Identifying Opportunities for Process Improvement in Innovative Healthcare Technology

Implementation

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Abstract

SolarSPELL is a digital learning library created at Arizona State University for educational environments in the Pacific and East Africa. The library is curated to deliver information to resource-challenged communities around the world, providing culturally relevant materials in a solar-powered data repository. A new SolarSPELL health library was deployed in a border-adjacent community in Sonora, Mexico to enhance health education resources. The Sonoran SolarSPELL (SSS) library is a community-driven model established through Doctor of Nursing Practice (DNP) leadership and reflects the innovative focus of SolarSPELL. The purpose of this report is to contextualize the Sonoran SolarSPELL experience, identify opportunities for process improvement and innovative leadership, and identify an evidence-based framework to guide implementation in new communities. Implementation framework utilization is especially important in the integration of technology into healthcare settings, where barriers can be novel and complex. Key focal points included the development of strong partnerships with the community members, collaborative design, and leadership roles of DNPs in project development and implementation. This study provides a paradigm for both DNP leadership and the application of innovative healthcare technologies in under-served communities throughout the world.

Keywords: Doctor of Nursing Practice (DNP), healthcare, leadership, innovation

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educational environments in the Pacific and East Africa. The digital library is curated to deliver

information to resource-challenged communities around the world, providing culturally relevant

materials in a solar-powered data repository. A new SolarSPELL health library was developed

and deployed in a border community in Sonora, Mexico to enhance health education resources

for students, practitioners, and community members. The Sonoran SolarSPELL library is a

community-driven model established through Doctor of Nursing Practice (DNP) leadership and

reflects the innovative focus of SolarSPELL. Guided by evidence-based content specifically

curated for efficacy and cultural relevance, SolarSPELL implementation has the potential to

yield meaningful improvement in health knowledge, engagement, and outcomes.

Problem Statement

The integration of technology into healthcare has mitigated barriers in many under-

resourced communities across the globe. Healthcare technology can improve treatment

opportunities, resources, and patient outcomes when utilized in a meaningful, culturally

appropriate capacity. Implementation framework utilization is especially important in the

integration of technology into healthcare settings, where barriers can be novel and complex.

These issues can be compounded with preexisting disparities derived from geographic and

economic conditions that disproportionately affect rural or under-resourced communities (Reid,

2019). To positively impact these communities, healthcare technology must be matched to the

unique complexities of each community. The most effectual technologies must be viable in

many settings and circumstances so that the unique barriers of each community can be overcome. For SolarSPELL, the use of an evidence-based framework will facilitate and enhance the implementation process in new communities worldwide.

Purpose and Rationale

The purpose of this DNP project was to contextualize the experiences of the Sonoran SolarSPELL (SSS) team as a new version of the digital library was deployed in a novel setting. In doing so, opportunities for process improvements were identified and used to inform the development of an evidenced-based implementation framework for SolarSPELL teams entering diverse international settings.

Successful implementation is essential, as the SolarSPELL digital library fosters and facilitates community-wide capability building by providing widely accessible health and education materials that can empower community members and mitigate healthcare disparities. Strategies that assist rural communities in both planning and securing essential resources to employ and sustain evidence-based practice (EBP) initiatives are critical for successful implementation (Booth & Carroll, 2015). By utilizing an implementation framework that focuses on the comprehension and consideration of the community's unique qualities and contexts, the SolarSPELL team will avoid potential pitfalls that can undermine the both the project and its progress. Implementation frameworks can assist with healthcare priority setting at the meso-level, which is crucial for interdisciplinary and collaborative teams in rural and resource-constrained communities (Mcdonald & Ollerenshaw, 2011). By partnering with the stakeholders and community in an effective and efficient way, SolarSPELL can build strong relationships that will empower local project development and sustainability (Laycock et al., 2019). Implementation barriers and facilitators must be identified through the comprehension

and contextualization of the experiences of all innovation agents in order to construct effective

implementation strategies (Martinez et al., 2017). By linking EBP outcome measurements to an

implementation framework that is tailored to the community, SolarSPELL will gather

meaningful data regarding the impact of the library, which will facilitate effective and efficient

revisions to the project scope over time. The use of a framework to guide SolarSPELL

implementation and continuous assessment will strengthen the overall capacity of the initiative in

the local community and across the globe.

Background and Significance

In both low and high-income countries, rural communities are continually and

systematically disadvantaged on numerous levels that impact health (Reid, 2019). Along with

low population density and distance from urban areas, the uniquely defining characteristics of

rural communities are the synthesis of their social, economic, and geographic characteristics as

well as the cultural, religious, and personal values of the inhabitants (Nelson, Pomerantz,

Howard, & Bushy, 2007). The application of innovative technology in rural, resource-reduced

settings can offer efficient, effective mechanisms to improve the health and wellbeing of the

community.

Border-Adjacent Communities

Although most rural Mexican communities have small health clinics, the quality of

staffing, medical training, and supplies varies widely, and as a result many communities do not

have effectual clinics (Duan et al., 2018). Existing clinics in rural and/or border-adjacent

communities commonly have multiple shortfalls: prescribed medicines are unavailable at the

clinic, forcing patients to purchase them out-of-pocket at a private pharmacy, lack of medical

staff and specialists, staff absenteeism, limited service hours/availability, inadequate treatment

space, and lack of coverage for some interventions (Wilson, 2016). These challenges are often

compounding or comorbid; as a result, many people must travel long distances to receive

adequate care for both episodic concerns and chronic diseases (Duan et al., 2018). A lack of trust

in providers causes poor continuity of care and care fragmentation, resulting in the episodic

consumption of healthcare: patients seek healthcare for acute concerns or chronic diseases only

when needed (Duan et al., 2018). Individual funding for Seguro Popular is not guaranteed and

must be renegotiated annually which places an extra burden on patients (Wilson, 2016). All of

these conditions can amplify preexisting health disparities of border-adjacent communities.

Population Demographics.

In 2017, the state of Sonora was home to three million people, with a per capita GDP of

$17,799 annually (IHME, 2020). In 2010, the national census recorded 6,401 residents in the

border-adjacent town (BAT) (INEGI, 2020). In the community about 50.4% of the population is

unemployed, with more than 60% of residents subsiding on $50 (U.S.) per week or less, which is

equivalent to $2,600 /year (INEGI, 2020; Curran, Spencer, & Chavez, 2020). In 2015, 50.1 % of

the BAT population was recorded as female, with only 9% of all residents aged 60 or more

(INEGI, 2020). Throughout the borderlands, populations are young: 30% of Mexican border-

adjacent inhabitants are under age 15, compared to 24% of U.S. peers; due to high fertility rates

and the northern migratory flow (PAHO, 2012). According to the INEGI (2020), 88% of BAT

residents are of Mexican nationality; yet this does not account for temporary or seasonal

residents.

National Healthcare.

