virus on a network" by Uri
Wilensky (2008) WITH MINOR CHANGES
  set-default-shape turtles "person"  ;;; changed circle to person
  create-turtles number-of-nodes
  [
    ; for visual reasons, we don't put any nodes *too* close to the edges
    setxy (random-xcor * 0.95) (random-ycor * 0.95)
  ]
end
```

```
to setup-spatially-clustered-network   ;;; taken directly from "Virus on a network" by Uri
Wilensky (2008)
  let num-links (average-node-degree * number-of-nodes) / 2
  while [count links < num-links ]
  [
    ask one-of turtles
    [
      let choice (min-one-of (other turtles with [not link-neighbor? myself])
                   [distance myself])
      if choice != nobody [ create-link-with choice ]
    ]
  ]
  ; make the network look a little prettier
  repeat 10
  [
    layout-spring turtles links 0.3 (world-width / (sqrt number-of-nodes)) 1
  ]
end

to setup-age-distribution                ;;; these numbers are test numbers for normal age
distribution. They are different in every country
  ;;; logic - 25% under 14, 8% 15-19, 8% 20-24, 6.25% for each 5 year interval 25-64 -->
50% of population is between 25 and 64. 9% the rest (elderly)
  ask turtles [
    if who <= (number-of-nodes * 0.25) [     ;;; in a normal population, about a quarter of
the population is younger than 14
      set old-age random 15 ]       ;;;; minnumber + (random (maxnumber - minnumber)) is
the format for ranom number in a range
    if ((number-of-nodes * 0.25) < who) and (who <= (number-of-nodes * 0.33)) [
      set old-age 15 + random 5 ]       ;;; need to set up a random number between 14 and
19, not just any number below 25
    if ((number-of-nodes * 0.33) < who) and (who <= (number-of-nodes * 0.41)) [
      set old-age 20 + random 5 ]       ;;; 8% of population is between 20-24
    if ((number-of-nodes * 0.41) < who) and (who <= (number-of-nodes * 0.4725)) [   ;;;
6.25% of population is between 25-29 (0.41 + 0.0625)
      set old-age 25 + random 5 ]
    if ((number-of-nodes * 0.4725) < who) and (who <= (number-of-nodes * 0.535)) [   ;;;
0.4725 + 0.0625
      set old-age 30 + random 5 ]
    if ((number-of-nodes * 0.535) < who) and (who <= (number-of-nodes * 0.5975)) [   ;;;
0.535 + 0.0625
      set old-age 35 + random 5 ]
    if ((number-of-nodes * 0.5975) < who) and (who <= (number-of-nodes * 0.66)) [    ;;;
0.5975 + 0.0625
      set old-age 40 + random 5 ]
```

```
    if ((number-of-nodes * 0.66) < who) and (who <= (number-of-nodes * 0.7225)) [    ;;;
0.66 + 0.0625
      set old-age 45 + random 5 ]
    if ((number-of-nodes * 0.7225) < who) and (who <= (number-of-nodes * 0.785)) [   ;;;
0.7225 + 0.0625
      set old-age 50 + random 5 ]
    if ((number-of-nodes * 0.785) < who) and (who <= (number-of-nodes * 0.8475)) [   ;;;
0.785 + 0.0625
      set old-age 55 + random 5 ]
    if ((number-of-nodes * 0.8475) < who) and (who <= (number-of-nodes * 0.91)) [    ;;;
0.8475 + 0.0625
      set old-age 60 + random 5 ]
    if who > (number-of-nodes * 0.91) [
      set old-age 65 + (random (age-expectancy - 65)) ]]  ;;; number of seniors, about 9% of
population
end

