

**Identifying Opportunities to Address Social Determinants of Health and Antibiotic Misuse
in a Federally Qualified Health Center**

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Abstract

A federally qualified health center in the southwest United States serves low-income, uninsured communities. By provider reports, unprescribed antibiotic use is common in this clinic's population, promoting development of antibiotic resistant bacteria. Antibiotics are widely available in Mexico and may be sold illegally in the United States without a prescription. This project's purpose is to identify social risks and opportunities for antibiotic education. A telephone survey was administered to patients at least 18 years of age. The 32-item survey included a demographic questionnaire created for this project, the PRAPARE social determinants of health questionnaire, and the Eurobarometer antimicrobial resistance questionnaire. Any social risks identified were forwarded to clinic staff for referral. The survey was completed in English or Spanish, per the participant's preference. A total of 20 surveys were completed. Low education level and unemployment were the most common social risks identified. Spanish language, housing and food insecurity, and difficulty meeting basic needs were associated with overall higher social risks. An antibiotic knowledge gap was identified, and self-medication with antibiotics was confirmed as a behavior within the population. Although no determinants for antibiotic misuse were identified, all participants indicated preference for provider-based education. This FQHC has an opportunity to develop a provider-based educational intervention. The length of the survey and the telephone format, required due to COVID-19 restrictions, were significant limitations, impacting recruitment. Further research is needed to determine the most effective way of delivering education. The clinic is continuing to administer the PRAPARE survey, expanding data on social risks.

Keywords: Antibiotic resistance, self-medication, social determinants of health, Hispanic immigrant, educational intervention

Identifying Opportunities to Address Social Determinants of Health and Antibiotic Misuse in a Federally Qualified Health Center

Antibiotic resistance is one of the most important threats to public health today, requiring drastic changes in the way antibiotics are being used. Little attention, however, is placed on self-medication with antibiotics by patients who are able to obtain them without a prescription. This behavior occurs in diverse geographical and cultural settings, requiring diverse, patient-centered methods to thoroughly attend to this problem (Catalan-Matamoros et al., 2019; Tamhankar et al., 2018). Commonly identified factors associated with this practice include access to unprescribed antibiotics, previous experiences with antibiotics, barriers in access to healthcare, and low levels of education (Aponte-Gonzalez et al., 2019; Machowska & Lundborg, 2018; Torres et al., 2018; Zanichelli et al., 2018).

Federally qualified health centers (FQHC's) bridge a gap for the low-income and uninsured individuals who experience the greatest barriers to access to health care. Part of bridging this gap involves addressing social determinants of health (SDOH) among each clinic's unique patient population (Hensley et al., 2017). SDOH includes education level, employment, isolation, immigration, financial strain, housing insecurity, food insecurity, transportation, exposure to violence, and stress (Hensley et al., 2017). SDOH correlates with high rates of acute and chronic health conditions, and they are also associated with low health literacy and possibly antibiotic misuse (Hensley et al., 2017). The purpose of this manuscript is to review the results of a needs assessment project with the goal of identifying opportunities to address antibiotic knowledge gaps, antibiotic misuse, and SDOH in a FQHC.

Background and Significance

Problem Statement

As more strains of bacteria develop resistance to antimicrobials, demand increases for new generation drugs to combat multi-drug resistant organisms (Roca et al., 2015; Tangcharoensathien et al., 2018). Ultimately, pharmaceutical innovation may not keep up with this, leading to a public health crisis with unprecedented mortality from previously treatable illnesses (Centers for Disease Control and Prevention [CDC], 2019b). Besides direct effects on the treatment of infectious disease, many other facets of medical progress depend on antimicrobial technology, including organ transplantation, other surgical procedures, and the treatment of cancer and chronic disease (CDC, 2019b). This is a supply and demand issue, where antibiotic stewardship is a growing movement to address practices that increase the prevalence of resistant microbes, but mainly addresses the supply side of the problem with a focus on rational prescribing and dispensing (CDC, 2019b; Machowska & Lundborg, 2018; Tangcharoensathien et al., 2018). Epidemiological data on this topic in the United States is similarly centered on inappropriate prescribing practices and disease transmission, while there is substantial data in geographically varied populations around the world revealing the prevalence of self-medication with antibiotics (Aponte-Gonzalez et al., 2019; European Commission, 2016; Sanchez, 2014; Torres et al., 2018; Zanichelli et al., 2018).

Purpose and Rationale

Multidisciplinary and multifaceted approaches are needed to address this serious global public health threat (Burstein et al., 2019; Machowska & Lundborg, 2018). Improving public knowledge about the principles of antimicrobial stewardship stands to reduce rates of self-medication, and to increase trust in patient-provider relationships when providers are adhering to the same principles (Machowska & Lundborg, 2018; Monnier et al., 2018). Cultural and ethnic differences impact knowledge, access, and expectations regarding antimicrobial therapy (Francois Watkins et al., 2015). Similar to interventions targeting prescribing and dispensing of

antibiotics, methods to address public beliefs and behaviors must be tailored to the culture, setting, and population (King et al., 2016; Tamhankar et al., 2018). The purpose of this review is to increase understanding of the scope and determinants of antibiotic self-medication in general, as well as identifying potential methods to address this issue in the Hispanic immigrant patient population of a federally qualified health center (FQHC) in a major metropolitan city.

Epidemiological Data

There is an abundance of literature on the topic of antimicrobial resistance and antibiotic stewardship measures. Internationally, government agencies, public health organizations, and health care institutes agree on the gravity of the problem and the need for action on multiple levels (CDC, 2018; European Commission, 2016; Roca et al., 2015). In the United States, antibiotic stewardship programs are becoming prevalent in public health, outpatient, hospital, and long-term care settings (CDC, 2019b). In 2019, the CDC provided millions of dollars in funding to state and local health departments to address antibiotic resistance (2019a). This funding is primarily targeted at detection and monitoring of antimicrobial resistant infections and healthcare-based stewardship programs (CDC, 2019a).

Interestingly, both Mexico and Brazil passed legislation in 2010 to limit the sale of antibiotics to only by prescription (Dreser, 2016; Santa-Ana-Tellez et al., 2013). These measures were effective to some extent at reducing rates of antibiotic usage (Santa-Ana-Tellez et al., 2013). However, by 2014 in Mexico, 13,000 community pharmacies had added a clinic office with a physician to prescribe antibiotics as a way to mitigate the economic impact of decreased sales (Dreser, 2016). In these pharmacy-based clinics, antibiotic prescription rates are as high as 80% for uncomplicated upper respiratory infections (Dreser, 2016). Also, anecdotal reports

indicate that many community pharmacies are not compliant with the new regulations, and individuals are still able to purchase antibiotics easily in Mexico without a prescription.

The practices of illegal sales and self-medication with antibiotics are likely to continue until the demand side of the equation is adequately addressed. In recent years, many studies and reviews have been completed in various regions to evaluate the scope and determinants of self-medication. Commonly identified factors associated with this practice include barriers in access to healthcare services, low education, access to unprescribed antibiotics, and previous experiences with antibiotics (Aponte-Gonzalez et al., 2019; Machowska & Lundborg, 2018; Torres et al., 2018; Zanichelli et al., 2018). Most frequently in this situation, antibiotics are used to treat colds, flu, sore throat, and fever, and are likely not the appropriate choice of medication, much less in the correct dosage, frequency, or duration (European Commission, 2016; Torres et al., 2018).

Hispanic Immigrant Population

Migrants in general are more likely to distrust the local healthcare system and experience actual or perceived barriers to healthcare services (Francois Watkins et al., 2015; Lindenmeyer et al., 2016; Sanchez, 2014). Hispanic health care consumers, compared to the general population, have been found to have lower knowledge of antibiotics, more access to unprescribed medication, and higher expectations to receive antibiotic prescriptions from primary care providers (Francois Watkins et al., 2015). High rates of undocumented immigration status within this group leads to heavy reliance on FQHC's that provide low-cost healthcare services for the uninsured. In this setting, there are opportunities to target the unique antibiotic beliefs and behaviors that are prevalent in the community.

Clinic-Based Education

Recent literature promotes multifaceted interventions, with emphasis on increasing public knowledge at all levels: healthcare, community, and individual (Burstein et al., 2019; Machowska & Lundborg, 2018; Roca et al., 2015; Tamhankar et al., 2019; Tangcharoensathien et al., 2018). Information provided to the public must be specific and solution-based, identifying the consequences of the status quo, as well as instructions for action (Catalan-Matamoros et al., 2019). Culturally sensitive, targeted education shows the most promise for effectively increasing antibiotic knowledge in specific populations (King et al., 2016). The CDC has developed patient education materials that have been effective and easy to implement in healthcare settings, with some resources available in Spanish language (Burstein et al., 2019; CDC, 2019b).

Public Health Campaigns

Mass media campaigns to educate the public on appropriate antibiotic use have been limited and largely ineffective (Catalan-Matamoros et al., 2019; King et al., 2016). Generally, these efforts address the topic superficially, without offering solutions in which individuals can participate (Catalan-Matamoros et al., 2019). Discussion of antibiotic resistance in the media often focuses on transmission of drug resistant organisms due to poor hospital protocol, or unclean care facilities, without addressing inappropriate antibiotic use (Catalan-Matamoros et al., 2019). Furthermore, mass education is difficult to tailor to unique communities with cultural and language barriers (Burstein et al., 2019; Catalan-Matamoros et al., 2019).

Self-Medication Rates

Modifiable determinants of self-medication with antibiotics differ by culture, language, social class, geographical location, and other factors (Aponte-Gonzalez et al., 2019; Francois Watkins et al., 2015; Machowska & Lundborg, 2018; Torres et al., 2018; Zanichelli et al., 2018). Population-specific education can target the primary drivers of inappropriate medication use

within the community, increasing the public level of knowledge and improving individual practices (Burstein et al., 2019; King et al., 2016; Tamhankar et al., 2019). Ideally, the future will see the public viewing self-medication with antibiotics as an unacceptable practice. For example, as public perception of smoking changed, rates of tobacco use have decreased consistently, from 40-50% in 1965 to under 20% in 2015 (CDC, 2020). This kind of change could be possible for antibiotic misuse as well.

Facilitating access to care and reducing the cost of care in regions where those are key factors is essential to improving antibiotic use (Lindemeyer et al., 2016; Torres et al., 2018). Just as important, is increasing the level of trust the community places in the healthcare system (Lindemeyer et al., 2016; Torres et al., 2018). Targeted patient education can improve the patient-provider relationship while developing public knowledge of antibiotics (Burstein et al., 2019; Catalan-Matamoros et al., 2019; King et al., 2016; Tamhankar et al., 2019). This intervention shows potential to address the antibiotic resistance crisis from a previously neglected dimension, and reduce self-medication rates (Burstein et al., 2019; Catalan-Matamoros et al., 2019; King et al., 2016; Tamhankar et al., 2019).

Internal Evidence

In a small FQHC in the southwestern United States, there is currently no hard data available regarding this issue. Soft data consists of community member and provider reports, indicating that self-medication with antibiotics is a significant problem in their predominantly uninsured, Hispanic immigrant patient population. For example, patients are frequently seen for an upper respiratory infection and report having taken unspecified doses of unprescribed antibiotics prior to the visit, only seeking care because they have not yet gotten better.

PICO Question

While interventions targeting supply are in progress, demand is equally important. There is an urgent need to change the overall culture of global society so that irrational use is as unacceptable as smoking in the view of the majority of the population. This will take time and a community-based, multifaceted approach. This inquiry has led to the clinically relevant PICOT question, “among Hispanic immigrant patients, how does clinic-based education on appropriate antibiotic use impact the probability of future self-medication?”

Literature Review

Search Strategy

In order to address this PICO question, a thorough search of the literature was conducted including five databases: CINAHL, Cochrane Library, Proquest, PubMed, and SciELO. These five were selected due to their relevance to the health care field and to include Spanish language journals. Boolean operators and varied combinations of terms were used to broaden or narrow the search as needed. Keywords included: *Hispanic American, Latin American, immigrant, OR migrant; antibiotic, antibacterial, OR antimicrobial; self-medication, unprescribed, OR misuse; and education, counseling, coaching, teaching, guidance, OR instruction.*

The initial search on the CINAHL Database yielded 342 results. The search was then limited to articles published in 2014 or later, yielding zero results. Some keywords were removed to expand the search, leaving *self-medication AND Latin American, Mexican American, Hispanic, OR immigrant.* The yield was then 26 articles, these were reviewed, and ten results were saved for further appraisal.

Cochrane Library was searched with an initial yield of zero results. Keywords were modified until the search yielded 13 results. This search removed the population keywords (*Latin*

American, Hispanic American, immigrant, OR migrant). All 13 results were reviewed, and two articles were saved for further appraisal.

The initial Proquest search yielded 2,304 results. This was limited by the year of publication within the past five years, which narrowed the results to 712. Further reduction was accomplished by limiting results to journal articles only, leading to 74 results. These were reviewed and 4 were saved for further appraisal.

PubMed was searched with an initial yield of 10 results, all of which were published more than five years ago. Six relevant articles were saved for further review despite the date of publication. The “cited by” feature was used to identify more results citing these 10 articles, leading to 96 additional results. All of these were reviewed for relevancy and an additional 21 articles were saved for further appraisal.

An initial search of the SciELO Database yielded zero results. The search was expanded by using only the keywords *antibiotic, antimicrobial, OR antibacterial*, leading to over 8,000 results. This was limited to year of publication within five years, and Spanish or English language. This yielded 138 results which were reviewed for relevance, and 7 articles were saved for further appraisal.

Of the 71 saved articles, 10 were selected for inclusion in the final evaluation table based on relevance to the PICO question and level of evidence. The 10 articles include six systematic reviews, one cross-sectional survey study, and three qualitative studies (see Appendix A, Tables A1 and A2).

Critical Appraisal and Synthesis of Evidence

Due to the focus on individual beliefs and behaviors in a cultural context, this search yielded only qualitative and descriptive evidence. This includes both individual studies and

several systematic reviews (see Appendix A, Tables A1 and A2). Some of the systematic reviews evaluated the effectiveness of educational interventions, but most of the studies used surveys to evaluate antimicrobial knowledge and determinants of behavior (see Appendix A, Tables A1 and A2). Designs include cross-sectional survey studies, focus groups, semi-structured interviews, controlled before and after studies, cohort studies, interrupted time series studies, non-controlled before and after studies, non-randomized trials, and randomized control trials (see Appendix A, Tables A1 and A2). The heterogeneity of study designs, variables, settings, and sampling complicate data evaluation. Of the six included in this evaluation, only one systematic review identified studies with enough homogeneity that they could be used for a meta-analysis (see Appendix A, Tables A1 and A2).

The majority of these studies investigated various determinants of self-medication with antibiotics or misuse of antibiotics. The most common determinants include low socioeconomic status, successful treatment with antibiotics in the past, and lack of access to healthcare services. Significant factors that were identified less frequently include low baseline antibiotic knowledge, immigrant status, access to unprescribed antibiotics, and distrust of the healthcare system (see Appendix A, Table A3). One study identified that low socioeconomic status was not associated with antibiotic misuse, while low baseline antibiotic knowledge was a determinant (Jamhour et al., 2017). This was a cross-sectional survey study completed in Lebanon, and therefore a lower level of evidence than the systematic reviews indicating that low socioeconomic status is a significant determinant of antibiotic behavior (see Appendix A, Table A3).