Driven by the rate of citizens pushed into extreme poverty because of healthcare

spending, Mexico's federal government endorsed the idea of healthcare as a human right and

implemented the Seguro Popular (SP) health insurance system in 2003 (Wilson, 2016). With a

continuing goal of universal healthcare, SP provides financial protection for the poorest citizens

and the non-Social Security insured, especially in the event of catastrophic healthcare expenses

(Duan et al., 2018; Gutiérrez, García-Saisó, Dolci, & Ávila, 2014). SP can be viewed as a

longitudinal public policy strategy aimed at economic growth that also enhances access to

healthcare services and primary healthcare utilization (Leyva-Flores et al., 2014).

In 2012, just under half of the Mexican population (57 million people) lacked effective

access to healthcare services (Gutiérrez et al., 2014). According to outcomes measurement

studies conducted at the national and state level, SP intervention programs do not reach into rural

regions where there is limited or nonexistent access to healthcare despite an equal disease burden

in both rural and urban areas (Duan et al., 2018). SP limitations result from either an absence of

financial protection or the presence of barriers to public services (Gutiérrez et al., 2014). These

barriers can disproportionately affect rural, border-adjacent communities, increasing the

concentration of poverty and poor health in these areas.

Local Healthcare Technologies.

The need for innovative technology goes beyond mere internet access, as many

communities do not have reliable, affordable, or viable broadband or electricity. In many older

populations, the lack of both acceptance of healthcare technologies and the necessary skills for

their use is a significant obstacle to widespread use (Clarke & Macdonald, 2018). A study of the

utilization of drone telemedicine units to monitor blood pressure in rural Mexico found that

efficacy was undermined by connectivity and accuracy issues (Wulfovich et al., 2018).

Despite the high level of poverty, smartphone and tablet use in the BAT are comparable

to other resource-constrained communities across the globe (SolarSPELL, 2020). According to

government data, about 37% of the town residents have a personal computer, 40% have a

landline phone, and 39% have internet access at home (INEGI, 2020). According to community

stakeholders, at least one smartphone is present in virtually every household, and most older

children have access to their family or an individual phone most day (Curran et al., 2020).

Smartphone use is so ubiquitous in the BAT that concerns regarding constant use and lack of

exercise in children were discussed at length during the community health assessment (CHA).

While this situation makes a digital library seem like a good fit for the community, the

stakeholders identified low technology literacy among older residents as a potential barrier to

SolarSPELL utilization (Curran et al., 2020).

SolarSPELL

In resource-constrained locations, access to EBP and quality information is problematic

due to numerous barriers like unreliable, absent, or expensive access to the internet and

electricity (SolarSPELL, 2020). Developed at Arizona State University and implemented across

the globe, the SolarSPELL device is an all-in-one, self-powered plug-and-play kit, ready to be

deployed with minimal training and maintenance (SolarSPELL, 2020). The small, rugged, and

portable device is powered by a built-in solar panel that can connect any capable device to its

offline WiFi hotspot. Users then have unlimited, free access to curated, open-sourced content

that can be downloaded directly onto the device, allowing continued access when no longer

linked to the server (SolarSPELL, 2020).

SolarSPELL provides pertinent, localized educational content to resource-constrained

locations around the world, enriching the development of each community (SolarSPELL, 2020).

SolarSPELL uses the training of the trainer (ToT) model that was developed by the Center for

Disease Control (CDC). The ToT engages master trainers in coaching new trainers, with its

training workshops creating a pool of competent instructors who can then effectively teach the

material to others (CDC, 2019). The SolarSPELL team travels to implementation sites and trains

in-country partners who remain in the community and can continue to spread these skills to local

community members. This implementation approach maximizes sustainability and overall

impact of the SolarSPELL library (SolarSPELL, 2020). With the possibility of community-wide

access, the SolarSPELL library fosters and facilitates community-wide capability building by

increasing access to materials on health and safety, agriculture, or learning English as a second

language (SolarSPELL, 2020).

As an organization, SolarSPELL employs a core administrative team which includes a

program coordinator who evaluates overall impact, a library specialist, and a sustainability

director who oversees in-field implementation. Each SolarSPELL device is embedded with

Automated Usage Tracking Software that tracks the access frequency of each library resource,

the most commonly utilized content categories, and the type of device being used to connect with

the SolarSPELL server (SolarSPELL, 2020). The collected data is used to evaluate impact and

inform ongoing improvements and revisions, ensuring that the library content is meeting the

unique needs of each community. SolarSPELL prioritizes integrating impact evaluation into

each stage of the project by assessing the efficacy of SolarSPELL training workshops and

conducting in-depth interviews with the implementation partners to understand how the device is

utilized in the community (SolarSPELL, 2020).

SolarSPELL Health.

Conventionally, SolarSPELL is operated in partnership with the U.S. Peace Corps and

national ministries of health: large, well-structured organizations that facilitate community

implementation using their local knowledge, established relationships, and trust. In Sonora,

SolarSPELL entered a novel setting with a new partner: a small, U.S.-based wellness initiative (WI). Since 2010, the WI has developed a strong presence within the community and is focused on collaborative capacity-building in healthcare resources. The WI provides medical and wellness services to benefit the minds and bodies of people with limited resources while maintaining the values and culture of the local people and their communities (WI, 2020). Among many successful initiatives, the WI is most proud of its two community centers and organic gardening education program for schools and families. The WI grows organically itself; the founder's experience with organizational culture informed the foundation's inception, and a flexible, adaptable process maintains the organization's growth and development.

Internal Evidence

In 2017 the top three causes of death in Sonora were ischemic heart disease, diabetes mellitus, and chronic kidney disease (IHME, 2020). Over 35% of Sonorans over age 60 have hypertension (INEGI, 2020). Approximately 77% of the adult population of the state are overweight or obese, and between 12-14% of adults have diabetes (INEGI, 2020). In the BAT, about 70% of the adult population is affected by diabetes according to estimations by local healthcare providers (Curran et al., 2020). Diabetes was the top cause of disability in the state in 2017 according to the, and roughly 2.5% of the BAT population is disabled (all causes) (IHME 2020, INEGI, 2020).

During the CHA, both healthcare workers and other community stakeholders identified top health concerns as diabetes, obesity (all ages), dental hygiene, low health literacy, lack of nutrition education/guideline adherence, hypertension, lice, first aid training, and handwashing/hygiene. Other concerns included a lack of positive role models for children, excessive electronic device use, and a lack of activities for children, especially girls (Curran et

al., 2020).   Meaningful nutrition education was designated as a top priority for the SolarSPELL health library: stakeholders stated that visual guides to healthy meals and portion control would best serve the town population (Curran et al., 2020). The innovative design of SolarSPELL facilitates public access to custom materials that are culturally relevant and widely inclusive.

Local Healthcare Resources

As expected, the healthcare resources in the border-adjacent town are severely deficient. There is no major hospital in the area, and no local emergency response system. Healthcare workers are required to respond to emergencies, but resources in town are scarce; medical emergencies are typically transported to a distant Sonoran town or to Tucson, Arizona. Local schools do not have healthcare staff, leaving teachers to perform basic first aid, even though they typically have no training or supplies (Curran et al., 2020). Medical specialists, including Women's and Children's hospitals, are in Hermosillo, Sonora, which is a 4.5-hour drive away on a toll road, further limiting access to these resources. This issue is substantial because the town has no locally available birthing and neonatal care, aside from a single bed reserved for obstetric emergencies.