to setup-fertility-awareness-natural            ;;; this simulates a society with no sex ed,
fertility awareness increases with age
  ask turtles [
    set age old-age
    if age < 20 [
      set fertility-awareness 1
      set color 89.9]                    ;;; the colors make it visually easier to see who has each
type of fertility awareness
    if (age >= 20) and (age < 30) [
      set fertility-awareness 2
      set color 89]
    if (age >= 30) and (age < 40) [
      set fertility-awareness 3
      set color 87]
    if (age >= 40) and (age < 50) [
      set fertility-awareness 4
      set color 85]
    if age >= 50 [
      set fertility-awareness 5
      set color 83]]
end

to setup-fertility-awareness-sex-ed      ;;; this simulates a society with varied levels of sex
ed. All turtles start with the same level, since they were taught it formally in school.
  ask turtles [
    set age old-age
    set fertility-awareness sex-ed-quality
    if fertility-awareness = 1 [
```

```
      set color 89.9]
    if fertility-awareness = 2 [
      set color 89]
    if fertility-awareness = 3 [
      set color 87]
    if fertility-awareness = 4 [
      set color 85]
    if fertility-awareness = 5 [
      set color 83] ]
end

to setup-fertility-awareness-mixed     ;;; both natural and sex ed together
  ask turtles [
    set age old-age
    if age < 20 [
      set fertility-awareness 1
      set color 89.9]                    ;;; the colors make it visually easier to see who has each
type of fertility awareness
    if (age >= 20) and (age < 30) [
      set fertility-awareness 2
      set color 89]
    if (age >= 30) and (age < 40) [
      set fertility-awareness 3
      set color 87]
    if (age >= 40) and (age < 50) [
      set fertility-awareness 4
      set color 85]
    if age >= 50 [
      set fertility-awareness 5
      set color 83]]                    ;;; this ends the immediate setup of age distribution and
natural fertility awareness
  ask turtles [
    if sex-ed-quality = 1 [
      set fertility-awareness fertility-awareness ]  ;;; low quality sex ed (1) is abstinence
based and proven ineffective, so it does not add to natural fertility awareness
    if sex-ed-quality = 2 [
      set fertility-awareness fertility-awareness + 1 ]
    if sex-ed-quality = 3 [
      set fertility-awareness fertility-awareness + 2 ]
    if sex-ed-quality = 4 [
      set fertility-awareness fertility-awareness + 3 ]
    if sex-ed-quality = 5 [
      set fertility-awareness fertility-awareness + 4 ]]  ;;; this is the end of the "mix" part, as
it adds FA levels to existing natural levels
end
```

```
to setup-fertility-awareness-social
  ask turtles [
    set age old-age
    set fertility-awareness 1 + random 5     ;;; the only way to increase fertility awareness here is to communicate with the network, everyone starts at a random number
    if fertility-awareness = 1 [
      set color 89.9]
    if fertility-awareness = 2 [
      set color 89]
    if fertility-awareness = 3 [
      set color 87]
    if fertility-awareness = 4 [
      set color 85]
    if fertility-awareness = 5 [
      set color 83] ]
end

to setup-increased-choice-initial-contraception   ;;; methods for the first tick
  ask turtles [
    if fertility-awareness = 1 [
      set contraceptive 0 ]                    ;;; no FA = no contraception
    if fertility-awareness = 2 [
      set contraceptive random 3 ]             ;;; low FA = traditional methods 0, 1, 2
    if fertility-awareness = 3 [
      set contraceptive random 4 ]             ;;; mid FA = trads + condoms, 0, 1, 2, 3
    if fertility-awareness = 4 [
      set contraceptive random 5 ]             ;;; mid-high FA = trads + condoms + pills, 0, 1, 2, 3, 4
    if fertility-awareness = 5 [
      set contraceptive random 11 ] ]          ;;; high FA = access to all, still chance not to use contraception at all 1/11
  ask turtles [
   if contraceptive = 0 [set no-contraception? true]
   if contraceptive = 1 [set withdrawal? true]
   if contraceptive = 2 [set fertility-tracking? true]
   if contraceptive = 3 [set condom? true]
   if contraceptive = 4 [set pill? true]
   if contraceptive = 5 [set iud? true]
   if contraceptive = 6 [set cpatch? true]
   if contraceptive = 7 [set injection? true]
   if contraceptive = 8 [set implant? true]
   if contraceptive = 9 [set plan-b? true]
   if contraceptive = 10 [set ring? true] ]
end
```