Recent research on this topic has been mostly focused on identifying determinants of behavior and perceptions of the problem among the general public, while very few studies have looked at interventions. Only two articles included in this literature review evaluated the

effectiveness of educational interventions (Burstein et al., 2019; King et al., 2016). Both of these systematic reviews found that clinic-based education increased antibiotic knowledge, while they offer conflicting findings on mass media campaigns (see Appendix A, Table, A3). Burstein et al. (2019) found that both methods effectively increased antibiotic knowledge, without offering descriptions of the interventions that were used. King et al. (2016), however, directly compared mass media campaigns and clinic-based education, finding that the latter is more effective. One qualitative study, evaluating recent immigrant perceptions of antibiotic use in the United Kingdom, suggested that interventions addressing provider communication about antibiotics might be an effective way to address this problem in the immigrant population (Lindenmeyer et al., 2016).

Conclusion

This evidence confirms the susceptibility of Hispanic immigrants in the United States to self-medication with antibiotics. This population is likely to have lower socioeconomic status and more difficulty accessing or affording healthcare services. There is also a deficit of trust in the healthcare system that stems from cultural differences, negative experiences, and fear related to undocumented immigration status. These unique factors promote the need for sensitive, culturally tailored interventions to address antibiotic misuse. The lack of conclusive evidence and internal evidence points to the need to gather more data specific to this population and setting.

Mass media campaigns have successfully changed antibiotic behaviors in some demographics, but not in others, while clinic-based interventions are more promising (see Appendix A, Table A3). This is likely because media-based interventions cannot be tailored to specific sub-populations which are more likely to self-medicate with antibiotics. For the best

outcomes, education must be tailored to each unique patient population, accounting for cultural beliefs, socioeconomic issues, SDOH, and linguistic differences. Ideally, internal data would direct the planning of interventions at the clinic level.

Theoretical Framework

The Health Communication Theory provides guidance for communicating health information between healthcare workers and the general public as well as among different sectors of the healthcare system (Schiavo, 2013). It applies to the promotion of health behaviors, culturally competent care, and policy development (Schiavo, 2013). This is a useful model for patient education on a variety of topics, especially when cultural sensitivity plays such a large role. Significant importance is placed on the intended audience and an audience-focused approach (Schiavo, 2013). There are two main models contained within this theory, the Health Communication Environment and the Health Communication Cycle (Schiavo, 2013).

The Health Communication Environment offers context to relate a recommended health behavior, community or group beliefs, and social and political environments (see Appendix B, Figure B1). These factors must be accounted for when developing methods to effectively pass health information from one group to another with the goal of changing health behaviors. The Health Communication Cycle offers a process for developing, implementing, and evaluating education techniques (see Appendix B, Figure B2). The cyclical nature of this model lends itself to a multistage process, consisting of information gathering, intervention, and ongoing evaluation. As a whole, this theory contributed to the structure of this project, which is based on a thorough evaluation of the environment and assessment of the needs of the population, followed by future cycles of intervention development, implementation, and evaluation.

Implementation Framework

The Health Communication Cycle parallels the Plan-Do-Study-Act (PDSA) Cycle implementation framework (see Appendix B, Figure B3). Ongoing evaluation and modification of interventions is key to both of these processes (Institute for Healthcare Improvement [IHI], 2020; Schiavo, 2013). Both promote a multistage process that is essential for this problem, in order to obtain internal data and develop an intervention that is culturally appropriate and population specific. The PDSA Cycle provides for a flexible, dynamic process to address a problem with repeated cycles of planning, intervention, and evaluation (IHI, 2020).

This project was the first of several cycles within this framework, consisting of a survey of the FQHC's patient population. The goal of this stage was to obtain internal data regarding SDOH, antibiotic behaviors, knowledge gaps, determinants of self-medication, and preferred intervention methods. Future cycles to be completed as separate projects will ideally consist of the intervention development, implementation, and evaluation based on the results of this survey.

Methods

Ethical Considerations

Institutional Review Board (IRB) approval was received through Arizona State University for a telephone-based survey (see Appendix C). Complete anonymity was maintained for project purposes, including data collection and analysis. Survey answers were recorded on paper copies of the survey without any identifiers. The social determinants of health portion of the survey was documented in the clinic's electronic health record (EHR) so that clinic staff may address any social needs that are identified through the survey. Each participant was made aware of this, and verbal consent was obtained before survey responses are documented in the EHR. A recruitment script and informed consent were read to each participant in English or Spanish, based on their preference (see Appendix D). Each individual contacted was assured that they

have the right to choose whether or not to participate, and to skip any questions or withdraw from participation at any time, without any impact on their care or treatment at the clinic.

Participants were required to be 18 years of age or older to participate. A list of patients, which included only the medical record number and telephone number, was provided by clinic staff for the purpose of recruitment for this project. This list was shredded after completion of data collection.

Objectives

The primary objective of this project was to gather data that can be used to empower this FQHC to better address the social and educational needs of their patient population. Educational gaps were identified, and recommendations made to address them. Staff and provider awareness of cultural and social determinants of self-medication with antibiotics will promote more effective communication with patients. This will improve health literacy with regard to antibiotic use and medication compliance in the population. Increased awareness of the SDOH that directly impact the population will allow providers and staff to address these issues in real-time during everyday interactions with patients. The goal of the FQHC is to bridge gaps in healthcare for the underserved. These gaps are closely tied to the SDOH impacting the community, so this project promotes the objectives that are central to the mission of the clinic.

Population and Setting

This project was comprised of a telephone survey administered to patients of an FQHC in the southwestern United States offering primary care for all ages. This facility serves predominantly low-income and uninsured patients. The majority of the patient population is Hispanic immigrants who are primarily Spanish-speaking. Participants were required to be 18

years of age or older, established patients of the FQHC, and able to speak and understand either English or Spanish.

Instruments

Three separate questionnaires made up the survey. The first was PRAPARE (Protocol for Responding to and Assessing Patients' Assets, Risks, and Experiences), a social determinants of health questionnaire that was developed by the National Association of Community Health Centers (NACHC, 2019) (see Appendix E). This tool is widely used among FQHC's to evaluate and address social needs in underserved populations. It includes 15 questions regarding money and resources, social and emotional health, refugee status, and safety. This questionnaire has been evaluated for validity and reliability by the NACHC (2019), with a Greatest Lower Bound (GLB) of 0.935 and Cronbach's Alpha of 0.86. PRAPARE has consistently demonstrated a higher risk level among patients with poorly controlled diabetes and hypertension (NACHC, 2019).

The second questionnaire requested demographic data (see Appendix E). This included the participant's age, gender, race and ethnicity, country of origin, length of time lived in the United States, and general familiarity with antibiotics. If the participant stated that they are familiar with antibiotics, they were asked to give a definition or example.

The final portion included 12 questions from the Eurobarometer 85.1 "Antimicrobial Resistance" questionnaire (see Appendix E). This survey has been widely used in the European Union and throughout the world to assess public knowledge and behaviors with regard to appropriate antibiotic use. The questions assessed antibiotic knowledge and behaviors as well as past education received and its impact on behavior. Finally, this questionnaire requested input on

preferred ways to receive future education on appropriate antibiotic use and to address antimicrobial resistance.

Data Collection

Patients were called by telephone and read a recruitment script and informed consent in English or Spanish, depending on their preference (see Appendix D). If they agreed to participate, all three questionnaires were read to them in their language of preference and their responses were recorded on paper copies of the survey without any identifiers. This process took approximately 15 minutes to complete. After completion of the survey, and if the participant consented, only the social determinants of health questionnaire was immediately documented in the medical record so that the clinic staff could place medical or social service referrals if indicated. All data collected for data analysis in relation to this project remained completely anonymous. Data was collected for six weeks. Seventy-one potential participants were contacted, and a total of 20 surveys were completed.

Data Analysis Plan

Intellectus software was utilized for data analysis. This included evaluation of population demographics, antibiotic knowledge, determinants of self-medication with antibiotics, social needs, and referrals made. Behavioral determinants of antibiotic misuse, current knowledge gaps, and preferred learning methods were evaluated to provide population-specific recommendations for future educational interventions. Trends in SDOH and referrals were assessed to identify common needs and gaps in resources currently provided to patients at the clinic.

Funding

Primary funding for this project consisted of in-kind support from the project director and clinic staff, who donated their time and office space. The Intellectus software subscription was

provided by Arizona State University. Actual expenses related to this project were minimal and included office supplies, such as paper and ink for printing surveys and other documents. No external sources of funding were necessary.

Results

Demographic Data

A convenience sample of 20 individuals consented to and completed the telephone survey. The average age of the sample was 52 years ($SD = 12.53$), with a range of 26 to 68 years (see Appendix F, Table F1). The majority of participants were female (75%) and chose to conduct the survey in Spanish (85%). Almost all identified as Hispanic (95%), and the only other race/ethnicity represented was Native American (5%). While most of the participants reported their country of origin as Mexico (90%), all had resided in the United States for greater than 10 years at the time of the survey.

Social Determinants of Health

In the context of the PRAPARE questionnaire, a positive response refers to an answer that indicates a potential social risk. The most frequent positive responses were found for education and employment (see Appendix F, Table F2). Nearly all of the participants reported education less than or equivalent to a high school diploma (90%), and half were unemployed due to disability, illness, or caregiver status (50%). Three participants worked full time (15%) and five worked part time (25%), with the remaining two currently seeking employment (10%). Housing and food insecurity each affected about one third of the sample (35%). A smaller portion reported trouble meeting their basic needs, including food, medicine or healthcare, clothing, or utilities (25%). About one third of participants reported a high level of social interactions (greater than five per week; 35%). More than half described their stress level as low

or none (65%). Three participants were somewhat stressed (15%), and four experienced quite a bit of stress (20%). No participants reported the highest level of stress. The majority of participants declined any referrals (70%), three received referrals for community resources, one for a provider visit, one for behavioral health counseling, and one for both community resources and behavioral health counseling.

There were four questions in the PRAPARE survey that had zero positive responses, lacking any variation throughout the sample. All of the participants denied having any trouble with transportation that interfered with daily life. All denied any concerns regarding intimate partner violence within the past year. None of the participants reported refugee status, and none had been recently incarcerated.

The SDOH portion of the survey was scored based on the PRAPARE Risk Tally Scoring Methodology (NACHC, 2016). The highest possible score was 24. A higher score indicates a higher cumulative risk level associated with SDOH (NACHC, 2016). Participants averaged a score of 7.15 ($SD = 1.90$), with a range of four to twelve. Several variables were found to correlate with an overall higher SDOH score. Point biserial correlation testing revealed that Spanish as a preferred language was associated with a higher SDOH score ($r_{pb} = 0.49$, $p = .029$, 95% CI [0.06, 0.77]). Other factors that correlated with a higher score included housing insecurity ($r_{pb} = 0.50$, $p = .025$, 95% CI [0.07, 0.77]), food insecurity ($r_{pb} = -0.70$, $p < .001$, 95% CI [-0.87, -0.38]), and difficulty meeting basic needs ($r_{pb} = 0.58$, $p = .008$, 95% CI [0.18, 0.81]). There was no statistically significant effect on the SDOH score associated with housing status, education level, social support, and stress level.

Antibiotic Knowledge and Behaviors

Almost all of the participants stated that they were familiar with antibiotics (95%), while just over half were able to give an accurate definition or example (60%) (see Appendix F, Table F3). Several participants gave inaccurate definitions, most commonly stating that antibiotics are medications used to treat pain. There were four true or false questions and one multiple choice question regarding appropriate use of antibiotics. A majority answered true to the statement that antibiotics kill viruses (65%) and about half thought that antibiotics could effectively treat cold and flu (55%). Most participants agreed that unnecessary use can make antibiotics ineffective (65%), and roughly half believed that antibiotics can have side effects (55%). The majority of the participants stated they would take antibiotics for the full duration prescribed (75%). An overall antibiotic knowledge score was calculated based these five questions, with one point for each correct answer. With a maximum score of five, the average was 2.65 ($SD = 1.39$), and scores ranged from zero to five. There were no statistically significant correlations between the antibiotic knowledge score and any other variables.

Half of the sample reported antibiotic use in the past year (50%). One participant had taken unprescribed antibiotics which were obtained from a pharmacy without a prescription. The geographical location and attributes of the pharmacy were not disclosed. In this case, the antibiotics were used to treat a cold. This participant had an antibiotic knowledge score of zero out of five. Other reasons for past antibiotic use included sore throat (10%), skin infection (5%), and urinary tract infection (5%), while the majority were unable to recall the reason (75%). No statistically significant correlations were identified between antibiotic behaviors and any other variables.

Two participants (10%) recalled receiving education on antibiotics in the past year. Of the education received, the sources reported were television (50%) and printed materials (50%).

The participant that reported television-based education stated the information did not change how they would use antibiotics in the future. The individual who received printed materials stated that it did change their future behavior. Both reported they would always consult a doctor in the future if they felt they needed antibiotics. Roughly one third of participants were interested in education on medical conditions for which antibiotics are used (35%). Other preferred topics included antibiotic resistance (15%), prescription of antibiotics (15%), and how to use antibiotics (10%). The following question asked for their preferred source of antibiotic education, with the option of selecting up to three responses. All participants preferred education from a healthcare provider. Other responses included an official health related website (20%), other health related website (25%), a pharmacy (15%), a nurse (5%), radio (5%), television (5%), and another health care facility (5%). The final question asked at what level the participants believe it would be most effective to address antibiotic resistance. Nearly half responded at the individual or family level (40%). Other responses included the global level (25%), the national level (20%), and unsure (15%).

Impact and Sustainability

Participants were directly impacted by this project through the referrals they received for positive responses on the SDOH questionnaire. Patients of the FQHC will benefit indirectly through increasing staff and provider awareness of social risks. As the clinic is able to expand community resources to target the most critical risk factors, the patient population will benefit in the long term. Although the antibiotic questionnaire was not designed to provide education, participants may have gained some awareness of antimicrobial resistance. Impact on providers lies primarily in increased awareness of social risks that are affecting their patients, as well as insight into their antibiotic knowledge and behaviors. Staff at the FQHC are continuing to

administer the SDOH questionnaire via telephone, providing referrals, and collecting data to evaluate social risks and resources. The antibiotic data will be passed on to another DNP student in a subsequent cohort for development of a provider-based educational intervention.

Discussion

This project assessed the current antibiotic knowledge and behaviors, as well as the impact of SDOH, in the patient population of an FQHC. While the sample size was small, it did represent most of the expected demographic characteristics. The vast majority of participants were Spanish-speaking and originally from Mexico, although none had immigrated recently. Several social risks were identified, including a high frequency of unemployment due to disability or caregiver responsibilities, low levels of education, and high rates of food insecurity, housing insecurity, social isolation, and stress. Many of these factors have been amplified by the COVID-19 pandemic. The antibiotic portion of the survey revealed several knowledge gaps, as well as scarce recall of past antibiotic education. Regarding antibiotic behavior, one case of self-medication with antibiotics was identified. The antibiotics in this case were used for a condition that was likely viral and were obtained in a retail setting without a prescription. This confirms that this type of behavior and access to unprescribed antibiotics does occur in this population.