In the BAT, healthcare is provided in small, resource-constrained clinics, such as the Centro Salud clinic, which primarily serves residents with national, public healthcare (Seguro Popular) and is operated by the Ministry of Health. The Unidad de Medicina clinic is operated by the Mexican Social Security Institute (IMSS), which provides health insurance for employed residents and their families. In addition to Seguro Popular and IMSS health insurance, several other public insurance systems exist for military, national, state, and oil employees, but in 2015 none of the town residents qualified for these services (INEGI, 2020). Each independent system has its own network of healthcare resources, and members must stay within their network

(Curran et al., 2020). In 2010, little more than half the town population were covered by any health insurance, and in 2015, 49.8% were covered by Seguro Popular (INEGI, 2020). While many Mexicans remain uninsured, the national and local rate of coverage is growing (INEGI, 2020).

The WI provides two clinics that provide education and social resources in addition to limited health programs, such as Physical Therapy, Reiki, exercise classes, diabetes management, blood pressure and blood glucose checks, free meals for seniors, and foot care clinics. The WI has been instrumental in securing many of the resources available in the Centro Salud clinic by fundraising and collecting donations of vital equipment such as an autoclave and mobility assistants like walkers and wheelchairs. The WI works to improve the health literacy of the BAT and has collaborated with many partners in order to increase awareness of health issues, available resources, and education opportunities (Curran et al., 2020).

Although there are private pharmacies in the town, the primary customers are U.S. citizens who cross the border in search of cheaper medication. Most locals get medication from the local clinic stocks, if available. The same is true for oral healthcare: private dentists in the community serve only the wealthiest residents and bargain-hunting Americans; there is no local dentist to serve most town residents (Curran et al., 2020).

Public Information Resources

The state of Sonora has 144 operating public libraries, with just one located in the BAT (INEGI, 2020). Upon visiting the tiny space, the library clerk described the library's primary function as a site for homework help, community crafts, and social engagement. Two computers with internet access were available, and the small collection is primarily old encyclopedias, periodicals, and non-fiction. The clerk noted that community engagement, especially with teens,

was a constant challenge, and that the entire resource was underutilized by the community. The library's sexual health and healthy relationships information sessions directed at teens has had minimal engagement (Curran et al., 2020). In addition to an internet café, the BAT has public internet access via two computers in each WI clinic, which also offer textbooks and homework resources to the community (Curran et al., 2020). While there are some educational resources available to the BAT residents, limited access and awareness are significant barriers to frequent utilization.

SolarSPELL Deployment

SolarSPELL has been very effective in mobilizing the devices in the following countries: Fiji, South Sudan, Rwanda, Vanuatu, Tonga, Comoros, Samoa, and the Federated States of Micronesia (SolarSPELL, 2020). In four years of operation, SolarSPELL has deployed over 365 digital libraries reaching over 87,000 people (SolarSPELL, 2020).

As SolarSPELL has grown its members and global impact, an adaptive and organized approach is needed to ensure that the same high-quality materials are delivered to all current and future SolarSPELL sites. With ready access to culturally and age appropriate heath education materials, individuals could download information from the SolarSPELL library directly onto their own devices. This opportunity for discrete access facilitated by SolarSPELL will increase the healthy literacy at the individual and community level. With the expansion into Sonora and other countries, the SolarSPELL directors recognized that the lack of an evidence-based implementation framework suitable for the delivery of cultural and literacy appropriate healthcare information signifies a major gap in the organization's implementation process.

PICOT Question

This inquiry has led to a PICOT question, "In an interdisciplinary team working in an under-resourced community (P), how does the utilization of an implementation framework (I) impact team efficacy (O)?

Search Strategy

The database PubMed was searched using key words "rural healthcare AND implementation AND strategies." Other key word searches included a combination of the following: "rural healthcare AND mobile technology AND implementation," "rural healthcare AND framework OR theory," and "rural healthcare AND Mexico." Inclusion criteria consisted of a publication date of 2015 or later, confirmed peer review status, and unrestricted accessibility.

The search of both CINAHL and Pubmed included: "DNP leadership," "interdisciplinary team," "healthcare technology," "communication," "efficacy," "collaboration," "teamwork," "diversity," and "international." These terms were matched in varying combinations; inclusion criteria consisted of a publication in 2015 or later, confirmed peer review status, and unrestricted accessibility. Ultimately, 144 documents were retained for review, and were assessed individually for fit and merit, based on implementation framework, population, setting, generalizability, and intervention type. Studies that utilized actionable technology applications and active participation were retained, while passive interventions like electronic health records were eliminated.

Synthesis of Evidence

The studies retained for this evidence appraisal were selected for their ability to demonstrate the complex nature of healthcare innovation in under-resourced or rural settings (Appendix A). Many studies utilized qualitative designs to assess implementation framework viability, several utilized a mixed-methods approach, and one systematic review examined the

effectiveness of the quality improvement (QI) collaborative strategy in low- and middle-income

countries (Appendix A). Several studies utilized validated implementation frameworks like the

Consolidated Framework for Implementation Research (CFIR) and then adapted it to meet the

needs of the population and intervention of interest (Appendix A). All studies identified the use

of a flexible implementation framework that is matched to the population as a major facilitator to

intervention success and sustainability (Appendix A). Several of the documents were

retrospective critical analyses of implementation framework projects (Appendix A). Though the

level of evidence is lower, these were included because the value of the researchers' reflection

and learning about the process is highly valuable and pertinent to the DNP project.

Guiding Theory

Critical realism (CR) is a relatively new theory that is gaining prominence in public

health and human rights research (Haigh, Kemp, Bazeley, & Haigh, 2019). CR is a holistic

framework that accommodates varied experiential and political viewpoints while maintaining a

pragmatic approach to community health (Reid, 2019). This theory allows that multiple

disciplines and methods are needed to fully understand the multifactorial relationships between

humans, human rights, and determinants of health (Haigh et al., 2019). When applied to rural

healthcare, CR holds that determinants of health extend beyond "social determinants" as

commonly described to include the geography and history of place, which is impacted by the

regional politics and economics, and are distinct social and cultural experiences (Reid, 2019).

Six key concepts underscore the CR theory applied to rural healthcare: geographic isolation, the

rural locale, health responses, wider health systems and social structures, and power dynamics

(Reid, 2019). CR also recognizes that the interpretation and understanding of health

determinants, like politics and the concept of healthcare as a human right, changes over time and

is subject to the same influences (Haigh et al., 2019). At its core, CR places high value on

interprofessional collaboration and cultural competency, which makes it an ideal theory to guide

the DNP project development. Critical realism is a valuable lens which can filter through the

myriad of complexities that impact the Sonoran community, distilling essential information that

may otherwise be passed over. To create meaningful change in this complex community, the

comprehensive consideration of all determinants of health is a crucial component of all

intervention design and implementation.