```
to go
  if all? turtles [age >= 50] [
    output-print (word ""old-abortion-number " total abortions")
    stop ]     ;;; the model stops when there are no more turtles of reproductive age (15-49)
  ask turtles [ set had-abortion? false
    if fertility-awareness = 1 [
      set color 89.9]
    if fertility-awareness = 2 [
      set color 89]
    if fertility-awareness = 3 [
      set color 87]
    if fertility-awareness = 4 [
      set color 85]
    if fertility-awareness >= 5 [
      set color 83] ]
  ask turtles [ group-sex-patterns ]             ;;; how often each group has sex, on average
  ask turtles [ new-choice ]   ;;; every year some women switch their method of
contraception for any reason. Usually, this is between 30-40%
  ask turtles [ age-up ]
  calculate-total-abortions
  tick
end


to group-sex-patterns            ;;; not everyone has sex every tick. different age groups have
sex at different sexual intercourse frequencies in different populations.
    if ((age >= 15) and (age <= 49)) [  ;;; this makes the simulation a lot more real, as
many people don't have sex (use abstinence) as their preferred method of BC
      if age < 18 [
        have-sex-teen-sex-rate ]
      if ( age >= 18 ) and ( age < 30 ) [
        have-sex-young-adult-sex-rate ]
      if ( age >= 30 ) and ( age <= 49 ) [
        have-sex-adult-sex-rate ] ]
 ;;; this eliminates turtles who are too young or too old to have sex from doing anything
and gives them "had-abortion? false"
end

to have-sex-teen-sex-rate
  let teens count turtles with [(age >= 15) and (age < 18)]
  let teen-sexers n-of ( teens * teen-sex-rate ) turtles   ;;; specific number of agents below
the age of 18 from the population has sex each tick. The selection of agents is random
each tick.
```

```
    ifelse member? self teen-sexers [                    ;;; teen sex rate is highly variable. in
developed countries it is around 30-40%. in some Asian countries with strong cultural
norms, it is closer to 0-5%
      select-fertility-awareness-effect-sex ]              ;;; only the selected random agents
have sex
      [ avoid-pregnancy ]                             ;;; everyone else avoids pregnancy. This same
logic applies for the next two procedures
end

to have-sex-young-adult-sex-rate
  let young-adults count turtles with [( age >= 18 ) and ( age < 30 )]
  let young-adult-sexers n-of ( young-adults * young-adult-sex-rate ) turtles
    ifelse member? self young-adult-sexers [
      select-fertility-awareness-effect-sex ]
      [ avoid-pregnancy ]
end

to have-sex-adult-sex-rate
  let adults count turtles with [( age >= 30 ) and ( age <= 49 )]
  let adult-sexers n-of ( adults * adult-sex-rate ) turtles
    ifelse member? self adult-sexers [
      select-fertility-awareness-effect-sex ]
      [ avoid-pregnancy ]
end

to select-fertility-awareness-effect-sex              ;;; this tests two approaches to fertility
awareness coding
  if fertility-awareness-effect = "increased-choice" [ ;;; more options unlock for each level
of FA, so higher level = higher number of options and options are progressively more
safe
    have-sex-increased-choice ]                         ;;; at high FA, it's unrealistic to switch
contraception each tick, so need a more nested procedure
  if fertility-awareness-effect = "set-choice" [       ;;; the agent is locked into using the
contraceptive that unlocks at each level. so, those at level 5 only use IUDs, patches, etc
(long term contraceptives with high success rate)
    have-sex-set-choice ]
end

to have-sex-increased-choice  ;;; all signs are > because contraceptive effectiveness is
high (0.7-0.99), except for no-contraception
  if no-contraception? = true [
      ifelse random-float 1 > no-contraception-effectiveness [ get-pregnant-increased-
choice ] [ avoid-pregnancy ] ]
  if withdrawal? = true [
```