Conclusions and Recommendations

SDOH

The most frequently identified social risks were unemployment, primarily associated with disability or caregiving responsibilities, and low levels of education. The factors that were associated with increased SDOH scores included housing and food insecurity, difficulty meeting basic needs, and Spanish language. Although this represents a small sample of the patient population, the FQHC's staff is continuing to administer the PRAPARE questionnaire via

telephone, adding to the data available to confirm these findings. Through this process, the clinic has an opportunity to improve the health outcomes of their patients by addressing these risk factors. The FQHC provides referrals to those impacted by financial difficulties and insecurities, but more could be done to address the disparities experienced by their non-English speaking patients.

Increasing health education services in Spanish and forming partnerships with community organizations that offer services such as English language learning are some ways the clinic could reduce the health disparities that impact the Spanish-speaking portion of the community. Community partnerships are also an integral part of addressing housing and food insecurity in the population. The clinic's staff includes case managers who are already working to provide some of these resources to patients. External evidence supports ongoing strengthening and restructuring of partnerships between clinics and community resources to better address SDOH (Hensley et al., 2017). This survey reinforces the need for the clinic to have heavy community involvement in order to positively impact the health outcomes of the patient population.

Antibiotic Knowledge and Behaviors

This project has confirmed one case of self-medication with antibiotics obtained without a prescription to treat a cold within the past year. This is almost certainly not the only instance of this behavior in the population. Antimicrobial resistance is a grave threat, and all forms of inappropriate antibiotic use need to be addressed. Because there was only one participant who reported this behavior in the survey, it was impossible to establish any correlation between self-medication and any other variables. This participant, however, also scored the lowest of the sample on overall antibiotic knowledge with a score of zero. This suggests that self-medication

may be associated with low antibiotic knowledge. Jamhour et al. (2017) and Lescure et al. (2018) similarly identified a low antibiotic knowledge as a significant determinant of self-medication.

A significant antibiotic knowledge gap was identified in this population. There is a common misunderstanding that antibiotics are medication with the primary purpose of treating pain. The majority of participants in the survey believed that it is appropriate to use antibiotics to treat viral illnesses such as cold and flu. Many do not understand that antibiotics can cause side effects or that inappropriate use contributes to antibiotics becoming ineffective. Several would stop taking antibiotics as soon as they felt better rather than taking them for the duration prescribed. There were no variables identified in this project that correlated with low antibiotic knowledge. This could be associated with the small sample size. Still, the knowledge deficit that has been identified, especially given its potential association with antibiotic misuse, presents a target for an educational intervention.

All participants in this survey expressed a preference for receiving antibiotic education directly from a healthcare provider, indicating this source of education is preferred over any other by a wide margin. This presents an opportunity for the FQHC to address the knowledge gap through a provider-based patient education intervention. External evidence supports this conclusion, as clinic-based education has been shown to be effective at increasing antibiotic knowledge (Burstein et al., 2019; King et al., 2016). Although none of the participants recalled receiving antibiotic education from a provider within the past year, it is likely that at least some did receive some information when they were last prescribed antibiotics. The challenge, therefore, is to develop an educational intervention that would be effective and likely to be retained long term.

Strengths

The survey was offered in English or Spanish, based on the participants' preference, which was essential given the demographics of the clinic's population. Also, this survey was telephone-based, allowing for patients to participate whether or not they were being seen in the FQHC during the timeframe of data collection for this project. Participants did not have to incur any transportation expenses or spend extra time at the clinic to complete the survey. All individuals with positive responses on the SDOH questionnaire had the opportunity to receive referrals through the FQHC to address their social risks in real time.

Barriers and Limitations

This project was limited due to the COVID-19 pandemic. During the time that project development and data collection were being completed, in-person work associated with the project was not possible. For this reason, a telephone-based format was used. This limited recruitment due to the additional time required to individually call each participant, reading out the recruitment script, informed consent, and survey. Many participants were busy at the time of the calls or were hesitant due to the amount of time required to complete the survey. Some potential participants may have preferred to complete the survey in-person during their wait time in the clinic. Due to some delays in project development associated with changes to the SDOH questionnaire, the timeframe for data collection was reduced, which further limited the sample size.

Implications and Recommendations for Future Research

This project demonstrates the value of assessing needs and preferences in order to develop population-based interventions. By incorporating demographic and problem-specific data, the solution can be made culturally sensitive with maximum efficacy. This process is especially useful when there is a lack of internal or hard data on a problem. The antibiotic

knowledge and behaviors portion of this survey has already been used extensively to evaluate antibiotic misuse and knowledge gaps in widely varied populations, but on a large scale. This work has shown that it can also be used successfully in small scale efforts to address antimicrobial resistance from the public perspective.

Additional research is needed to expand the internal data and develop a robust understanding of the population's antibiotic knowledge and behaviors. Larger sample sizes would allow for more thorough evaluation of variables to identify determinants of antibiotic misuse and low antibiotic knowledge. Further review of literature may help to identify the most effective means of provider-based patient education.

The clinic staff are continuing to administer the PRAPARE questionnaire via telephone to their established patients. Additional data will provide a more robust picture of the social risk profile of the community, refining the development of community-based interventions. Ideally, future projects will be undertaken by DNP students in subsequent cohorts that will involve the development of interventions to address antibiotic misuse and SDOH.

Conclusion

SDOH disproportionately affect the patient population of this FQHC. Ongoing evaluation of social risks and expansion of community-based interventions is a vital function of the clinic. Gaining an understanding of the most critical social factors in the population, and the impact of language barriers, has potential to improve patient-provider communication, increasing health literacy and improving health outcomes. Confirmation that self-medication with unprescribed antibiotics does occur in this population highlights the need to address low antibiotic knowledge. Identified knowledge gaps and participant preferences clearly indicate an opportunity for a provider-based educational intervention.

References

- Aponte-González, J., González-Acuña, A., Lopez, J., Brown, P., & Eslava-Schmalbach, J. (2019). Perceptions in the community about the use of antibiotics without a prescription: Exploring ideas behind this practice. *Journal of Pharmacy Practice, 17*(1), 1394. <https://doi.org/10.18549/PharmPract.2019.1.1394>
- Burstein, V. R., Trajano R. P., Kravitz R. L., Bell R. A., Vora D., & May L. S. (2019). Communication interventions to promote the public's awareness of antibiotics: A systematic review. *BMC Public Health, 19*(1), Article 899. <https://doi.org/10.1186/s12889-019-7258-3>
- Catalan-Matamoros, D., Pariente, A., & Elias-Perez, C. (2019). What we know about media communication on antibiotics and antimicrobial resistance: A systematic review of the scientific literature. *Patient Education and Counseling, 102*, 1427-1438. <https://doi.org/10.1016/j.pec.2019.03.020>
- Centers for Disease Control and Prevention. (2018). *2018 update: Antibiotic use in the United States: Progress and opportunities*. United States Department of Health and Human Services. <https://www.cdc.gov/antibiotic-use/stewardship-report/pdf/stewardship-report-2018-508.pdf>
- Centers for Disease Control and Prevention. (2019a). *Funding for antibiotic resistance fiscal year 2019*. United States Department of Health and Human Services. <https://www.cdc.gov/arinvestments>
- Centers for Disease Control and Prevention. (2019b). *What CDC is doing: Antibiotic resistance (AR) solutions initiative*. United States Department of Health and Human Services. <https://www.cdc.gov/drugresistance/solutions-initiative/index.html>

Centers for Disease Control and Prevention. (2020). *Smoking cessation: A report of the Surgeon General*. United States Department of Health and Human Services.

<https://www.hhs.gov/sites/default/files/2020-cessation-sgr-full-report.pdf>

Dresler, A. (2016). *Regulation of antibiotic sales in Mexico: Process and impact* [PowerPoint Presentation]. Instituto Nacional de Salud Publica, Mexico.

<http://www.bsac.org.uk/antimicrobialstewardshipebook/Chapter%2016/South%20America/Regulation%20of%20antibiotic%20sales%20in%20Mexico%20process%20and%20impact.pdf>

European Commission. (2016). *Special Eurobarometer 445: Antimicrobial resistance*. European Union. <https://doi.org/10.2875/760366>

Francois Watkins, L. K., Sanchez, G. V., Albert, A. P., Roberts, R. M., & Hicks, L. A. (2015). Knowledge and attitudes regarding antibiotic use among adult consumers, adult Hispanic consumers, and health care providers – United States 2012-2013. *Morbidity and Mortality Weekly Report*, 64(28), 767-770. <https://doi.org/10.15585/mmwr.mm6428a5>

Hensley, C., Joseph, A., Shah, S., O’Dea, C., & Carameli, K. (2017). Addressing social determinants of health at a federally qualified health center. *International Public Health Journal*, 9(2), 189-198. <https://search-proquest-com.ezproxy1.lib.asu.edu/docview/1929693079/fulltextPDF/40EFA1E82824D67PQ/1?accountid=4485>

Institute for Healthcare Improvement. (2020). *Science of improvement: Testing changes*. <http://www.ihl.org/resources/Pages/HowtoImprove/ScienceofImprovementTestingChanges.aspx>

Jamhour, A., El-Kheir, A., Salameh, P., Hanna, P. A., & Mansour, H. (2017). Antibiotic

- knowledge and self-medication practices in a developing country: A cross-sectional study. *American Journal of Infection Control*, 45(4), 384-388.
- <https://doi.org/10.1016/j.ajic.2016.11.026>
- King, S., Exley, J., Taylor, J., Kruithof, K., Larkin, J., & Pardal, M. (2016). Antimicrobial stewardship: The effectiveness of educational interventions to change risk-related behaviours in the general population: A systematic review. *Rand Health Quarterly*, 5(3), 2. <https://www.ncbi.nlm.nih.gov/pubmed/28083399>
- Lescure, D., Paget, J., Schellevis, F., & van Dijk, L. (2018). Determinants of self-medication with antibiotics in European and Anglo-Saxon countries: A systematic review of the literature. *Frontiers in Public Health*, 6, Article 370.
- <https://doi.org/10.3389/fpubh.2018.00370>
- Lindenmeyer, A., Redwood, S., Griffith, L., Ahmed, S., & Phillimore, J. (2016). Recent migrants' perspectives on antibiotic use and prescribing in primary care: A qualitative study. *British Journal of General Practice* 66(652), e802-e809.
- <https://doi.org/10.3399/bjgp16X686809>
- Machowska, A., & Lundborg, C. S. (2018). Drivers of irrational use of antibiotics in Europe. *International Journal of Environmental Research and Public Health*, 16(1), 27-41.
- <https://doi.org/10.3390/ijerph16010027>
- Monnier, A. A., Eisenstein, B. I., Hulscher, M. E., & Gyssens, I. C. (2018). Towards a global definition of responsible antibiotic use: results of an international multidisciplinary consensus procedure. *Journal of Antimicrobial Chemotherapy*, 73(6), vi3-vi16.
- <https://doi.org/10.1093/jac/dky114>
- National Association of Community Health Centers. (2016). *PRAPARE risk tally scoring*

methodology. <http://www.nachc.org/wp-content/uploads/2019/01/PRAPARE-SDH-Risk-Tally-Score-Methodology.pdf>

National Association of Community Health Centers. (2019). *PRAPARE validation fact sheet*.

https://www.nachc.org/wp-content/uploads/2019/10/prapare_validation-fact-sheet-2019-9-26.pdf

Nepal, G. & Bhatta, S. (2018). Self-medication with antibiotics in WHO Southeast Asian Region:

A systematic review. *Cureus*, 10(4), e2428. <https://doi.org/10.7759/cureus.2428>

Ocan, M., Obuku, E. A., Bwanga, F., Akena, D., Richard, S., Ogwal-Okeng, J., & Obua, C. (2015).

Household antimicrobial self-medication: A systematic review and meta-analysis of the burden, risk factors, and outcomes in developing countries. *BMC Public Health*, 15, Article 742. <https://doi.org/10.1186/s12889-015-2109-3>

Roca, I., Akova, M., Baquero, F., Carlet, J., Cavaleri, M., Coenen, S., Cohen, J., Findlay, D.,

Gyssens, I., Heuer, O. E., Kahlmeter, G., Kruse, H., Laxminarayan, R., Liébana, E., López-Cerero, L., MacGowan, A., Martins, M., Rodríguez-Baño, J., Rolain, J. M., ... Vila, J.

(2015). The global threat of antimicrobial resistance: A science for intervention. *New Microbes and New Infections*, 6(C), 22-29. <https://doi.org/10.1016/j.nmni.2015.02.007>

Sánchez, J. (2014). Self-medication practices among a sample of Latino migrant workers

in South Florida. *Frontiers in Public Health*, 4(2), 108.

<https://doi.org/10.3389/fpubh.2014.00108>

Santa-Ana-Tellez, Y., Mantel-Teeuwisse, A. K., Dreser, A., Leufkens, H. G. M., & Wirtz, V.J.

(2013). Impact of over-the-counter restrictions on antibiotic consumption in Brazil and

Mexico. *PLoS ONE*, 8(10), Article e75550. <https://doi.org/10.1371/journal.pone.0075550>

Schiavo, R. (2013). *Health communication: From theory to practice*. Jossey-Bass.

- Tamhankar, A. J., Nachimuthu, R., Singh, R., Harindran, J., Meghwanshi, G. K., Kannan, R., Senthil Kumar, N., Negi, V., Jacob, L., Bhattacharyya, S., Sahoo, K. C., Mahadik, V. K., Diwan, V., Sharma, M., Pathak, A., Khedkar, S. U., Avhad, D., Saxena, S., Nerkar, S., ... Kumar, A. (2019). Characteristics of a nationwide voluntary antibiotic resistance awareness campaign in India: Future paths and pointers for resource limited settings/low and middle income countries. *International Journal of Environmental Research and Public Health*, 16(24), Article 5141. <https://doi.org/10.3390/ijerph16245141>
- Tangcharoensathien, V., Chanvatik, S., & Sommanustweechai, A. (2018). Complex determinants of inappropriate use of antibiotics. *Bulletin of the World Health Organization*, 96(2), 141-144. <https://doi.org/10.2471/BLT.17.199687>
- Torres, N. F., Chibi, B., Middleton, L. E., Solomon, V. P., & Mashamba-Thompson, T. P. (2018). Evidence of factors influencing self-medication with antibiotics in low and middle-income countries: A systematic scoping review. *Public Health*, 168, 92-101. <https://doi.org/10.1016/j.puhe.2018.11.018>
- Zanichelli, V., Tebano, G., Gyssens, I. C., Vlahovic-Palcevski, V., Monnier, A. A., Stanic Benic, M., Harbarth, S., Hulscher, M., Pulcini, C., & Huttner, B. D. (2018). Patient-related determinants of antibiotic use: A systematic review. *Clinical Microbiology and Infection*, 25(1), 48-53. <https://doi.org/10.1016/j.cmi.2018.04.031>