EBP Process Model Guiding Project

The Prescribe Vida Saludable (PVS) framework utilizes an audit-feedback model focused

on various levels: top-down managerial support, bottom-up organizational change, community

involvement, and the development of innovative healthcare technologies and use (Martinez et al.,

2017). The PVS is a reinterpretation of the Consolidated Framework for Implementation

Research (CFIR) model which supports rapid-cycle evaluation of EBP healthcare interventions

and quickly delivers actionable evaluation findings intended to refine intervention methods

(Martinez et al., 2017, Keith et al., 2017). The PVS (Appendix B) identifies core constructs of

intervention design that are positively linked to implementation success: intervention design

(source, evidence strength and quality, adaptability, and design packaging), implementation

climate (learning capacity, tension for change), and process (planning, tracking, engaging

champions, executing, and reflecting/evaluating) (Martinez et al., 2017).

The intervention design construct is grounded by three steps (Appendix C) the first is

action research, a collective development process that strives to adapt EBP interventions to the

specific needs and contexts of the community and organization, while simultaneously

transforming the professional organization culture and processes (Martinez et al., 2017).

Following is step two: pilot implementation and quantitative analysis of the strategy's viability

(Martinez et al., 2017). The final step of the design construct is the qualitative analysis of the

pilot project, which involves regular, collaborative discussions of the implementation indicators

and outcome measurements, identifying strategies to increase efficacy, and overall reflections of

the implementation teams' learning process (Martinez et al., 2017).

Martinez et al. (2017) found that the effectiveness of the PVS audit and feedback loop is

dependent on how the feedback is provided. Additionally, the authors found a negative

association between the lack of adaptability and flaws in the intervention's design and packaging

(Martinez et al., 2017). This is another indication that well-ordered interventions backed by

logical strategies are essential for successful EBP implementation and meaningful quality

improvement efforts. Not only is the collection of quality qualitative feedback necessary, but

this information must be properly interpreted and delivered in a purposefully productive and

collaborative manner.

Model Application to DNP Project

The PVS model meets the needs and practicalities of this DNP project: the SSS/DNP

students are at the community level gathering data and building relationships, while operating

under the oversight of a faculty mentor and the SolarSPELL administrative team. The

continuous audit-feedback loop is essential for the SSS team as it works to identify needs,

relevant contexts, existing resources, barriers, facilitators, and outcome measurements; these

elements can and will shift over time, necessitating adaption and realignment.

The purpose of this DNP project was to contextualize the experiences of the SSS team as

an innovative version of the digital library was developed and deployed in a new language, a

new culture, a new setting, and a new capacity. This open and complex QI project premise

required comprehensive contextual understanding and capacious thinking; the three steps of the intervention design construct served as the project's starting point. This project was undertaken with the intention to establish a foundation within the BAT community, the WI, and SolarSPELL that would facilitate the digital library's development and implementation while simultaneously facilitating the QI projects of subsequent DNP students. This dual purpose is parallel to the action research construct of the PVS model which seeks to concurrently understand and influence the circumstances of intervention design (Martinez et al., 2017). The opening action research of the DNP project was a "windshield survey" of the town as part of a larger community health needs assessment (Curran et al., 2020). This visual survey oriented the SSS team to the community and its resources, and subsequently informed the development of specific interview questions for the CHA process. Action research was continued throughout the CHA process, which included numerous meetings with BAT and WI stakeholders. Throughout this time, detailed meeting notes, stakeholder feedback, and researcher reflections were collected to aid in the qualitative research process. Additionally, several concept maps were created in order to facilitate the recontextualization process as well as inform future SSS team members and DNP students. This qualitative analysis served as step three of the PVS model process (Martinez et al., 2017). Step two, quantitative analysis, was unable to be completed because the SolarSPELL device was not fully developed within the project's allocated timeframe.

Implementation Science Frameworks

Most modern implementation science theories recognize the need for innovative leadership modalities to pilot healthcare systems through the continuously changing landscape. The successful implementation of global healthcare improvement initiatives requires more than targeted outcomes; analysis and development of explanatory theory is necessary if we are to

understand what things are, how they work – and how they might work better (Haigh at al., 2019). Leadership in complex situations requires the use of a complexity lens: a collaborative, reflective, and relationship-based lens in order to promote systemic and systematic learning (Belrhiti, Nebot Giralt, & Marchal, 2018). Like other SolarSPELL sites, the Sonoran community is a complex setting with many active elements and varied contexts; in such settings, competent leadership is essential to project feasibility and sustainability. Through continuous exploration, leaders can obtain the essential situational understanding that enables successful navigation of uncertain or dynamic settings (Bartscht, 2015). Several implementation theories can be used to inform the SSS implementation process in any setting.

Changing Landscape

Recent shifts in politics on both sides of the border have had a tremendous impact on the economy, infrastructure, and resources of the BAT. Since 2016, the U.S government has been increasing immigration and asylum restrictions and their enforcement, and continues to build an impenetrable border wall to all but close off the U.S. These pressures are inflicting new constraints on border communities and making binational existences more dangerous and impossible. In order to navigate this dynamic and challenging situation, the SSS team must remain informed and adaptable. The conscientious application of implementation frameworks could expedite the development of improvement interventions, optimize their design, identify facilitators, and enhance team learning (Davidoff, Dixon-Woods, Leviton, & Michie, 2015).

Implementation Theory Review

Both the geographic setting and novel partnership demanded an innovative implementation approach by the interdisciplinary SSS team. To drive change in complex settings such as Sonora, an adaptive approach that empowers emergence is essential. Emergence

is the dynamic creation of a new system where all elements (diverse people, pressure, and ideas) interact freely generating innovation (Uhl-Bien & Arena, 2017). Following the adaptive approach of the WI, the SSS entered the community with a flexible approach focused on engaging community members and building strong relationships. Several introductory meetings with numerous community stakeholders facilitated relationship building and provided education about the SolarSPELL device and project goals.

Sharing knowledge and resources with external partners aides in short-term EBP implementation, but internal capacity building is necessary to sustain change initiatives (Booth & Carroll, 2015). Analysis of organization and community data enables the ongoing identification of gaps in the intervention delivery and drives decision-making about further program development (Sherrod & Goda, 2016). For SSS, the partnership with the WI facilitates the rapid acquisition of both community knowledge and stakeholder relationships, which then inform DNP project development. The SSS must also focus on internal capacity-building to ensure organizational stability and efficacy, which subsequently drives sustainability in all dimensions.

Developmental Evaluation.