```
      ifelse random-float 1 > withdrawal-effectiveness [ get-pregnant-increased-choice ] [
avoid-pregnancy ] ]
    if fertility-tracking? = true [
      ifelse random-float 1 > fertility-tracking-effectiveness [ get-pregnant-increased-
choice ] [ avoid-pregnancy ] ]
    if condom? = true [
      ifelse random-float 1 > condom-effectiveness [ get-pregnant-increased-choice ] [
avoid-pregnancy ] ]
    if pill? = true [
      ifelse random-float 1 > pill-effectiveness [ get-pregnant-increased-choice ] [ avoid-
pregnancy ] ]
    if iud? = true [
      ifelse random-float 1 > iud-effectiveness [ get-pregnant-increased-choice ] [ avoid-
pregnancy ] ]
    if cpatch? = true [
      ifelse random-float 1 > cpatch-effectiveness [ get-pregnant-increased-choice ] [
avoid-pregnancy ] ]
    if injection? = true [
      ifelse random-float 1 > injection-effectiveness [ get-pregnant-increased-choice ] [
avoid-pregnancy ] ]
    if implant? = true [
      ifelse random-float 1 > implant-effectiveness [ get-pregnant-increased-choice ] [
avoid-pregnancy ] ]
    if plan-b? = true [
      ifelse random-float 1 > plan-b-effectiveness [ get-pregnant-increased-choice ] [ avoid-
pregnancy ] ]
    if ring? = true [
      ifelse random-float 1 > ring-effectiveness [ get-pregnant-increased-choice ] [ avoid-
pregnancy ] ]
end

to have-sex-set-choice                                   ;;; here each agent is locked into using the
new method at each level
    if fertility-awareness = 1 [                ;;; basically no fertility awareness, no
contraception, abortion is the only choice
      ifelse random-float 1 > 0.5 [    ;;; there's about 50% chance to get pregnant with no
contraception in a year
        get-pregnant-set-choice ] [ avoid-pregnancy ] ]
    if fertility-awareness = 2 [                 ;;; traditional contraception like withdrawal
      ifelse random-float 1 > withdrawal-effectiveness [
        get-pregnant-set-choice ] [ avoid-pregnancy ] ]
    if fertility-awareness = 3 [                 ;;; condom
      ifelse random-float 1 > condom-effectiveness [
        get-pregnant-set-choice ] [ avoid-pregnancy ] ]
    if fertility-awareness = 4 [                 ;;; oral BC
```

```
      ifelse random-float 1 > pill-effectiveness [
        get-pregnant-set-choice ] [ avoid-pregnancy ] ]
    if fertility-awareness >= 5 [                ;;; all other forms of contraception that are 99%
effective
      ifelse random-float 1 > iud-effectiveness [
        get-pregnant-set-choice ] [ avoid-pregnancy ] ]
end


to get-pregnant-set-choice                   ;;;
    set color 15                  ;;; red to easily see
    set abortion-count abortion-count + 1
    set had-abortion? true
    if learning = "abortion" [
      set fertility-awareness fertility-awareness + abortion-effect-fa ]
    if learning = "none" [                                         ;;; these agents don't learn from
abortion, so they keep their level of fertility awareness
      set fertility-awareness fertility-awareness ]
    if learning = "social" [
      if count link-neighbors > 0 [
        if any? link-neighbors with [ had-abortion? = false ] [
          set fertility-awareness [ fertility-awareness ] of one-of link-neighbors with [ had-
abortion? = false ] ] ] ]  ;;; all agents want to avoid pregnancy, so they learn from
neighbors who avoided it last tick only.
end


to get-pregnant-increased-choice
    set color 15                  ;;; red to easily see
    set abortion-count abortion-count + 1
    set had-abortion? true
    if learning = "abortion" [
      set fertility-awareness fertility-awareness + abortion-effect-fa
      if fertility-awareness = 1 [
        set contraceptive 0 ]
      if fertility-awareness = 2 [
        set contraceptive random 3 ]
      if fertility-awareness = 3 [
        set contraceptive random 4 ]
      if fertility-awareness = 4 [
        set contraceptive random 5 ]
      if fertility-awareness >= 5 [
        set contraceptive random 11 ] ;;; 11 because 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
      if contraceptive = 0 [set no-contraception? true]
      if contraceptive = 1 [set withdrawal? true]
```