Appendix A
Evaluation and Synthesis Tables

Table A1

Evaluation Table Quantitative Studies

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Decision for Use
<p>Burstein et al. (2019) Communication interventions to promote the public’s awareness of antibiotics: A systematic review.</p> <p>Funding: None reported Bias: NR Country: US</p>	<p>Health Communication Theory (Inferred)</p>	<p>Design: SR</p> <p>Purpose: Identify, characterize, and evaluate the messaging approaches used in educational interventions to increase AM awareness</p>	<p>N: 34</p> <p>DS: Pubmed, Google Scholar, Embase, CINAHL, and Scopus</p> <p>Inclusion Criteria: Patient or public education to increase AM awareness. Outcomes include AMK, attitudes, and/or beliefs, adherence, resistance patterns, or prescribing practices.</p>	<p>IV1: EIs targeting the GP’s AM awareness.</p> <p>IV2: Education level, SES, or baseline AMK</p> <p>DV: AMK, attitudes, and/or beliefs of NMCs.</p>	<p>AMK surveys</p>	<p>Descriptive Statistics</p>	<p>71% of studies (75% of RCTs) with EI targeting only NMC were effective at improving AMK, attitudes, and/or beliefs. Included information about appropriate AM use and risks of inappropriate use.</p> <p>ES: Not reported</p>	<p>QOE: Level V</p> <p>Strengths: Setting is specific to the US. Rationale for search strategy and data analysis clearly discussed. Included RCTs.</p> <p>Weaknesses: MA not performed due to heterogeneity of interventions and outcome measures.</p> <p>Conclusions: EI targeting NMC, and provider communication training, can be effective in improving AM awareness and reducing AM prescriptions. Lacked detailed descriptions of EIs used.</p>

Key: **AM-** antimicrobial; **AMK-** antimicrobial knowledge; **AMR-** antimicrobial resistance; **AMS-** antimicrobial stewardship; **CBAS-** controlled before and after studies; **CR-** community researchers; **CS-** cohort studies; **CSOS-** cross sectional observational study; **CSS-** cross sectional survey; **DS-** databases searched; **EI-** educational intervention; **ES-** effect size; **EU-** Europe; **FG-** focus group; **GP-** general public; **GPP-** general practice provider; **HC-** health care; **HCS-** health care settings or system; **HCW-** health care workers; **HS-** high school; **IP-** infection prevention; **ITS-** interrupted time series study; **LOE-** level of evidence; **MA-** meta-analysis; **MI-** monthly income; **MMC-** mass media campaign; **N-** number of studies or number of participants; **NBAS-** non-controlled before and after studies; **NIHR-** National Institute for Health Research; **NMC-** non-medical community; **NR-** not recognized; **NRT-** non-randomized trial; **RCT-** randomized control trial; **ROI-** region of origin; **RX-** pharmacy; **SC-** social contacts; **SEAR-** Southeast Asia Region; **SES-** socio-economic status; **SM-** self-medication; **SR-** systematic review; **SSP-** Spanish speaking populations; **UAM-** unprescribed antimicrobials; **UK-** United Kingdom; **URI-** upper respiratory infection; **US-** United States; **WHO-** World Health Organization; **y.o.-** years old

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Decision for Use
			Exclusion Criteria: Setting outside of the US					Feasibility/Applicability to pt. population: Applicable to the US and SSPs within the US. Does not offer specific examples of EI.
Jamhour et al. (2017) Antibiotic knowledge and self-medication practices in a developing country: A cross-sectional study. Funding: The authors received no financial support for the research, authorship, and/or publication of this article. Bias: NR Country: Lebanon	Theory of Planned Behavior (Inferred)	Design: Descriptive CSS Purpose: To evaluate the knowledge and behaviors of individuals in Lebanon with regard to appropriate AM use and SM with AM.	N: 400 Setting: Street-based survey completed in 2 major cities in Lebanon (Beirut and Tripoli). Sample Demographics: 45.5% male 54.5% female 72% < 45 y.o. 86% HS degree 47% MI < \$1000 Inclusion Criteria: Adult (18+ y. o.) Literate in English or Arabic Non-HC workers (excluded nurses,	IV1: Gender Age (< or ≥ 45 y.o.) Education (< grade 9 or HS) MI (< or ≥ \$1,000) Having ABX prescription DV1: Knowledge of ABX IV2: Gender Age (< or ≥ 45 y.o.) Education (< grade 9 or HS) MI (< or ≥ \$1,000)	Questionnaire adapted from a validated scale, written at 5 th grade reading level. (scale not specifically identified)	Descriptive Statistics Chi-square test Logistic regression	DV1: Having AM prescription associated with higher AMK (P = .006; 95% CI (0.235-0.784)). All other IV insignificant. DV2: Higher AMK associated with stopping AM at appropriate time (P = .002; 95% CI (1.469-5.566)). All other IV insignificant.	QOE: Level VI Strengths: Sociodemographics representative of the Lebanese population. Rationale for study, data collection, and data analysis clearly discussed. Weaknesses: Cross sectional descriptive study, convenience sample, recall bias. Unclear questionnaire validity. Conclusions: Established association between low AMK and SM and misuse of AM without correlation to sociodemographic factors.

Key: **AM-** antimicrobial; **AMK-** antimicrobial knowledge; **AMR-** antimicrobial resistance; **AMS-** antimicrobial stewardship; **CBAS-** controlled before and after studies; **CR-** community researchers; **CS-** cohort studies; **CSOS-** cross sectional observational study; **CSS-** cross sectional survey; **DS-** databases searched; **EI-** educational intervention; **ES-** effect size; **EU-** Europe; **FG-** focus group; **GP-** general public; **GPP-** general practice provider; **HC-** health care; **HCS-** health care settings or system; **HCW-** health care workers; **HS-** high school; **IP-** infection prevention; **ITS-** interrupted time series study; **LOE-** level of evidence; **MA-** meta-analysis; **MI-** monthly income; **MMC-** mass media campaign; **N-** number of studies or number of participants; **NBAS-** non-controlled before and after studies; **NIHR-** National Institute for Health Research; **NMC-** non-medical community; **NR-** not recognized; **NRT-** non-randomized trial; **RCT-** randomized control trial; **ROI-** region of origin; **RX-** pharmacy; **SC-** social contacts; **SEAR-** Southeast Asia Region; **SES-** socio-economic status; **SM-** self-medication; **SR-** systematic review; **SSP-** Spanish speaking populations; **UAM-** unprescribed antimicrobials; **UK-** United Kingdom; **URI-** upper respiratory infection; **US-** United States; **WHO-** World Health Organization; **y.o.-** years old

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Decision for Use
			physicians, and pharmacists) Attrition: Not mentioned	AMK DV2: Proper discontinuation of AM				Feasibility/Applicability to pt. population: Provides insight into drivers of AM misuse, and potential for EIs. Not generalizable due to cultural specificity.
King et al. (2016) Title Funding: National Institute for Health and Care Excellence (NICE) Bias: Not mentioned Country: UK	Health Communication Theory (Inferred)	Design: SR Purpose: Evaluate the effectiveness and cost-effectiveness of EIs targeting the GP to change risky AM behaviors.	N: 60 DS: Not Stated Inclusion Criteria: Relating to research questions: (1) Which EIs are effective in changing GP's AM behaviors? (2) Which EIs are effective in changing GP's IP and AMR behaviors? Exclusion Criteria: Interventions targeting HCWs	IV1: EIs led by GPP targeting patients. IV2: Home-based EI targeting Latino population. IV3: Community-based EIs DV: AMK and AMR awareness	Various surveys on AMK and behaviors.	Descriptive Statistics: Each EI individually analyzed for effectiveness and applicability to develop Evidence Statements per NICE guidelines.	EI led by GPPs: Improved AMK but not AMR awareness. Home-based EI targeting Latino population: improved AMK. Community-based EIs: MMCs have little to no effect on AMK and AMR awareness and behaviors, except among parents of Medicaid-insured children.	QOE: Level V Strengths: Rationale for study and problem clearly discussed. Clearly specified assessment of study quality. Evidence clearly separated by intervention and target population. Weaknesses: MA not performed due to heterogeneity of interventions/outcome measures. Lacks discussion of bias, strengths, and limitations of study. Conclusions: Population-based, culturally-sensitive EIs may be more effective

Key: **AM-** antimicrobial; **AMK-** antimicrobial knowledge; **AMR-** antimicrobial resistance; **AMS-** antimicrobial stewardship; **CBAS-** controlled before and after studies; **CR-** community researchers; **CS-** cohort studies; **CSOS-** cross sectional observational study; **CSS-** cross sectional survey; **DS-** databases searched; **EI-** educational intervention; **ES-** effect size; **EU-** Europe; **FG-** focus group; **GP-** general public; **GPP-** general practice provider; **HC-** health care; **HCS-** health care settings or system; **HCW-** health care workers; **HS-** high school; **IP-** infection prevention; **ITS-** interrupted time series study; **LOE-** level of evidence; **MA-** meta-analysis; **MI-** monthly income; **MMC-** mass media campaign; **N-** number of studies or number of participants; **NBAS-** non-controlled before and after studies; **NIHR-** National Institute for Health Research; **NMC-** non-medical community; **NR-** not recognized; **NRT-** non-randomized trial; **RCT-** randomized control trial; **ROI-** region of origin; **RX-** pharmacy; **SC-** social contacts; **SEAR-** Southeast Asia Region; **SES-** socio-economic status; **SM-** self-medication; **SR-** systematic review; **SSP-** Spanish speaking populations; **UAM-** unprescribed antimicrobials; **UK-** United Kingdom; **URI-** upper respiratory infection; **US-** United States; **WHO-** World Health Organization; **y.o.-** years old

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Decision for Use
							ES: Not reported	than MMCs. GPP led EIs have potential but more is needed to address AMR awareness in the GP. Patients of lower SES may be more impacted by EIs to improve AMK. Feasibility/Applicability to pt. population: Applicable to SSP and lower SES population. Highlights benefits of clinic-based EIs.
Lescure et al. (2018) Determinants of self-medication with antibiotics in European and Anglo-Saxon countries: A systematic review of the literature. Funding: European Commission Public Health Directorate	Theory of Planned Behavior (Inferred)	Design: SR Purpose: Identify determinants of SM with AM.	N: 54 DS: PubMed, Scopus, Embase Inclusion Criteria: Studies addressing SM with AM. All languages, all types of empirical studies. Exclusion Criteria: Studies not set in European and	IV1: Socio-demographic determinants IV2: Treatment-related determinants IV3: HCW related determinants IV4: HCS related determinants	Quantitative and qualitative criteria lists from the “Standard quality assessment criteria for evaluating primary research papers from a variety of fields” handbook.	Determinants categorized as patient level, HCW level, or HCS level. Association of determinant with outcome categorized as positive, negative, or no association.	Significant determinants include: Socio-demographics: immigrant status Treatment-related: lack of AMK, successful past AM treatment, having AM at home, access to UAM	QOE: Level V Strengths: Wide variety of determinants studied. Clearly specified assessment of study quality. Rationale for search strategy and data analysis clearly discussed. Weaknesses: Variability of outcome measures among studies, limits comparability. Overrepresentation of southeast Europe and the

Key: **AM-** antimicrobial; **AMK-** antimicrobial knowledge; **AMR-** antimicrobial resistance; **AMS-** antimicrobial stewardship; **CBAS-** controlled before and after studies; **CR-** community researchers; **CS-** cohort studies; **CSOS-** cross sectional observational study; **CSS-** cross sectional survey; **DS-** databases searched; **EI-** educational intervention; **ES-** effect size; **EU-** Europe; **FG-** focus group; **GP-** general public; **GPP-** general practice provider; **HC-** health care; **HCS-** health care settings or system; **HCW-** health care workers; **HS-** high school; **IP-** infection prevention; **ITS-** interrupted time series study; **LOE-** level of evidence; **MA-** meta-analysis; **MI-** monthly income; **MMC-** mass media campaign; **N-** number of studies or number of participants; **NBAS-** non-controlled before and after studies; **NIHR-** National Institute for Health Research; **NMC-** non-medical community; **NR-** not recognized; **NRT-** non-randomized trial; **RCT-** randomized control trial; **ROI-** region of origin; **RX-** pharmacy; **SC-** social contacts; **SEAR-** Southeast Asia Region; **SES-** socio-economic status; **SM-** self-medication; **SR-** systematic review; **SSP-** Spanish speaking populations; **UAM-** unprescribed antimicrobials; **UK-** United Kingdom; **URI-** upper respiratory infection; **US-** United States; **WHO-** World Health Organization; **y.o.-** years old

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Decision for Use
<p>Bias: NR Researchers are independent of funding source. Country: Netherlands</p>			Anglo-Saxon countries. Focus on AM use in hospital or agricultural setting.	DV1: Likelihood to SM with AM.			<p>HCW related: receiving advice from pharmacist or NMC members</p> <p>HCS related: lack access to care, lack of time/money</p> <p>ES: Not reported</p>	<p>US, determinants may be country-dependent.</p> <p>Conclusions: Immigrant status, lower education and SES, lacking access to HCS all increase likelihood of SM with AM.</p> <p>Feasibility/Applicability to pt. population: Confirms vulnerability of immigrant population to SM with AM, due to low access to care, high access to UAM, lack of education, immigrant status.</p>
<p>Nepal & Bhatta. (2018) Self-medication with antibiotics in WHO Southeast Asian region: A systematic review. Funding: The authors received no financial support for the</p>	Theory of Planned Behavior (Inferred)	<p>Design: SR of CSS studies</p> <p>Purpose: Quantify the frequency and effect of SM with AM.</p>	<p>N: 19</p> <p>DS: PubMed, PubMed Central, Google Scholar</p> <p>Inclusion Criteria: Studies assessing SM with AM in the WHO SEAR, including</p>	<p>IV: SM with AM</p> <p>DV1: Illnesses and reasons for SM</p> <p>DV2: AM frequently used and source of AM.</p>	PRISMA CSS	Data abstraction spreadsheet using Microsoft Excel 2013	<p>DV1: Illnesses: cold, sore throat, GI disease, respiratory disease</p> <p>Reasons: prior AM experiences, lack of time/money</p>	<p>QOE: Level V</p> <p>Strengths: Specifically addresses SM with AM. Rationale for search strategy and data analysis clearly discussed.</p> <p>Weaknesses: Heterogeneity of setting, recall period, sample size, and population.</p>

Key: **AM-** antimicrobial; **AMK-** antimicrobial knowledge; **AMR-** antimicrobial resistance; **AMS-** antimicrobial stewardship; **CBAS-** controlled before and after studies; **CR-** community researchers; **CS-** cohort studies; **CSOS-** cross sectional observational study; **CSS-** cross sectional survey; **DS-** databases searched; **EI-** educational intervention; **ES-** effect size; **EU-** Europe; **FG-** focus group; **GP-** general public; **GPP-** general practice provider; **HC-** health care; **HCS-** health care settings or system; **HCW-** health care workers; **HS-** high school; **IP-** infection prevention; **ITS-** interrupted time series study; **LOE-** level of evidence; **MA-** meta-analysis; **MI-** monthly income; **MMC-** mass media campaign; **N-** number of studies or number of participants; **NBAS-** non-controlled before and after studies; **NIHR-** National Institute for Health Research; **NMC-** non-medical community; **NR-** not recognized; **NRT-** non-randomized trial; **RCT-** randomized control trial; **ROI-** region of origin; **RX-** pharmacy; **SC-** social contacts; **SEAR-** Southeast Asia Region; **SES-** socio-economic status; **SM-** self-medication; **SR-** systematic review; **SSP-** Spanish speaking populations; **UAM-** unprescribed antimicrobials; **UK-** United Kingdom; **URI-** upper respiratory infection; **US-** United States; **WHO-** World Health Organization; **y.o.-** years old