The Developmental Evaluation (DE) framework is used to design adaptive change initiatives in complex environments, and uses systems thinking to understand the complexity of interactions within a dynamic system (Laycock, Bailie, Matthews, & Bailie, 2019). In this framework, stakeholders are actively engaged in research, reflection, and change processes, and evaluators are embedded as innovation partners (Laycock at al., 2019). When designing and evaluating interventions, knowledge translation and dissemination approaches grounded in theory like DE help identify how knowledge is generated and utilized and inform decision-making (Laycock et al., 2019). In Australia, DE has been used to develop successful

participatory research programs with Indigenous communities that are culturally relevant and produce actionable findings that improve healthcare delivery (Laycock et al., 2019). This participatory approach framework is an ideal fit for stakeholder focused groups like SolarSPELL.

Reflection and qualitative review of the SSS implementation process identified opportunities for both process improvement and enhanced leadership in current and future SolarSPELL projects. With this experience-informed perspective, the necessity of an implementation framework to guide SolarSPELL implementation projects in new communities was evident. The utilization of the DE would ensure active stakeholder participation and collaborative intervention design. Using the DE model (Appendix D), the framework should include recommendations for outcome and impact measures that will guide the continuous assessment and refinement of the SolarSPELL implementation process. An organization's readiness for change is an essential factor that enables the integration of EBP knowledge into practice (Booth & Carroll, 2015). Frameworks like DE enable initial and ongoing organizational readiness to change through the affect-reflect loop which provides consistent outcome measurement and can identify the need for organization shift or goal realignment. Adaptable leadership and flexible frameworks are crucial for SolarSPELL as it seeks to optimize stakeholder collaboration, cultural relevance, and sustainability.

Recommendation

The DE framework is the recommended implementation framework for future SolarSPELL projects. This framework has been used extensively to address continuing healthcare disparities in rural, resourced-constrained, indigenous communities in Australia; these communities share many qualities with Sonora and other SolarSPELL sites, including a complex

history of marginalization. Following CR theory, these factors must be included in the

community assessment to understand the real determinants of health for a community (Haigh et

al., 2019). The DE framework facilitates deep comprehension through the integral inclusion of

local stakeholders throughout the process. This intimate, co-design research process forges deep

community bonds that both strengthen sustainability and can ellicit inmost community

information. The WI operates in this manner in the BAT, utilizing connections to reinforce and

expand wellness initiatives throughout the community. The affect-reflect methodology of the DE

framework strengthens the initiative over time and sustains stakeholder engagement. As part of

the SSS implementation process, the writer served as an embedded researcher, thus offering a

uniquely relevant perspective to the SSS project as part of the DE framework.

Ongoing Sustainability

The use of a framework to structure and guide the SSS ongoing work is necessary to

ensure sustainability for individual project initiatives, community engagement, and the essential

partnership with the WI. Organizational stability is a key factor in the durability and efficacy of

EBP healthcare initiatives (Booth & Carroll, 2015). As an organization composed of DNP

students, turnover for the SSS is unavoidable. The use of a framework that recognizes and

actually harnesses the strength of both entering and departing members will improve the overall

stability for the SSS and its projects. Using the DE framework to coordinate both subsequent

and concurrent DNP projects will maximize their individual and combined efficacy and

efficiency. Future DNP students could also use the PVS implementation model to guide their

project design and implementation, but it is not essential for overall SSS project continuity. This

project was designed as a foundational effort, while subsequent projects will likely focus more

narrowly on specific EPB interventions. What is most essential for SSS continuity is the

consistent use of a structured and focused approach to SolarSPELL operations in the BAT.

Clearly defined organizational structure, processes, and goals will ensure consistent SSS actions

while allowing for constant adaptation and improvement.

The completion of this DNP project is really the conclusion of one phase of the SSS

implementation process. Currently, the SSS team continues to build relationships with

community stakeholders, collect data as part of the CHA, plan targeted health interventions, and

curate the SolarSPELL library content. The DE framework can be easily incorporated into the

SSS team's current actions and could provide a clear scaffolding for all subsequent DNP projects

and team initiatives. This project was intended to expedite the SSS's implementation and

initiatives so that improved health information resources would benefit the community more

rapidly. With increased health literacy, the impact and sustainability of both WI and SSS

projects will increase. With increased health literacy, increased individual autonomy should

follow. Greater personal autonomy enriches the health and wellbeing of all individuals,

especially those who are marginalized.

Project Timeline

Initial contact between SolarSPELL and the WI occurred in August of 2019, the BAT as

a new partnership site (Figure 1). The SSS was formed in October 2019, with new DNP student

members added over the next few months. The first BAT site visit occurred in mid-October, and

the community health assessment began with a windshield survey and large stakeholder meeting

at a WI community center. Two other visits to the BAT were conducted over the next few

months, but other scheduled visits were cancelled due to COVID-19 restrictions. SSS and

stakeholder communication occurred regularly through video conferencing, which became a

critical tool after travel restrictions were applied. The brief time allotment significantly impacted

this DNP project development by limiting its scope and focus, but these constraints were

ultimately beneficial and strengthened the educational outcomes of the project.

Conclusion

Although time constraints and situational complexities made this project quite

challenging, these factors ultimately increased the individual capacity-building for this writer.

This experience was a fitting capstone to my DNP education as I was able to apply complexity

leadership theory and utilize organizational knowledge to better serve the overall SSS project and

community impact. The complex nature of the project allowed me to utilize much of the didactic

learning content which enriched the entire DNP education process in a deeply meaningful way.

By contributing to the efficacy and sustainability of SolarSPELL, I hope that my work will

contribute to the wellbeing and health of individuals and communities across the globe. By

working with the WI in Sonora, I formed an enduring relationship that will enable me to use

DNP skills as I continue serve under-resourced communities.

References

Bartscht, J. (2015). Why systems must explore the unknown to survive in VUCA environments. *Kybernetes, 44*, 253-270. doi:10.1108/K-09-2014-0189.

Beauchamp, A., Batterham, R.W., Dodson, S., Astbury, S. B., Elsworth, G. R., McPhee, C., … Osborne, R. O. (2017). Systematic development and implementation of interventions to OPtimise Health Literacy and Access (Ophelia). *BMC Public Health, 17***,** 230. https://doi-org.ezproxy1.lib.asu.edu/10.1186/s12889-017-4147-5

Belrhiti, Z., Nebot Giralt, A., & Marchal, B. (2018). Complex leadership in healthcare: a scoping review. *International Journal of Health Policy and Management*, *7*(12), 1073–1084. https://doi.org/10.15171/ijhpm.2018.75

Booth, A., & Carroll, C. (2015). How to build up the actionable knowledge base: the role of 'best fit' framework synthesis for studies of improvement in healthcare. *BMJ Quality Safety, 24*(11), 700-708.

Center for Disease Control and Prevention (CDC). (2019, March 13). *Understanding the Training of Trainers model.* Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion. Retrieved from: https://www.cdc.gov/healthyschools/tths/train_trainers_model.htm

Clarke, R., & Macdonald, C. (2018). Can healthcare policy and technology heal rural-urban divides? *OECD Observer.* doi:https://doi.org/10.1787/fe6385cd-en

Curran, S., Spencer, K., & Chavez, D. (2020). [Community health assessment]. Unpublished raw data.