```
      if contraceptive = 2 [set fertility-tracking? true]
      if contraceptive = 3 [set condom? true]
      if contraceptive = 4 [set pill? true]
      if contraceptive = 5 [set iud? true]
      if contraceptive = 6 [set cpatch? true]
      if contraceptive = 7 [set injection? true]
      if contraceptive = 8 [set implant? true]
      if contraceptive = 9 [set plan-b? true]
      if contraceptive = 10 [set ring? true]  ]
   if learning = "none" [              ;;; these agents don't learn from abortion, so they keep
their level of fertility awareness, but switch to a different contraceptive method
      reset-old-contraception ]
   if learning = "social" [
     if count link-neighbors > 0 [
       if any? link-neighbors with [ had-abortion? = false ] [
         set fertility-awareness [ fertility-awareness ] of one-of link-neighbors with [ had-
abortion? = false ] ] ] ]   ;;; all agents want to avoid pregnancy, so they learn from
neighbors who avoided it last tick only.
end

to reset-old-contraception ;;; if old method failed (abortion last tick), the agent will
randomly choose a new method based on their FA.
     set no-contraception? false
     set withdrawal? false
     set fertility-tracking? false
     set condom? false
     set pill? false
     set iud? false
     set cpatch? false
     set injection? false
     set implant? false
     set plan-b? false
     set ring? false
     pick-new-contraception         ;;; this means that if an agent avoided pregnancy, they
stick to the same method
end


to pick-new-contraception                          ;;; new options unlock at each level
   if fertility-awareness = 1 [
     set contraceptive 0 ]
   if fertility-awareness = 2 [
     set contraceptive random 3 ]
   if fertility-awareness = 3 [
     set contraceptive random 4 ]
```

```
    if fertility-awareness = 4 [
      set contraceptive random 5 ]
    if fertility-awareness >= 5 [
      set contraceptive random 11 ] ;;; 11 because 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
    if contraceptive = 0 [set no-contraception? true]
  if contraceptive = 1 [set withdrawal? true]
  if contraceptive = 2 [set fertility-tracking? true]
  if contraceptive = 3 [set condom? true]
  if contraceptive = 4 [set pill? true]
  if contraceptive = 5 [set iud? true]
  if contraceptive = 6 [set cpatch? true]
  if contraceptive = 7 [set injection? true]
  if contraceptive = 8 [set implant? true]
  if contraceptive = 9 [set plan-b? true]
  if contraceptive = 10 [set ring? true]
end

to avoid-pregnancy
  set had-abortion? false
    if fertility-awareness = 1 [
      set color 89.9 ]
    if fertility-awareness = 2 [
      set color 89 ]
    if fertility-awareness = 3 [
      set color 87 ]
    if fertility-awareness = 4 [
      set color 85 ]
    if fertility-awareness = 5 [
      set color 83 ]
end

to age-up
    set age age + 1 ; simulates aging of 1 year per tick
end

to new-choice
  if random-float 1 < chance-to-switch [                  ;;; 33-40% of people switch their
contraceptive method every year
    if count link-neighbors > 0 ; does the agent have connections?
    [
      set fertility-awareness [ fertility-awareness ] of one-of link-neighbors ]
  ]

to calculate-total-abortions
```

```
  set new-abortion-number (old-abortion-number + count turtles with [had-abortion? =
true])
  set old-abortion-number new-abortion-number
end
```