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Decision for Use
research, authorship, and/or publication of this article. Bias: NR Country: Nepal			English language studies. Exclusion Criteria: studies on antivirals, antifungals, antiprotozoal, or topical antimicrobials. Studies on self-medication of overall drugs. Editorials, correspondences, letters to the editor				DV2: Sources: RX, leftover AM, SC AM most used: amoxicillin ES: Not reported	Specific to WHO SEAR. Limited DS. Conclusions: Lack of financial resources, or time to access care influence SM with AM. Common illnesses indicating SM with AM are not appropriate use. Feasibility/Applicability to pt. population: Different population but correlates with data from US and immigrant populations (lack of resources, access to care, and access to UAM).
Ocan et al. (2015) Household antimicrobial self-medication: A systematic review and meta-analysis of the burden, risk factors, and outcomes in developing countries. Funding:	Theory of Planned Behavior (Inferred)	Design: SR and MA of CSOSs Purpose: Establish the burden, risk factors, and effects of SM with AM in low and middle-	N: 34 DS: PubMed, Medline, Scopus, Embase Inclusion Criteria: SM with AM Low-middle income countries Adults (> 18 y.o.)	IV: SM with AM in developing countries DV: Burden, risk factors, and outcomes of SM with AM	Excel version 2007 data abstraction spreadsheet	Stata software version 12.0 Narrative and quantitative synthesis with descriptive summaries of outcomes.	Inappropriate practices: incorrect medication, dose or duration; illness not indicating AM. Factors associated with SM: past use of AM, low	QOE: Level V Strengths: Specifically addressed SM with AM. Rationale for search strategy and data analysis clearly discussed. Weaknesses: Limited DS. Heterogeneity of recall period, surveys used, data collection techniques, limited

Key: **AM-** antimicrobial; **AMK-** antimicrobial knowledge; **AMR-** antimicrobial resistance; **AMS-** antimicrobial stewardship; **CBAS-** controlled before and after studies; **CR-** community researchers; **CS-** cohort studies; **CSOS-** cross sectional observational study; **CSS-** cross sectional survey; **DS-** databases searched; **EI-** educational intervention; **ES-** effect size; **EU-** Europe; **FG-** focus group; **GP-** general public; **GPP-** general practice provider; **HC-** health care; **HCS-** health care settings or system; **HCW-** health care workers; **HS-** high school; **IP-** infection prevention; **ITS-** interrupted time series study; **LOE-** level of evidence; **MA-** meta-analysis; **MI-** monthly income; **MMC-** mass media campaign; **N-** number of studies or number of participants; **NBAS-** non-controlled before and after studies; **NIHR-** National Institute for Health Research; **NMC-** non-medical community; **NR-** not recognized; **NRT-** non-randomized trial; **RCT-** randomized control trial; **ROI-** region of origin; **RX-** pharmacy; **SC-** social contacts; **SEAR-** Southeast Asia Region; **SES-** socio-economic status; **SM-** self-medication; **SR-** systematic review; **SSP-** Spanish speaking populations; **UAM-** unprescribed antimicrobials; **UK-** United Kingdom; **URI-** upper respiratory infection; **US-** United States; **WHO-** World Health Organization; **y.o.-** years old

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Decision for Use
Medical Education Partnership Initiative – Medical Education for Equitable Services for all Ugandans (National Institutes for Health, Department of Human Health and Services, US) Africa Centre for Systematic Reviews and Knowledge Translation at Makerere University College of Health Services, Uganda. International Development Research Centre, Canada Bias: NR Country: Uganda		income countries	Exclusion Criteria: Chronic UAM use Population of children, pregnant or breast-feeding mothers, institutionalized elderly patients, students of health related courses and HCWs. Studies measuring only knowledge, attitudes, or behaviors without community behaviors.			DerSimonian-Laird Random Effects MA	education, female gender, age, middle income. Outcomes: allergies, lack of cure, death, recovery from illness. ES: Not reported	reports of negative outcomes of SM with AM. Conclusions: Lower education level and SES associated with lower AM knowledge and inappropriate AM behavior. Past AM prescriptions encourage future SM. Feasibility/Applicability to pt. population: Focused on developing countries but is applicable to Hispanic immigrant population in the US.

Key: **AM-** antimicrobial; **AMK-** antimicrobial knowledge; **AMR-** antimicrobial resistance; **AMS-** antimicrobial stewardship; **CBAS-** controlled before and after studies; **CR-** community researchers; **CS-** cohort studies; **CSOS-** cross sectional observational study; **CSS-** cross sectional survey; **DS-** databases searched; **EI-** educational intervention; **ES-** effect size; **EU-** Europe; **FG-** focus group; **GP-** general public; **GPP-** general practice provider; **HC-** health care; **HCS-** health care settings or system; **HCW-** health care workers; **HS-** high school; **IP-** infection prevention; **ITS-** interrupted time series study; **LOE-** level of evidence; **MA-** meta-analysis; **MI-** monthly income; **MMC-** mass media campaign; **N-** number of studies or number of participants; **NBAS-** non-controlled before and after studies; **NIHR-** National Institute for Health Research; **NMC-** non-medical community; **NR-** not recognized; **NRT-** non-randomized trial; **RCT-** randomized control trial; **ROI-** region of origin; **RX-** pharmacy; **SC-** social contacts; **SEAR-** Southeast Asia Region; **SES-** socio-economic status; **SM-** self-medication; **SR-** systematic review; **SSP-** Spanish speaking populations; **UAM-** unprescribed antimicrobials; **UK-** United Kingdom; **URI-** upper respiratory infection; **US-** United States; **WHO-** World Health Organization; **y.o.-** years old

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Decision for Use
<p>Zanichelli et al. (2019) Patient-related determinants of antibiotic use: A systematic review.</p> <p>Funding: Innovative Medicines Initiative Joint Undertaking – European Union’s Seventh Framework Programme and in-kind contributions from EFPIA companies.</p> <p>Bias: 2 authors report receiving educational grants from Pfizer outside of this work.</p> <p>Country: European Union Countries</p>	<p>Patient Factors in Healthcare Improvement</p>	<p>Design: Mixed Methods SR</p> <p>Purpose: Assess patient related determinants of AM use.</p>	<p>N: 87</p> <p>DS: MEDLINE, PubMed</p> <p>Inclusion Criteria: Patient-related determinants of AM use. Original research studies. All ages</p> <p>Exclusion Criteria: Non-English language</p>	<p>IV: patient related determinants (Age, level of education, SES, satisfaction with HCS)</p> <p>DV: Any systemic AM use, regardless of appropriateness</p>	<p>Distiller SR Software</p>	<p>Qualitative summary presented by setting and determinant category.</p>	<p>Demographic Determinants: youth, low SES, male gender, personal or parental immigrant status.</p> <p>HCW Factor Determinants: Lacking clear understanding of indication, follow up, and empathic behavior of provider. Lacking control or feeling ignored by provider.</p> <p>ES: not reported</p>	<p>QOE: Level V</p> <p>Strengths: Includes all AM outcomes: SM, adherence, and prescription rates.</p> <p>Weaknesses: No MA due to heterogeneity of outcomes. Lacking specific category for cultural determinants of AM use. Only English language studies included. Limited DS.</p> <p>Conclusions: Low SES and immigrant status, as well as lack of trust of HCS increase SM with AM.</p> <p>Feasibility/Applicability to pt. population: Applicable to patients with low SES, immigrant status. Emphasizes lack of understanding of common education in clinic setting.</p>

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Table A2

Evaluation Table Qualitative Studies

Citation	Theory/ Conceptual Framework	Design/ Method/ Sampling	Sample/Setting	Major Themes Studied/ Definitions	Measurement / Instruments	Data Analysis	Findings/ Themes	Decision for Use
<p>Aponte-Gonzalez et al. (2019) Perceptions in the community about the use of antibiotics without a prescription: Exploring ideas behind this practice.</p> <p>Funding: Colombian Administrative Department of Science, Technology, and Innovation COLCIENCIAS and the University of California, Merced</p> <p>Bias: NR</p>	<p>Social Ecological Theory (inferred)</p>	<p>Design: Phenomenology</p> <p>FG sessions with semi-structured interview guide.</p> <p>Purpose: Expand on previous studies indicating frequent use of unprescribed AM in Colombia. Investigate environmental, interpersonal, and organizational factors driving this behavior.</p>	<p>N: 21 (divided into 4 FG's) FG1: 4 FG2: 5 FG3: 4 FG4: 8</p> <p>Setting: FG held in a private room at the site of recruitment. FG1: Public school FG2: Public school FG3: Public institution FG4: Private company</p> <p>Sample Demographics: 25-50 y.o. FG1: all female, low to middle SES FG2: all female, low SES</p>	<p>Ideas about AM</p> <p>SM experiences</p> <p>Reasons for SM</p> <p>Possible interventions stop SM</p>	<p>Semi-structured Interview Guide: Clarified concept of AM, mentioned use under prescription and difficulties accessing medical services. Next discussed unprescribed AM use and identified this as the topic of interest for open discussion.</p> <p>Data Collection: FG sessions</p>	<p>Thematic analysis using the framework method</p> <p>Data was coded independently by 2 researchers using the QDA MINER LITE v 1.4.6 program.</p>	<p>Ideas about AM: Varied AM knowledge. Awareness of AMR without depth of knowledge.</p> <p>SM experiences: SM is common practice, but most disapprove of it. Common indication for use: URI. Common source: RX and leftovers. High level of trust placed in pharmacy storekeepers.</p> <p>Reasons for SM: Limited HC access Distrust of providers Prior use of AM</p>	<p>LOE: Level VI</p> <p>Strengths: Sample demographics included varied socioeconomic levels. Rationale for study, data collection, and data analysis clearly discussed.</p> <p>Weaknesses: Participants may have been reluctant to express their views honestly to the interviewer. Small sample size. Sample limited to 4 sites in Bogota, Colombia. 86% of sample was female. Qualitative design</p> <p>Conclusions: Identified key role of RX storekeepers in community. Possible interventions include</p>

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<p>Country: Colombia</p>			<p>FG3: all female, middle SES FG4: 3 male, 5 female, high SES</p> <p>Inclusion Criteria: Adult (18+ y.o.) Literate in Spanish</p> <p>Attrition: None</p>		<p>were audiotaped and transcribed verbatim. Constant comparison approach used to review and analyse data after each session.</p>		<p>Saves money/time</p> <p>Possible interventions: Education Restricting sales of AM Improve access to HC</p>	<p>increasing access to HC, involving sources in the solution, and addressing AM misconceptions.</p> <p>Feasibility/ Applicability to pt. population: Provides insight into drivers of unprescribed AM use, but not necessarily generalizable due to limited sample demographics.</p>
<p>Lindenmeyer et al. (2016) Recent migrants' perspectives on antibiotic use and prescribing in primary care.</p> <p>Funding: British Academy/ Leverhulme Trust Small Grant, NIHR Collaboration for Leadership in Applied Health Research and Care West at University</p>	<p>Health Belief Model (Inferred)</p>	<p>Design: Narrative Research</p> <p>Individual Interviews conducted by trained CR's in participants' preferred language.</p> <p>Purpose: To explore factors influencing migrants' perspectives and experiences of AM use. To suggest interventions to improve communication</p>	<p>N: 23</p> <p>Setting: Community primary care clinic</p> <p>Sample Demographics: 25-60 y.o. 35% male 65% female 43% seeking asylum ROI: Africa: 8 Asia: 6 Eastern EU: 4 Middle East: 5</p> <p>Inclusion Criteria: Migrant in UK for 1-5 years</p>	<p>Themes: Health beliefs</p> <p>Interactions with health services</p> <p>Fairness and justice</p> <p>Use of health resources from abroad and in the UK.</p>	<p>Individual Interviews: Semi-structured, based on themes but only discussed AM if topic raised by participant</p> <p>Data Collection: Interviews were translated and transcribed by CR's.</p>	<p>Collective thematic analysis of transcripts by research team.</p>	<p>AM are "strong" medicine.</p> <p>Receiving AM prescription = being taken seriously</p> <p>Lack of trust in HC system leads to seeking alternative sources of AM</p>	<p>LOE: Level VI</p> <p>Strengths: Sample included migrants from multiple ROI.</p> <p>Weaknesses: Small sample size, not representative of all recent migrants. CR's did not discuss AM unless the topic was raised by the participant.</p> <p>Conclusions: Recommend improved communication regarding AM prescribing with recent migrant patients. Needs to be tailored to cultural beliefs and practices in ROI.</p> <p>Feasibility/Applicability to pt. population: While the Sample does not directly</p>

Key: **AM-** antimicrobial; **AMK-** antimicrobial knowledge; **AMR-** antimicrobial resistance; **AMS-** antimicrobial stewardship; **CBAS-** controlled before and after studies; **CR-** community researchers; **CS-** cohort studies; **CSOS-** cross sectional observational study; **CSS-** cross sectional survey; **DS-** databases searched; **EI-** educational intervention; **ES-** effect size; **EU-** Europe; **FG-** focus group; **GP-** general public; **GPP-** general practice provider; **HC-** health care; **HCS-** health care settings or system; **HCW-** health care workers; **HS-** high school; **IP-** infection prevention; **ITS-** interrupted time series study; **LOE-** level of evidence; **MA-** meta-analysis; **MI-** monthly income; **MMC-** mass media campaign; **N-** number of studies or number of participants; **NBAS-** non-controlled before and after studies; **NIHR-** National Institute for Health Research; **NMC-** non-medical community; **NR-** not recognized; **NRT-** non-randomized trial; **RCT-** randomized control trial; **ROI-** region of origin; **RX-** pharmacy; **SC-** social contacts; **SEAR-** Southeast Asia Region; **SES-** socio-economic status; **SM-** self-medication; **SR-** systematic review; **SSP-** Spanish speaking populations; **UAM-** unprescribed antimicrobials; **UK-** United Kingdom; **URI-** upper respiratory infection; **US-** United States; **WHO-** World Health Organization; **y.o.-** years old

Hospitals Bristol NHS Foundation Trust. Bias: NR Country: UK		about AM with this population.	Attrition: Not mentioned					represent migrants' in the U. S., it does provide insight into recent immigrant perceptions in general, including various geographical ROIs.
Sanchez (2014) Self-medication practices among a sample of Latino migrant workers in South Florida. Funding: National Institute on Minority Health and Health Disparities. Nova Southeastern University President's Faculty Research and Development Grant. Bias: NR Country: US	Community Based Participatory Research	Design: CSS and FG Purpose: Expand knowledge of SM practices among Latino immigrants in the US.	N(CSS): 278 N (FG): 24 Setting: Homestead area, South Florida Sample Demographics: All Latino migrant workers in South Florida. 54% male mean age 37.2 y.o. 68.7% < HS education 88% uninsured Inclusion Criteria: Latino origin ≥ 18 y. o. have a "farm card" 1+ episode unprotected sex in past 3 months Attrition: Not discussed.	Self-reported SM with medication and home remedies in past 12 months Themes: Access to HCS, trust in lay persons, injections are better than pills	Survey: Adapted Stage-Enhanced Motivational Interviewing (A-SEMI) and Health Promotion Comparison (HPC) FG: Began with 5 minute presentation on AM health issues.	Descriptive Statistics using IBM SPSS Version 21 QSR NVivo 10	Personal or secondary previous experience with AM. Lacking access to HCS, and high cost of services. Access to AM in local stores catering to immigrant population. Preference for injections over pills.	LOE: Level VI Strengths: Specific to Latino immigrant population in US. Weaknesses: FG included a convenience sample. Varied countries of origin. Behaviors are exclusively self-reported. Limited literacy of participants and ability to identify AMs. Conclusions: Due to difficulty accessing care in the US and cultural differences, Hispanic immigrants are likely to SM with AM. Culturally sensitive interventions are necessary to address this misuse of AM. Feasibility/Applicability to pt. population: Applicable: Specific to Hispanic immigrant population and SM with AM. Emphasizes need to develop culturally sensitive, population specific interventions.