Dattalo, M., Wise, M., Ford, J. H., Abramson, B., Mahoney, J. (2017). Essential resources for implementation and sustainability of evidence-based health promotion programs: a mixed

methods multi-site case study. *Journal of Community Health, 42,* 358–368.

doi:10.1007/s10900-016-0263-x

Davidoff, F., Dixon-Woods, M., Leviton, L., & Michie, S. (2015). Demystifying theory and its

use in improvement. *BMJ Quality Safety, 24*(3), 228-238.

Dent, E., Hoon, E., Kitson, A., Karnon, J., Newbury, J., Harvey, G., … Beilby, J. (2016).

Translating a health service intervention into a rural setting: lessons learned. *BMC Health

Services Research*, *16*(62). doi: 10.1186/s12913-016-1302-0

Duan, K., Mcbain, R., Flores, H., Rodriguez Garza, F., Nigenda, G., Palazuelos, L., . . . Elliott,

P.F. (2018). Implementation and clinical effectiveness of a community-based non-

communicable disease treatment programme in rural Mexico: a difference-in-differences

analysis. *Health Policy and Planning, 33*(6), 707-714.

Garcia-Elorrio, E., Rowe, S.Y., Teijeiro, M.E., Ciapponi, A., & Rowe, A.K. (2019). The

effectiveness of the quality improvement collaborative strategy in low- and middle-

income countries: a systematic review and meta-analysis. *PLoS ONE, 14*(10), e0221919.

https://doi.org/10.1371/journal.pone.0221919

Glynn, L.G., Glynn, F., Casey, M., Wilkinson, L. G., Hayes, P. S., Heaney, D., & Murphy, A.W.

M. (2018). Implementation of the SMART MOVE intervention in primary care: A

qualitative study using normalisation process theory. *BMC Family Practice, 19*(1), 48.

Gutiérrez, J.P., García-Saisó, S., Dolci, G.F.*,* & Ávila, M. H. (2014). Effective access to health

care in Mexico. *BMC Health Services Research, 14*(186). doi.org/10.1186/1472-6963-14-

186

Haigh, F., Kemp, L., Bazeley, P., & Haigh, N. (2019). Developing a critical realist informed

framework to explain how the human rights and social determinants of health relationship

works. *BMC Public Health, 19*, 1571. https://doi.org/10.1186/s12889-019-7760-7

Instituto Nacional de Estadística, Geografía e Informática (INEGI) [National Institute of

Statistics, Geography and Informatics]. (2020). *Naco, Sonora* (Mexico in Figures No.

26039). Retrieved from: https://en.www.inegi.org.mx/

http://en.www.inegi.org.mx/app/areasgeograficas/?ag=26#tabMCcollapse-Indicadores

Institute for Health Metrics and Evaluation (IHME). (2020). Sonora, Mexico. In *Global Burden

of Disease*. Retrieved from: http://www.healthdata.org/Mexico-sonora

Keith, R.E., Crosson, J.C., O'Malley, A.S., Cromp, D., & Fries Taylor, E. (2017). Using the

Consolidated Framework for Implementation Research (CFIR) to produce actionable

findings: a rapid-cycle evaluation approach to improving implementation.

Implementation Science, 12(15). https://doi.org/10.1186/s13012-017-0550-7

Laycock, A., Bailie, J., Matthews, V., Cunningham, F., Harvey, G., Percival, N., & Bailie, R.

(2019). A developmental evaluation to enhance stakeholder engagement in a wide-scale

interactive project disseminating quality improvement data: study protocol for a mixed-

methods study. *BMJ Open, 7*(7), E016341.

Leyva-Flores, R., Servan-Mori, E., Infante-Xibille, C., Pelcastre-Villafuerte, B. E., & Gonzalez,

T. (2014). Primary health care utilization by the Mexican indigenous population: the role

of the Seguro Popular in socially inequitable contexts. *PLOS ONE, 9*(8), e102781.

doi.org/10.1371/journal.pone.0102781

Martinez, C., Bacigalupe, G., Cortada, J.M. …PVS Group. (2017). The implementation of health

      promotion in primary and community care: a qualitative analysis of the 'Prescribe Vida

      Saludable' strategy. *BMC Family Practice, 18* (23). doi.org/10.1186/s12875-017-0584-6

Mcdonald, J. & Ollerenshaw, A. (2011). Priority setting in primary health care: a framework for

      local catchments. *Rural and Remote Health*, *11*(1714). Retrieved from:

      www.rrh.org.au/journal/article/1714

Naco Wellness Initiative (WI). (2020). About. *Naco Wellness Initiative*. Retrieved from:

      www.nacowellnessiniative.org

Pan American Health Organization (PAHO). (2012). *United States–Mexico border area.* Health

      in the Americas, 2012 Edition: Country Volume. Retrieved from: www.paho.org

Nelson, W., Pomerantz, A., Howard, K., & Bushy, A. (2007). A proposed rural healthcare ethics

      agenda. *Journal of Medical Ethics, 33,*136-139. doi:10.1136/jme.2006.015966

Ovretveit, J., Mittman, B., Rubenstein, L., & Ganz, D. (2017). Using implementation tools to

      design and conduct quality improvement projects for faster and more effective

      improvement. *International Journal of Health Care Quality Assurance, 30*(8), 755-

      768.

Reid, S. (2019). The rural determinants of health: using critical realism as a theoretical

      framework. *Rural and Remote Health, 19*(3).

Sherrod, B., & Goda, T. (2016). DNP-prepared leaders guide healthcare system change. *Nursing

      Management, 47*, 13-16. https://doi.org/10.1097/01.NUMA.0000491133.06473.92

SolarSPELL. (2020). About. *SolarSPELL*. Retrieved from: www.solarspell.org

Stokes, T., Tumilty, E., Doolan-Noble, F., Gauld, R. (2018). HealthPathways implementation in

a New Zealand health region: a qualitative study using the Consolidated Framework for

Implementation Research. *BMJ Open,* e025094. doi:10.1136/ bmjopen-2018-025094

Uhl-Bien, M. & Arena, M. (2017). Complexity leadership: enabling people and organizational

adaptability. *Organizational Dynamics*, *46*(1), 9-20.

Weberg, D. (2016). Innovation leadership behaviors: starting the complexity journey. In S.

Davidson, D. Weberg, T. Porter-O'Grady, & K. Malloch (Eds.), *Leadership for evidence-

based innovation in nursing and health professions* (pp. 43-76). Burlington,

Massachusetts: Jones & Bartlett Learning.

Wilson, T. D. (2015). Mexico's rural poor and targeted educational and health programs. *Human

Organization*, *74*(3), 207-216.

Woodward, E., Matthieu, M., Uchendu, U., Rogal, S., & Kirchner, J. (2019). The health equity

implementation framework: proposal and preliminary study of hepatitis C virus

treatment. *Implementation Science, 14*(1), 26.

Wulfovich, S., Matabuena, P., Wilhelm, D., García Osuna, L., Wac, K., & Rivas, H. (2018).