Key: **AM-** antimicrobial; **AMK-** antimicrobial knowledge; **AMR-** antimicrobial resistance; **AMS-** antimicrobial stewardship; **CBAS-** controlled before and after studies; **CR-** community researchers; **CS-** cohort studies; **CSOS-** cross sectional observational study; **CSS-** cross sectional survey; **DS-** databases searched; **EI-** educational intervention; **ES-** effect size; **EU-** Europe; **FG-** focus group; **GP-** general public; **GPP-** general practice provider; **HC-** health care; **HCS-** health care settings or system; **HCW-** health care workers; **HS-** high school; **IP-** infection prevention; **ITS-** interrupted time series study; **LOE-** level of evidence; **MA-** meta-analysis; **MI-** monthly income; **MMC-** mass media campaign; **N-** number of studies or number of participants; **NBAS-** non-controlled before and after studies; **NIHR-** National Institute for Health Research; **NMC-** non-medical community; **NR-** not recognized; **NRT-** non-randomized trial; **RCT-** randomized control trial; **ROI-** region of origin; **RX-** pharmacy; **SC-** social contacts; **SEAR-** Southeast Asia Region; **SES-** socio-economic status; **SM-** self-medication; **SR-** systematic review; **SSP-** Spanish speaking populations; **UAM-** unprescribed antimicrobials; **UK-** United Kingdom; **URI-** upper respiratory infection; **US-** United States; **WHO-** World Health Organization; **y.o.-** years old

Table A3

Synthesis Table

Citation		Aponte-Gonzalez et al.	Burstein et al.	Jamhour et al.	King et al.	Lescure et al.	Lindenmeyer et al.	Nepal & Bhatta	Ocan et al.	Sanchez	Zanichelli et al.
Basic Data	Year	2019	2019	2017	2016	2018	2016	2018	2015	2014	2019
	LOE	VI	V	VI	V	V	VI	V	V	VI	V
	Design/Method	QR: FG and SSI	SR of VSD	CSS	SR of VSD	SR of VSD	QR: SSI	SR of CSSs	SR/MA of CSSs	QR: CSS/FG	SR of VSD
	Setting	CO	US	LB	Varied	EU/US	UK	SEAR	DC	US	EU
	SSP, DC, or Immigrant Focus	Y	N	N	N	N	Y	N	Y	Y	Y
	Bias	None	None	None	None	None	None	None	None	None	LR
Determinants of SM with AM	Age			I							
	Gender			I							
	Lower SES	S		I		S		S	S	S	S
	Less Education			I		S			S		
	Low AMK			S		S					
	Past AM Use	S				S		S	S	S	
	Access to AM					S				S	
	Immigrant Status					S					S
	Low HCS Access					S	S	S		S	
	Distrust of HCS						S				S
Interventions & Findings	MMC-Based EI's		↑ AMK		~ AMK ~ AMR						
	Clinic-Based EI's		↑ AMK		↑ AMK ~ AMR		Suggested				
	Home-Based EI's				↑ AMK						

Key: **AM**- antimicrobial; **AMK**- antimicrobial knowledge; **AMR**- antimicrobial resistance awareness; **CO**- Colombia; **CSS**- cross sectional study; **DC**- developing countries; **EI**- educational intervention; **EU**- Europe; **FG**- focus group; **HCS**- health care settings or system; **HIP**- Hispanic immigrant population; **I**- insignificant factor; **LB**- Lebanon; **LOE**- level of evidence; **LR**- low risk; **MA**- meta-analysis; **MMC**- mass media campaign; **QR**- qualitative research; **S**- significant factor; **SES**- socio-economic status; **SM**- self-medication; **SR**- systematic review; **SSI**- semi-structured interview; **SSP**- Spanish speaking populations; **UK**- United Kingdom; **US**- United States; **VSD**- various study designs; **↑**- increased; **↓**- decreased; **~**- no change

Appendix B

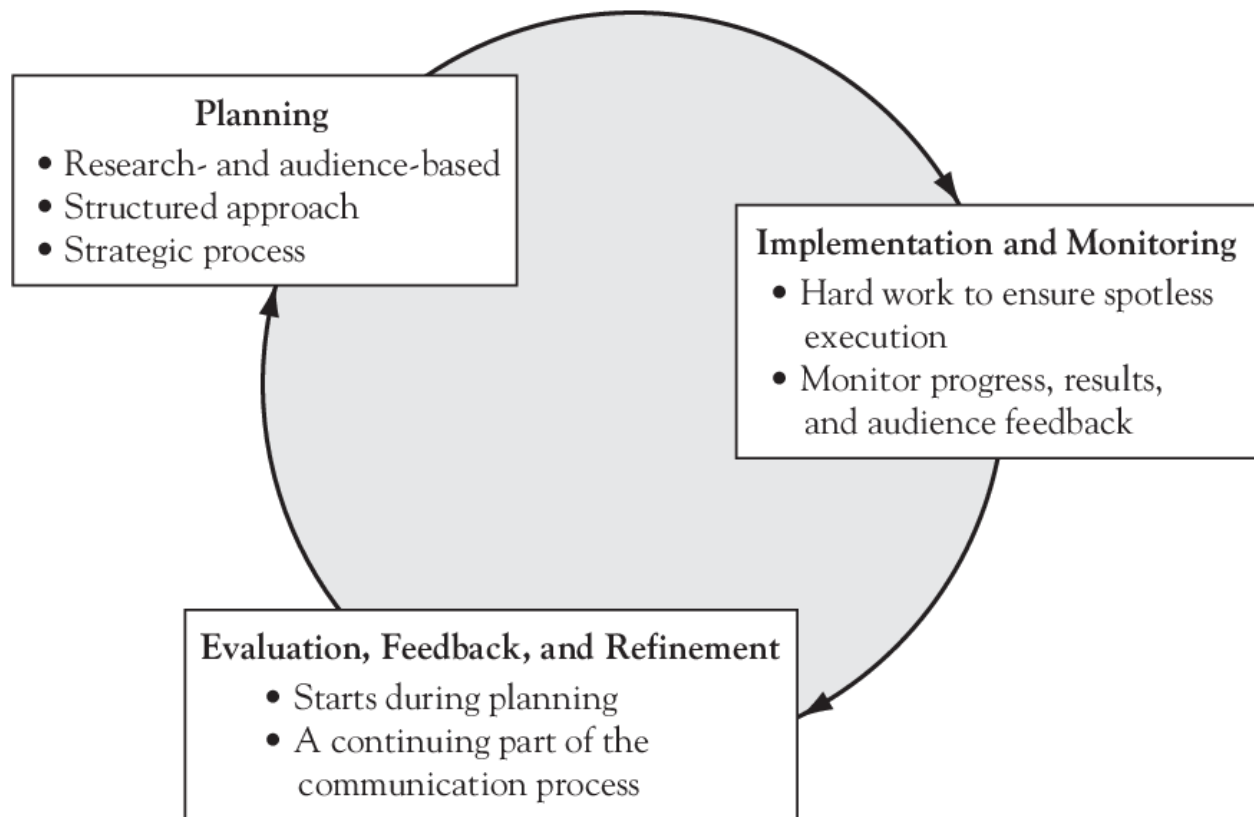
Models and Frameworks

Figure B1

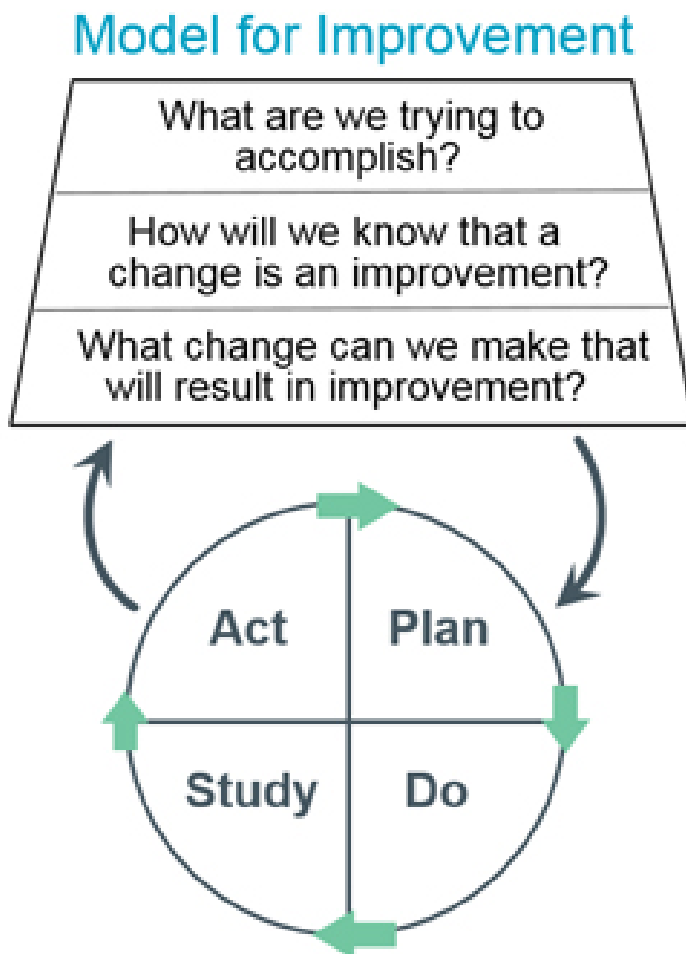
Health Communication Environment



Schiavo (2013).

Figure B2*Health Communication Cycle*

Schiavo (2013).

Figure B3*PDSA Cycle*

IHI (2020).

Appendix C

Institutional Review Board Approvals

Initial Approval



APPROVAL: EXPEDITED REVIEW

[Erin Tharalson](#)
[EDSON: DNP](#)

-
 Erin.Tharalson@asu.edu

Dear [Erin Tharalson](#):

On 7/27/2020 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Identifying Opportunities to Address Social Determinants of Health and Antibiotic Misuse in a Federally Qualified Health Center
Investigator:	Erin Tharalson
IRB ID:	STUDY00012206
Category of review:	
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	<ul style="list-style-type: none"> • Miranda_S_CITI Training Certificate.pdf, Category: Non-ASU human subjects training (if taken within last 3 years to grandfather in); • recruitment_methods_informedconsent_17-07-2020.pdf, Category: Consent Form; • recruitment_methods_recruitmentscript_14-07-2020.pdf, Category: Recruitment Materials; • Response to Modification Request Letter, Category: Other; • supporting_documents_EurobarometerEmail_13-7-2020.pdf, Category: Off-site authorizations (school permission, other IRB approvals, Tribal permission etc); • supporting_documents_questionnaires_17-7-2020.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • supporting_documents_WesleyLetterofSupport_17-7-2020.pdf, Category: Off-site authorizations (school

	permission, other IRB approvals, Tribal permission etc); • supporting_documents_WesleyNoticeofPrivacyPractices_13-07-2020.pdf, Category: Other; • Tharalson_E_CITI Training Certificate.pdf, Category: Non-ASU human subjects training (if taken within last 3 years to grandfather in); • Updated Protocol with Track Changes 30-7-2020, Category: IRB Protocol; • Wesley Registration Forms with Consent, Category: Other;
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The IRB approved the protocol from 7/27/2020 to 7/26/2021 inclusive. Three weeks before 7/26/2021 you are to submit a completed Continuing Review application and required attachments to request continuing approval or closure.

If continuing review approval is not granted before the expiration date of 7/26/2021 approval of this protocol expires on that date. When consent is appropriate, you must use final, watermarked versions available under the “Documents” tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Sarah Miranda
 Sarah Miranda

Final Modification



APPROVAL: MODIFICATION

[Erin Tharalson](#)

[EDSON: DNP](#)

-

Erin.Tharalson@asu.edu

Dear [Erin Tharalson](#):

On 10/28/2020 the ASU IRB reviewed the following protocol:

Type of Review:	Modification / Update
Title:	Identifying Opportunities to Address Social Determinants of Health and Antibiotic Misuse in a Federally Qualified Health Center
Investigator:	Erin Tharalson
IRB ID:	STUDY00012206
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	<ul style="list-style-type: none"> • recruitment_methods_informedconsent_26-10-2020.pdf, Category: Consent Form; • recruitment_methods_informedconsent_Spanish_18-10-2020.pdf, Category: Consent Form; • recruitment_methods_recruitmentscript_26-10-2020.pdf, Category: Recruitment Materials; • Social Determinants of Health and Antibiotic Misuse_IRB Protocol_27-10-2020.docx, Category: IRB Protocol; • supporting_documents_English questionnaires_26-10-2020.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);

The IRB approved the modification.

When consent is appropriate, you must use final, watermarked versions available under the “Documents” tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Sarah Miranda
Sarah Miranda

Final Translation

APPROVAL: MODIFICATION

[Erin Tharalson](#)
[EDSON: DNP](#)

-
 Erin.Tharalson@asu.edu

Dear [Erin Tharalson](#):

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The IRB approved the modification.

When consent is appropriate, you must use final, watermarked versions available under the "Documents" tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Sarah Miranda
Sarah Miranda

Appendix D

Recruitment Materials

Recruitment Script

English

Identifying Opportunities to Address Social Determinants of Health and Antibiotic Misuse in a Federally Qualified Health Center

Recruitment Script

Hello, my name is Sarah Miranda and I am a graduate student under the direction of Dr. Erin Tharalson in the Edson College of Nursing and Health Innovation at Arizona State University. I am conducting a study to evaluate social determinants of health and antibiotic knowledge among the patients at Wesley Community and Health Center. The purpose of this study is to inform the development of a future projects addressing social needs and antibiotic education.

I am recruiting individuals to complete a survey which will take approximately 15 minutes. Participants will answer 15 questions regarding social determinants of health, then 5 demographic questions, and finally 12 questions regarding antibiotic knowledge and behaviors.

Your participation in this study is voluntary. If you choose not to participate in this study or withdraw at any time it will not impact your care or treatment at the clinic. If you have any questions concerning the research study, please call me at (602) 499-8285.

Spanish

Identifying Opportunities to Address Social Determinants of Health and Antibiotic Misuse in a Federally Qualified Health Center

Recruitment Script-Spanish

Hola, me llamo Sarah Miranda, y soy una estudiante de postgrado bajo la dirección de la Doctora Erin Tharalson de la escuela Edson de Enfermería e Innovación de Salud en la Universidad Estatal de Arizona. Estoy llevando a cabo un estudio para evaluar determinantes sociales de la salud y conocimiento de antibióticos entre los pacientes del Centro de Salud Wesley. El propósito de este estudio es informar el desarrollo de proyectos en el futuro que van a ayudar con necesidades sociales y educación sobre antibióticos.

Estoy reclutando a personas para completar una encuesta que tomará aproximadamente 15 minutos. Los participantes responderán a 15 preguntas sobre los determinantes sociales de la salud, luego 5 preguntas demográficas, y finalmente 12 preguntas sobre el conocimiento y el uso de los antibióticos.

Su participación en este estudio es voluntaria. Si elige no participar en este estudio o no finaliza la encuesta en cualquier momento, no afectará su atención o tratamiento en el Centro de Salud Wesley. Si usted tiene alguna pregunta sobre el estudio de investigación, por favor llámeme al (602) 499-8285.

Informed Consent*English***Identifying Opportunities to Address Social Determinants of Health and Antibiotic Misuse in a Federally Qualified Health Center**

Dear Participant,

I am a graduate student under the direction of Dr. Erin Tharalson in the Edson College of Nursing and Health Innovation at Arizona State University. I am conducting a study to evaluate social determinants of health and antibiotic knowledge among the patients at Wesley Community and Health Center. The purpose of this study is to inform the development of a future project addressing social needs and antibiotic education.

Participants will verbally answer questions that will be read to them from three questionnaires. These include a social determinants of health questionnaire, a demographic questionnaire, and an antibiotic use questionnaire. These three questionnaires will take approximately 15 minutes to complete. There will be additional time to answer any questions you may have regarding the survey. Only the social determinants of health responses (the first 15 questions that will ask about money and resources, social and emotional health, refugee status, and safety) will be confidentially documented in the medical record so that Wesley Health Center may follow through with any necessary referrals for your social needs. All responses to the rest of the survey will be anonymous. For the purposes of this project we will not collect your name or any other personal identifying information. The results of this project may be used in reports, presentation, or publications as aggregate data only and will not report any personal identifying information.

Your participation in this survey is voluntary. You can skip any questions on the questionnaires if you wish. You may decline to have your social determinants of health responses be placed in the medical record and any referrals recommended as a result of that survey. If you choose not to participate or to withdraw at any time, there will be no penalty. It will not affect your care or treatment at Wesley Health Center in any way. You must be 18 years of age or older to participate. There are no foreseeable risks or discomforts to your participation.

Completing the survey will be considered your consent to participate. If you have any questions concerning this project, please contact the following team members:

Erin Tharalson, DNP, RN, ANP-BC, CWS at (480) 206-8076
Sarah Miranda, BSN, RN at (602) 499-8285

This project has been reviewed and approved by the Arizona State University Institutional Review Board. If you have any questions about your rights as a participant in this project, or if you feel you have been placed at risk, you can contact the Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480)-965-6788.

Thank you,

Sarah Miranda, BSN, RN, Graduate Student
Erin Tharalson, DNP, RN, ANP-BC, CWS

Spanish

Identifying Opportunities to Address Social Determinants of Health and Antibiotic Misuse in a Federally Qualified Health Center

Querido participante,

Yo soy una estudiante de postgrado bajo la dirección de la Doctora Erin Tharalson de la escuela Edson de Enfermería e Innovación de Salud en la Universidad Estatal de Arizona. Estoy llevando a cabo un estudio para evaluar determinantes sociales de la salud y conocimiento de antibióticos entre los pacientes del Centro de Salud Wesley. El propósito de este estudio es informar el desarrollo de proyectos en el futuro que van a ayudar con necesidades sociales y educación sobre antibióticos.

Los participantes responderán verbalmente a las preguntas que se les leerán de tres cuestionarios. Estos incluyen un cuestionario sobre determinantes sociales de la salud, un cuestionario demográfico y un cuestionario sobre el uso de antibióticos. Estos tres cuestionarios tardarán aproximadamente 15 minutos en completarse. Habrá tiempo adicional para responder cualquier pregunta que pueda tener sobre la encuesta. Solo las respuestas de los determinantes sociales de la salud (las primeras 15 preguntas sobre dinero y recursos, salud social y emocional, situación de refugiado, y seguridad) se documentarán de manera confidencial en el registro médico, para que el Centro de Salud Wesley pueda dar seguimiento con las recomendaciones necesarias para sus necesidades sociales. Todas las respuestas del resto de la encuesta serán anónimas. Para los propósitos de este proyecto, no recopilaremos su nombre ni ninguna otra información de identificación personal. Los resultados de este proyecto podrían ser utilizados en informes, presentaciones o publicaciones solo como datos agregados y no reportarán ninguna información de identificación personal.

Su participación en este estudio es voluntaria. Usted puede omitir cualquier pregunta de los cuestionarios si lo desea. Usted puede pedir que sus respuestas sobre los determinantes sociales de la salud no se incluyan en el registro médico y también puede rechazar cualquier referencia recomendada como resultado de esa encuesta. Si elige no participar o no finalizar la encuesta en cualquier momento, no habrá penalización. No afectará su atención o tratamiento en el Centro de Salud Wesley de ninguna manera. Usted debe tener 18 años de edad o más para participar. No hay riesgos ni molestias previsibles por su participación.

El completar la encuesta se considerará como su consentimiento para participar. Si tiene alguna pregunta sobre este proyecto, comuníquese con los siguientes miembros del equipo:

Erin Tharalson, DNP, RN, ANP-BC, CWS al (480) 206-8076
Sarah Miranda, BSN, RN al (602) 499-8285

Este proyecto ha sido revisado y aprobado por la Junta de Revisión Institucional de la Universidad Estatal de Arizona. Si tiene alguna pregunta sobre sus derechos como participante en este proyecto, o si siente que ha sido puesto en riesgo, puede comunicarse con la Junta de Revisión Institucional, a través de la Oficina de Integridad y Garantía de la Investigación de la ASU, al (480)-965-6788.

Gracias,

Sarah Miranda, BSN, RN, Estudiante de Postgrado
Erin Tharalson, DNP, RN, ANP-BC, CWS

Appendix E
Questionnaires

English

Social Determinants of Health Questionnaire	
The following questions and responses will be entered in the medical record:	
1	What is your current housing situation? I have housing I do not have housing (staying with others, in a hotel, in a shelter, outside on the street, or in a park) I choose not to answer this question
2	Are you worried about losing your housing? Yes No I choose not to answer this question
3	What is the highest level of school that you have finished? Less than a high school degree High school diploma or GED More than high school I choose not to answer this question
4	What is your current work situation? Unemployed and seeking work Part-time or temporary work Full time work Unemployed but not seeking work (student, retired, disabled, primary care giver) I choose not to answer this question
5	In the past year, have you or any family members you live with been unable to get any of the following when it was really needed? (circle all that apply) Food Clothing Utilities Childcare Medicine or any health care (medical, dental, mental health, or vision) Phone Other I do not have problems meeting my needs I choose not to answer this question

6	<p>Has lack of transportation kept you from medical appointments, meetings, work, or from getting things needed for daily living?</p> <p>Yes, it has kept me from medical appointments or from getting my medications</p> <p>Yes, it has kept me from non-medical meetings, appointments, work, or getting things needed for daily living</p> <p>No</p> <p>I choose not to answer this question</p>
7	<p>How often do you see or talk to people that you care about and feel close to? (For example: talking to friends on the phone, visiting friends or family, going to church or club meetings)</p> <p>Less than once a week</p> <p>1 or 2 times a week</p> <p>3 to 5 times a week</p> <p>More than 5 times a week</p> <p>I choose not to answer this question</p>
8	<p>How stressed are you? Stress is when someone feels tense, nervous, anxious, or cannot sleep at night because their mind is troubled.</p> <p>Not at all</p> <p>A little bit</p> <p>Somewhat</p> <p>Quite a bit</p> <p>Very much</p> <p>I choose not to answer this question</p>
9	<p>In the past year have you spent more than 2 nights in a row in a jail, prison, detention center, or juvenile correctional facility?</p> <p>Yes</p> <p>No</p> <p>I choose not to answer this question</p>
10	<p>Are you a refugee?</p> <p>Yes</p> <p>No</p> <p>I choose not to answer this question</p>
11	<p>What country are you from?</p> <p>United States</p> <p>Country other than the United States _____</p> <p>I choose not to answer this question</p>

Antibiotic Self-Medication Demographic Questionnaire	
1	Age: _____
2	Gender: Male Female
3	Race and Ethnicity: Hispanic or Latino/a White, Not Hispanic or Latino/a African American Native American Asian Other
4	How long have you lived in the U.S.: 0-2 years 3-5 years 6-10 years >10 years
5	Are you familiar with what is an antibiotic? Yes No Please give an example or definition:

ZA6693

Eurobarometer 85.1

**Country Questionnaire
United Kingdom**

NEW

B. ANTI-MICROBIAL RESISTANCE

ASK ALL

QB1 Have you taken any antibiotics orally such as tablets, powder or syrup in the last 12 months?

(ONE ANSWER ONLY)

Yes	1
No	2
DK	3

ASK QB2 AND QB3 IF "YES", CODE 1 IN QB1 – OTHERS GO TO QB4

QB2 How did you obtain the last course of antibiotics that you used?

(READ OUT – ONE ANSWER ONLY)

From a medical prescription	1
Administered by a medical practitioner	2
You had some left over from a previous course	3
Without prescription from a pharmacy	4
Without prescription from elsewhere	5
Don't remember (SPONTANEOUS)	6
DK	7

QB3 What was the reason for last taking the antibiotics that you used?

(READ OUT – MULTIPLE ANSWERS POSSIBLE)

Flu	1
Cold	2
Sore throat	3
Cough	4
Fever	5
Headache	6
Diarrhoea	7
Urinary tract infection	8
Skin or wound infection	9
Other (SPONTANEOUS)	10
DK	11

QB4	For each of the following statements, please tell me whether you think it is true or false.
-----	---

(READ OUT – ONE ANSWER PER LINE)

		True	False	DK
1	Antibiotics kill viruses	1	2	3
2	Antibiotics are effective against colds and flu	1	2	3
3	Unnecessary use of antibiotics makes them become ineffective	1	2	3
4	Taking antibiotics often has side-effects such as diarrhoea	1	2	3

EB79.4 QE2a

QB5	When do you think you should stop taking antibiotics once you have begun a course of treatment?
-----	---

(READ OUT – ONE ANSWER ONLY)

When you feel better	1
When you have taken all of the antibiotics as directed	2
Other (SPONTANEOUS)	3
DK	4

NEW

QB6	In the last 12 months, do you remember getting any information about not taking antibiotics unnecessarily, for example for a cold or flu?
-----	---

(ONE ANSWER ONLY)

Yes	1
No	2
DK	3

EB79.4 QE3a TREND MODIFIED

ASK QB7 TO QB9 IF "YES", CODE 1 IN QB6 – OTHERS GO TO QB10

PROG: CODE 12 IS EXCLUSIVE

QB7	How did you first get this information about not taking any antibiotics unnecessarily?
-----	--

(READ OUT – MULTIPLE ANSWERS POSSIBLE)

A doctor talked to you about it	1
A pharmacist talked to you about it	2
Another health professional (e.g. nurse or physio-therapist) talked to you about it	3
A family member or friend talked to you about it	4
You saw it on a TV advertisement	5
You saw it on the Internet or on online social media	6
You saw it in a leaflet or on a poster	7
You read it in a newspaper	8
You saw it on the TV news	9
You heard it on the radio	10
Other (SPONTANEOUS)	11
DK	12

EB79.4 QE3b TREND MODIFIED

QB8	Did the information that you received change your views on using antibiotics?
-----	---

(ONE ANSWER ONLY)

Yes	1
No	2
DK	3

EB79.4 QE3c TREND MODIFIED

ASK QB9 IF "YES", CODE 1 IN QB8 – OTHERS GO TO QB10

PROG: ROTATE ANSWERS 1 TO 6

PROG: CODES 8 AND 9 ARE EXCLUSIVE

QB9	On the basis of the information you received, how do you now plan to use antibiotics?
-----	---

(READ OUT – MULTIPLE ANSWERS POSSIBLE)

You will always consult a doctor in situations when you think you need antibiotics	1
You will no longer self-medicate with antibiotics	2

You will no longer take antibiotics without a prescription from a doctor	3
You will no longer keep left over antibiotics for next time you are ill	4
You will use antibiotics against the flu	5
You will give left-over antibiotics to your relatives or friends when they are ill	6
Other (SPONTANEOUS)	7
None (SPONTANEOUS)	8
DK	9

EB79.4 QE3d TREND MODIFIED

ASK ALL

INT.: (READ OUT) Antimicrobial Resistance (AMR) is the ability of microorganisms to resist antimicrobial treatments, especially antibiotics.

PROG: ROTATE ANSWERS 1 TO 5

PROG: CODES 7 AND 8 ARE EXCLUSIVE

QB10 On which topics, if any, would you like to receive more information?

(READ OUT – MULTIPLE ANSWERS POSSIBLE)

Resistance to antibiotics	1
How to use antibiotics	2
Medical conditions for which antibiotics are used	3
Prescription of antibiotics	4
Other (SPONTANEOUS)	5
None (SPONTANEOUS)	6
DK	7

NEW

PROG: QB11 MAX 3 ANSWERS

PROG: CODE 15 AND 16 ARE EXCLUSIVE

QB11 Which of the following sources of information would you use in order to get trustworthy information on antibiotics?

(READ OUT – MAX. 3 ANSWERS)

A doctor	1
----------	---

A nurse	2
A pharmacy	3
A hospital	4
Another health care facility	5
Family or friends	6
An official health-related website (e.g. a website set up by the national government/ public health body/ European Union)	7
A health-related personal blog	8
Another health-related website	9
Online social media	10
TV	11
Newspapers or magazines	12
The radio	13
Other (SPONTANEOUS)	14
You are not interested in finding information on antibiotics (SPONTANEOUS)	15
DK	16

EB79.4 QE4 TREND MODIFIED

QB12 At what level do you believe it is most effective to tackle the resistance to antibiotics?