Scaling access to care in rural Mexico via digital health, telemedicine, and drone. *Journal

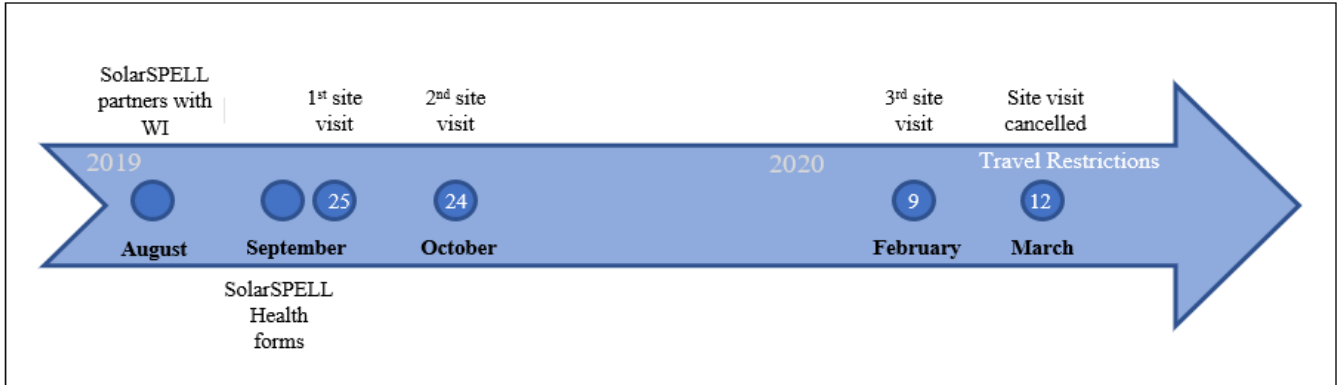of the American College of Surgeons, 227*(4), S132.

Figures

Figure 1. A timeline depicting major events of the DNP project.

Appendix A

Table 1

Evaluation Table

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Analysis	Findings/ Results	Level/Quality of Evidence; application to practice
Stokes, T. (2016). Barriers and enablers to guideline implementation strategies to improve obstetric care in practice in low- and middle-income countries: a systematic review of qualitative evidence. **Funding:** None. **Bias:** none **Country:** New Zealand	"best fit" framework synthesis	**Design**: Qualitative Systematic Review using PROSPERO protocol. **Purpose**: Synthesize QUAL evidence on guideline IMP strategies; identify barriers and enablers to successful IMP.	**n**= 9 **Sample:** All from Sub-Saharan Africa **Setting:** MEDLINE and CINAHL databases **Inclusion Criteria:** Studies that used QUAL approach in LMIC; perinatal healthcare delivery, with one of 7 i types to change healthcare provider behavior. **Exclusion criteria:** studies that only described current practice, barriers, health policy level IMP,		PRISMA flow chart to show search strategy process;	CASP quality assessment tool for QUAL studies; Berg & Belizan's Stages of Change model	-most studies use audit/feedback implementation strategy, some used education-based strategies. -high (enabler) and low (barrier) intrinsic health care professional motivations guide IMP outcome. -IND meetings and local leadership improve change with little or no cost	**LOE: I** **Strengths:** uses rigorous, systematic methodology; identified a conceptual framework to fit the data **Weaknesses:** limited QUAL evidence available on barriers and enablers in LMIC for obstetrics; none also measured for effectiveness concurrently **Conclusions:** each level of health system should have processes and structures in place to promote high intrinsic healthcare professional motivation -low intrinsic motivation is a barrier to IMP at all stages **Application to practice:** Supports need of IMP frameworks to guide successful change processes in health care settings in LMIC

Key: avg: average; **CD**: clinical decision;; **comm:** community; **DE:** developmental evaluation framework; **EBP:** evidence-based practice; **id**: identify **IMP:** implementation; **IND**: interdisciplinary; **int:** intervention**; LMIC**: low-and-middle income countries; **LE:** life expectancy; **N-** number of participants; **NIDRR:** National Institute on Disability and Rehabilitation Research; **NIH:** National Institutes of Health; **org:** organization(al); **PHC:** primary healthcare; **pop:** population**; QUAL:** qualitative; **QIC:** Quality improvement collaboratives; **RC:** rural community; **RCT:** randomized controlled trial; **tech**: technology; **TDM:** team development measure; **U.S.:** United States; **US DHHS:** US Department of Health and Human Services;

				traditional birth attendants				
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Analysis	Findings/Results	Level/Quality of Evidence; application to practice
Dattalo, M. (2017). Essential resources for implement ation and sustainabil ity of evidence-based health promotion programs: a mixed methods multi-site case study. **Bias**: none recognized **Funding:** WI Partnership Program (OAC #2299) at Uni. of WI School of Medicine and Public Health **Country**: U.S.	None identified	**Design:** QUAL multi-site case study **Purpose:** to compare org. readiness and IMP strategies used by RC that achieved varying levels of success in sustaining EBP programs over a 3-year period.	**n**=16 **Setting**: RCs; community centers **Sample demographics:** Counties across rural Wisconsin. **Inclusion Criteria:** had fewer than 20 adults over age 60 per square mile; and had been unable to implement at least one workshop **Exclusion criteria:** none disclosed	**"successful implementa tion"** - delivering ≥1 target workshop during the intervention year **"sustainabil ity"**- delivering ≥1 target workshop in both post-intervention years	semi-structured telephone interviews	conventi onal content analysis to conduct a cross-case comparis on for the purpose of identifyi ng common features; multidisc iplinary analysis team that reflected on the findings in an iterative process	**6 Essentials**: senior admin. Support, external partnerships, Assigned tasks, ongoing support, team engagement, org. stability	**LOE:** IV **Strengths:** rigor increased with triangulation **Weaknesses:** Sample is not representative of nation; limits generalizability; sample is poorly described **Conclusions:** ORG stability and staff turnover for is vital to intervention sustainability. Staff retention is cited as a key factor in sustainability of evidence-based practices **Application to practice:** provide guidance on successful strategies for combining external partnerships with internal capacity-building when IMP evidence-based health promotion programs in rural public health agencies; focus on org. stability for sustainability

Key: avg: average; **CD**: clinical decision;; **comm:** community; **DE:** developmental evaluation framework; **EBP:** evidence-based practice; **id**: identify **IMP:** implementation; **IND**: interdisciplinary; **int:** intervention**; LMIC**: low-and-middle income countries; **LE:** life expectancy; **N-** number of participants; **NIDRR:** National Institute on Disability and Rehabilitation Research; **NIH:** National Institutes of Health; **org:** organization(al); **PHC:** primary healthcare; **pop:** population**; QUAL:** qualitative; **QIC:** Quality improvement collaboratives; **RC:** rural community; **RCT:** randomized controlled trial; **tech**: technology; **TDM:** team development measure; **U.S.:** United States; **US DHHS:** US Department of Health and Human Services;