(READ OUT – ONE ANSWER ONLY)

At individual level or within the family	1
At regional level	2
At national level	3
At global level	4
Action at all levels is needed (SPONTANEOUS)	5
DK	6

Spanish

Cuestionario de Determinantes Sociales de la Salud	
Las siguientes preguntas y respuestas se ingresarán en el registro médico:	
1	<p>¿Cuál es su situación actual de vivienda?</p> <p>Tengo vivienda</p> <p>No tengo vivienda (vivo con otras personas, en un hotel, en un albergue, vivo en la calle, o en un parque)</p> <p>Prefiero no responder a esta pregunta</p>
2	<p>¿Le preocupa poder perder su vivienda?</p> <p>Sí</p> <p>No</p> <p>Prefiero no responder a esta pregunta</p>
3	<p>¿Cuál es el nivel más alto de educación que ha completado?</p> <p>No terminó escuela secundaria</p> <p>Escuela secundaria o GED</p> <p>Superior a escuela secundaria</p> <p>Prefiero no responder a esta pregunta</p>
4	<p>¿Cuál es su situación de trabajo?</p> <p>Desempleado y busca trabajo</p> <p>Trabajo de tiempo parcial o temporal</p> <p>Trabajo de tiempo completo</p> <p>Desempleado, pero no busca trabajo (p. ej., estudiante, jubilado, incapacitado, cuidador principal).</p> <p>Prefiero no responder a esta pregunta</p>
5	<p>Durante el último año, ¿usted o algún miembro de su familia tuvieron que dejar de comprar algo que realmente se necesitaba entre las siguientes opciones? (Marque todas las que correspondan)</p> <p>Alimentos</p> <p>Ropa</p> <p>Servicios básicos</p> <p>Cuidado infantil</p> <p>Medicamentos o cualquier tipo de cuidado de la salud (médico, dental, mental, oftalmológico)</p> <p>Teléfono</p> <p>Otro</p> <p>No tengo problemas para satisfacer mis necesidades</p> <p>Prefiero no responder a esta pregunta</p>

6	<p>¿La falta de transporte le ha impedido acudir a consultas médicas, reuniones, al trabajo, o conseguir cosas necesarias para la vida cotidiana?</p> <p>Sí, me ha impedido acudir a consultas médicas o a recoger mis medicamentos</p> <p>Sí, me ha impedido ir a reuniones o citas no médicas, al trabajo o conseguir cosas que necesito en mi vida cotidiana</p> <p>No</p> <p>Prefiero no responder a esta pregunta</p>
7	<p>¿Con qué frecuencia ve o conversa con personas cercanas por las que se preocupa? (Por ejemplo: conversar con amigos por teléfono, visitar a amigos o familiares, asistir a la iglesia o a reuniones de club)</p> <p>Menos de una vez por semana</p> <p>1 o 2 veces por semana</p> <p>3 a 5 veces por semana</p> <p>5 o más veces por semana</p> <p>Prefiero no responder a esta pregunta</p>
8	<p>¿Qué tan estresado se encuentra? Estrés es cuando alguien se siente tenso, nervioso, ansioso o no puede dormir a la noche porque su mente está preocupada.</p> <p>Para nada</p> <p>Un poco</p> <p>Algo</p> <p>Mucho</p> <p>Bastante</p> <p>Prefiero no responder a esta pregunta</p>
9	<p>En el último año, ¿ha pasado más de 2 noches seguidas en una cárcel, prisión, centro de detención o centro correccional juvenil?</p> <p>Sí</p> <p>No</p> <p>Prefiero no responder a esta pregunta</p>
10	<p>¿Es refugiado?</p> <p>Sí</p> <p>No</p> <p>Prefiero no responder a esta pregunta</p>
11	<p>¿Cuál es su país de origen?</p> <p>Estados Unidos</p> <p>Otro país _____</p> <p>Prefiero no responder a esta pregunta</p>

12	<p>¿Se siente física o emocionalmente a salvo en su actual lugar de residencia?</p> <p>Sí No En duda Prefiero no responder a esta pregunta</p>
13	<p>Durante el último año, ¿ha tenido miedo de su pareja o su expareja?</p> <p>Sí No En duda No he tenido pareja durante el último año Prefiero no responder a esta pregunta</p>
14	<p>En los últimos 12 meses hemos estado preocupados porque se acabe la comida antes de tener dinero para comprar más.</p> <p>Sí No</p>
15	<p>En los últimos 12 meses la comida que compramos no nos duró y no teníamos dinero para comprar más.</p> <p>Sí No</p>
16	<p>Sus respuestas a estas quince preguntas se documentarán en su expediente médico en el Centro de Salud Wesley. Usted tiene derecho a rechazar ahora o más adelante este ingreso en su registro médico.</p> <p>¿Puedo documentar sus respuestas a las quince preguntas en su registro médico?</p> <p>Sí No</p>
17	<p>¿Le gustaría recibir ayuda en las siguientes áreas?</p> <p>Administración de Casos Consejería Cita con un Doctor Recursos Comunitarios</p> <p>*If the participant requests assistance to one or more of these, then respond:</p> <p>Enviaré una referencia para asistencia a través del registro médico electrónico al Centro de Salud Wesley y ellos se comunicarán con usted con respecto a su solicitud.</p>

Antibiotic Self-Medication Demographic Questionnaire	
1	Edad: _____
2	Sexo: Masculino Femenino
3	Raza y etnicidad: Hispano o Latino Blanco, no de origen Hispano o Latino Afroamericano Nativo Americano Asiático Otro
4	¿Cuánto tiempo ha usted vivido en los Estados Unidos? 0-2 años 3-5 años 6-10 años >10 años
5	¿Sabe usted que es un antibiótico? Sí No Por favor provea un ejemplo o definición:

ZA6693

Eurobarometer 85.1

**Country Questionnaire
Spain (Spanish)**

B. RESISTENCIA ANTIMICROBIANA

A TODOS

QB1	¿Ha tomado antibióticos de forma oral como comprimidos, en polvo o jarabes en los últimos 12 meses?
-----	---

(UNA SOLA RESPUESTA)

Sí	1
No	2
NS	3

QB2	¿Cómo obtuvo el último tratamiento de antibióticos que tomó?
-----	--

(LEER - UNA SOLA RESPUESTA)

Con receta médica	1
Administrado por un profesional sanitario	2
Le quedaban algunos de un tratamiento anterior	3
De una farmacia sin receta	4
De otro lugar sin receta	5
No lo recuerda (ESPONTÁNEO)	6
NS	7

QB3	¿Cuál fue el motivo para tomar antibióticos la última vez?
-----	--

(LEER - POSIBLE RESPUESTA MÚLTIPLE)

Gripe	1
Resfriado	2
Dolor de garganta	3
Tos	4
Fiebre	5
Dolor de cabeza	6
Diarrea	7
Infección de las vías urinarias	8
Infección de la piel o de una herida	9
Otro (ESPONTÁNEO)	10

QB4	Para cada una de las siguientes afirmaciones, me gustaría que me dijera si cree que es verdadera o falsa.
-----	---

(LEER - UNA RESPUESTA POR LÍNEA)

		Verdadera	Falsa	NS
--	--	-----------	-------	----

1	Los antibióticos matan virus	1	2	3
2	Los antibióticos son efectivos contra los resfriados y la gripe	1	2	3
3	El uso innecesario de antibióticos los convierte en inefectivos	1	2	3
4	A menudo, tomar antibióticos tiene efectos secundarios como la diarrea	1	2	3

EB79.4 QE2a

QB5	¿Cuándo cree que debe dejar de tomar antibióticos una vez empezado un tratamiento?
-----	--

(LEER - UNA SOLA RESPUESTA)

Cuando se siente mejor	1
Quando ha tomado todos los antibióticos que le han indicado	2
Otro (ESPONTÁNEO)	3
NS	4

NEW

QB6	En los últimos 12 meses, ¿recuerda haber recibido información acerca de no tomar antibióticos de manera innecesaria, por ejemplo, en caso de resfriado o gripe?
-----	---

(RESPUESTA ÚNICA)

Sí	1
No	2
NS	3

EB79.4 QE3a TREND MODIFIED

PREGUNTAR QB7 A QB9 SI "SÍ", CÓDIGO 1 EN QB6 - OTROS IR A QB10

PROG.: EL CÓDIGO 12 ES ÚNICO

QB7	¿Cómo recibió por primera vez esta información acerca de no tomar antibióticos de manera innecesaria?
-----	---

(LEER - POSIBLE RESPUESTA MÚLTIPLE)

Se lo dijo un/a médico	1,
Se lo dijo un/a farmacéutico/a	2,
Se lo dijo otro profesional de la salud (por ejemplo, un/a enfermero/a o fisioterapeuta)	3,
Se lo dijo un/a familiar o amigo/a	4,
Lo vio en un anuncio de televisión	5,
Lo vio en Internet o en un medio social online	6,
Lo vio en un folleto o póster	7,
Lo leyó en el periódico	8,
Lo vio en el telediario	9,
Lo oyó en la radio	10,
Otro (ESPONTÁNEO)	11,
NS	12,

EB79.4 QE3b TREND MODIFIED

QB8	¿La información que recibió cambió su opinión sobre el uso de antibióticos?
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(RESPUESTA ÚNICA)

Sí	1
No	2
NS	3

EB79.4 QE3c TREND MODIFIED

PREGUNTAR QB9 SI "SÍ", CÓDIGO 1 EN QB8 - OTROS IR A QB10

PROG.: ROTAR RESPUESTAS 1 A 6

PROG.: LOS CÓDIGOS 8 Y 9 SON ÚNICOS

QB9 Basándose en la información recibida, ¿cómo se plantea utilizar los antibióticos ahora?

(LEER - POSIBLE RESPUESTA MÚLTIPLE)

Siempre consultará con un/a médico en las situaciones en las que crea que necesita tomar antibióticos	1,
Nunca volverá a automedicarse con antibióticos	2,
Nunca volverá a tomar antibióticos sin una receta médica	3,
Nunca volverá a conservar antibióticos que le sobren para la próxima vez que esté enfermo/a	4,
Utilizará antibióticos contra la gripe	5,
Dará los antibióticos que le sobren a familiares y amigos cuando estén enfermos	6,
Otro (ESPONTÁNEO)	7,
Ninguno (ESPONTÁNEO)	8,
NS	9,

EB79.4 QE3d TREND MODIFIED

A TODOS

ENT.: (LEER) La resistencia a los antimicrobianos es la habilidad que tienen los microorganismos de resistir los tratamientos antimicrobianos, especialmente los antibióticos.

PROG.: ROTAR RESPUESTAS 1 A 5

PROG.: LOS CÓDIGOS 7 Y 8 SON ÚNICOS

QB10 ¿Sobre qué temas, si hay alguno, le gustaría recibir más información?

(LEER - POSIBLE RESPUESTA MÚLTIPLE)

Resistencia a los antibióticos	1,
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Cómo utilizar los antibióticos	2,
Problemas médicos para los cuales se utilizan antibióticos	3,
Prescripción de antibióticos	4,
Otro (ESPONTÁNEO)	5,
Ninguno (ESPONTÁNEO)	6,
NS	7,

NEW

PROG.: QB11 MÁX. 3 RESPUESTAS

PROG.: LOS CÓDIGOS 15 Y 16 SON ÚNICOS

QB11 ¿Cuáles de las siguientes fuentes de información usaría para obtener información fiable sobre los antibióticos?

(LEER - MÁXIMO 3 RESPUESTAS)

Un/a médico/a	1,
Un/a enfermero/a	2,
Una farmacia	3,
Un hospital	4,
Otro centro de salud	5,
Familiares o amigos	6,
Una página web oficial relacionada con la salud (por ejemplo, una página web creada por el gobierno nacional, un organismo de sanidad pública o la Unión Europea)	7,
Un blog personal relacionado con la salud	8,
Otra página web relacionada con la salud	9,
Medios sociales online	10,
Televisión	11,
Periódicos o revistas	12,
La radio	13,
Otra (ESPONTÁNEO)	14,
No le interesa encontrar información sobre los antibióticos (ESPONTÁNEO)	15,
NS	16,

EB79.4 QE4 TREND MODIFIED

QB12 ¿A qué escala cree que es más eficaz luchar contra la resistencia a los antibióticos?

(LEER - UNA SOLA RESPUESTA)

A escala individual o dentro de la familia	1
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A escala regional	2
A escala nacional	3
A escala mundial	4
Hay que actuar a todas las escalas (ESPONTÁNEO)	5
NS	6

Appendix F

Tables

Table F1

Demographic Characteristics of Participants

Demographic Characteristic	<i>n</i>	%
Language		
English	3	15.00
Spanish	17	85.00
Gender		
Female	15	75.00
Male	5	25.00
Race/Ethnicity		
Native American	1	5.00
Hispanic	19	95.00
Time Lived in the US		
> 10 years	20	100.00
Age		
Range (in years)	26-68	
Average (SD)	52.4 (12.53)	

Table F2*SDOH Survey Results*

SDOH Items	<i>n</i>	%
Housing status		
I have housing	16	80.00
I do not have housing	4	20.00
Housing insecurity		
Yes	4	20.00
No	16	80.00
Education level		
Less than high school	11	55.00
High school/GED	7	35.00
More than high school	2	10.00
Employment status		
Full time	3	15.00
Part time or temporary	5	25.00
Unemployed and seeking work	2	10.00
Unemployed due to disability or caregiver role	10	50.00
Difficulty meeting needs of daily living (multiple answers allowed)		
No difficulty	15	75.00
Food and clothing	1	5.00
Medicine or healthcare	2	10.00
Clothing and utilities	1	5.00
Other	1	5.00
Lack of transportation		
Yes	0	0.00
No	20	100.00
Social contact frequency		
1-2 times per week	9	45.00
3-5 times per week	4	20.00
More 5 times per week	7	35.00
Stress level		
Not at all	5	25.00
A little bit	8	40.00
Somewhat	3	15.00
Quite a bit	4	20.00
Very much	0	0.00

SDOH Items	<i>n</i>	%
Recent Incarceration		
Yes	0	0.00
No	20	100.00
Refugee status		
Yes	0	0.00
No	20	100.00
Country of origin		
United States	2	10.00
Mexico	18	90.00
Feels safe at home		
Yes	19	95.00
No	1	5.00
Domestic violence history		
Yes	0	0.00
No	20	100.00
Food insecurity (concern)		
Yes	7	35.00
No	13	65.00
Food insecurity (actual)		
Yes	4	20.00
No	16	80.00
Resources requested (multiple answers allowed)		
None	14	70.00
Community resources	4	20.00
Provider visit	1	5.00
Behavioral health counseling	2	10.00
Overall SDOH score		
Range	4.00 – 12.00	
Average (SD)	7.15 (1.90)	

Table F3*Antibiotic Survey Results*

Antibiotic Items	<i>n</i>	<i>%</i>
Familiar with antibiotics		
Yes	19	95.00
No	1	5.00
Definition or example		
Accurate	12	60.00
Inaccurate	5	25.00
Unable to give definition or example	3	15.00
Antibiotic use in the past year		
Yes	10	50.00
No	10	50.00
Source of last antibiotics used		
Prescribed	10	50.00
Unprescribed	1	5.00
Unsure	9	45.00
Reason for last antibiotics used		
Cold	1	5.00
Sore throat	2	10.00
Urinary tract infection	1	5.00
Skin infection	1	5.00
Unsure	9	45.00
Other	6	30.00
Antibiotics kill viruses (true/false)		
True	9	45.00
False	7	35.00
Unsure	4	20.00
Antibiotics treat cold and flu (true/false)		
False	9	45.00
True	11	55.00
Unsure	0	0.00
Unnecessary antibiotic use can make them ineffective		
True	13	65.00
False	7	35.00
Unsure	0	0.00
Antibiotics can have side effects		

Antibiotic Items	<i>n</i>	%
False	8	40.00
True	11	55.00
Unsure	1	5.00
When is it appropriate to stop taking antibiotics after prescribed		
Take full course as prescribed	15	75.00
When you feel better	4	20.00
Unsure	1	5.00
Received recent antibiotic education		
Yes	2	10.00
No	18	90.00
Source of antibiotic education		
Television	1	5.00
Poster	1	5.00
Not applicable	18	90.00
Did antibiotic education change views		
Yes	1	5.00
No	1	5.00
Not applicable	18	90.00
After antibiotic education future antibiotic use		
Always consult doctor before taking antibiotics	2	10.00
Not applicable	18	90.00
Preferred education topics (multiple answers allowed)		
Medical conditions for antibiotic use	7	35.00
Antibiotic resistance	3	15.00
Prescription of antibiotics	3	15.00
Antibiotic use	2	10.00
Unsure	2	10.00
All	2	10.00
None	3	15.00
Preferred source for antibiotic education (multiple answers allowed)		
Doctor	20	100.00
Pharmacy	3	15.00
Nurse	1	5.00
Official health related website	4	20.00
Other health related website	4	20.00
Other healthcare facility	1	5.00
Radio	1	5.00

Antibiotic Items	<i>n</i>	%
Television	1	5.00
Preferred level to tackle resistance		
Individual/family	8	40.00
National	4	20.00
Global	5	25.00
Unsure	3	15.00
Antibiotic knowledge score		
Range	0.00 – 5.00	
Average (SD)	2.65 (1.39)	