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Analysis	Findings/Results	Level/Quality of Evidence; application to practice
Laycock, A. (2017). A developmental evaluation to enhance stakeholder engagement in a wide-scale interactive project disseminating quality improvement data: study protocol for a mixed-methods study. **Funding:** None reported **Bias:** Potential internal: lack of objectivity **Country:** Australia	Developmental Evaluation	**Design:** Prospective case study; The DE is being applied within an iterative dissemination project, data review, interviews. **Purpose:** evaluate and enhance a novel interactive dissemination project designed to engage PHC stakeholders in Indigenous PHC in widescale processes to interpret and use aggregated quality improvement data	**n**= Twenty-five to 30 interviews are expected to provide representative data for effective comparison between groups and setting; 175 PHC centers involved in the Partnership voluntarily provided service level deidentified CQI data for analysis. **Setting:** Aboriginal & Torres Strait Islander PHCs in Australia **Inclusion Criteria:** varies among methods **Exclusion criteria:** None stated		documentation, quantitative (rate on a Likert scale), and QUAL surveys and participant interviews, and participant-observation	simple descriptive statistics	Anticipates identifying priority EBP gaps, barriers, enablers, and strategies in different areas of clinical care.	**LOE:** VI **Strengths:** process and importance well-described, DE described clearly; Use of mixed methods and inclusion of perspectives of the research team and diverse healthcare stakeholders enhances validity and provides comprehensive data **Weaknesses:** Prospective design; Potential lack of objectivity, **Conclusions:** The project aims to effect multilevel system improvement in Aboriginal and Torres Strait Islander primary healthcare. **Application to practice:** shows viability of DE; a strategy that integrates knowledge production, translation and use across disciplines; Use of DE in resource-constrained RCs

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Analysis	Findings/Results	Level/Quality of Evidence; application to practice
Keith, R.E. (2017). Using the Consolidated Framework for Implementation Research (CFIR) to produce actionable findings: a rapid-cycle evaluation approach to improving implementation **Funding:** US DHHS, NIH, and National Institute of Diabetes and Digestive and Kidney Diseases (Grant number: 7R18DK091810-02). **Bias**: None recognized **Country:** U.S.	Consolidated Framework for Implementation Research (CFIR)	**Design:** cross-case qualitative investigation **Purpose**: to evaluate efficacy of CFIR for EBP interventions & timely implementation	**n**= 21 **Setting:** PHCs across 7 U.S. regions **Sample Demographics:** rural & urban locations, small, medium, large practice sizes. **Inclusion Criteria:** primary care practices participating in the Comprehensive Primary Care (CPC) initiative **Exclusion criteria:** None stated	**Actionable finding**: gives info about changes that can improve implementation efficacy or uptake into practice.	semi-structured interview guides to conduct in-depth interviews with multiple respondents	code reports from ATLAS.ti; analytic matrices populate with codified data, constructs	factors & contexts that may have influenced imp: teamwork enabled care transitions in the broader medical neighborhood, which promotes team-based care in improving care coordination. -	**LOE:** VI **Strengths:** rapid-cycle evaluation methods, broad application potential, framework is flexible in application **Weaknesses:** CFIR is inherently difficult process that requires close attention to the quality and consistency of data collection, coding, and analysis; demographics vaguely described **Conclusions:** CFIR is a useful tool for guiding rapid-cycle evaluation of the imp of EBP transformation initiatives. **Application to practice:** Shows efficacy of imp frameworks for EBP improvements in variety of settings, highlights importance of *Access and continuity* in imp success

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Analysis	Findings/Results	Level/Quality of Evidence; application to practice
Martinez, C. (2017). The implementation of health promotion in primary and community care: a qualitative analysis of the 'Prescribe Vida Saludable' strategy. **Funding:** multiple grants from various Spanish governmental agencies and European Regional Development Fund **Bias:** confirmation bias (possible) **Country:** Spain	Damschroder et al.'s Consolidated Framework for Implementation Research (CFIR)	**Design:** QUAL comparative analysis design; audit-feedback **Purpose:** id core factors associated with success and barriers in the imp of the PVS **int.** and assess factors associated with better performance in its piloting phase	**N:** 4 **Setting:** PHC clinics in Basque region of Spain **Demographics:** staff of all levels at clinics & other comm stakeholders **Inclusion criteria:** convenience sample; picked due to previous involvement in health promotion programs or preventive practice optimization initiatives. **Exclusion criteria:** n/a	**STRATEGIES:** comm involvement, top-down support, bottom-up primary care org change, development of e-health information and communication tech	grounded qualitative analysis; focus groups, structured interviews	within-case analysis; common themes were identified and a rating valence) assigned to each code; Valences from +2 to −2 show + or - impact of each construct on the org., process, and/or imp.	the feeling of ownership of the i by the participants emerged as a characteristic strongly associated with imp performance, along with evidence strength and quality; effectiveness of audit and feedback depends on how the feedback is provided	**LOE:** VI **Strengths:** findings can be transferred to other similar sites. **Weaknesses:** constructs and performance associations could be bidirectional, are not mutually exclusive categories, and are in continuous evolution **Conclusions:** the success of the imp is associated with these components: the context, the imp process, and the collaborative modelling. Strong imp strategies are required to influence the multiple factors associated with innovation in health-promoting practices **Application to Practice:** Shows utility and efficacy of imp framework use in RC settings.
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Analysis	Findings/Results	Level/Quality of Evidence; application to practice

Key: avg: average; **CD:** clinical decision;; **comm:** community; **DE:** developmental evaluation framework; **EBP:** evidence-based practice; **id:** identify **IMP:** implementation; **IND:** interdisciplinary; **int:** intervention**; LMIC:** low-and-middle income countries; **LE:** life expectancy; **N-** number of participants; **NIDRR:** National Institute on Disability and Rehabilitation Research; **NIH:** National Institutes of Health; **org:** organization(al); **PHC:** primary healthcare; **pop:** population**; QUAL:** qualitative; **QIC:** Quality improvement collaboratives; **RC:** rural community; **RCT:** randomized controlled trial; **tech:** technology; **TDM:** team development measure; **U.S.:** United States; **US DHHS:** US Department of Health and Human Services;

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Analysis	Findings/Results	Level/Quality of Evidence; application to practice
Woodward, E. (2019). The health equity implementation framework: Proposal and preliminary study of hepatitis C virus treatment. **Funding:** US Department of Veterans Affairs (VA) Office of Health Equity **Bias:** None noted **Country:** U.S.	Implementation science framework: i-PARIHS; the Health Care Disparities Framework; Health Equity Implementation Framework	**Design:** mixed method study design; partially mixed sequential dominant status design, Quan ➔ QUAL **Purpose:** Eval. The viability of new framework derived from blending imp science and disparities frameworks	N= 12 **Setting:** PHC clinics in rural Southern U.S. **Sample Demographics:** Male, black, rural dwelling, elderly; 50% were retired/disabled **Inclusion criteria:** QUAN: visit at one of 6 VA comm PHC clinics in rural Southern U.S., HCV documented, race coded as unknown or any other than white. **Exclusion criteria:** n/a	**Health equity:** includes fair access to opportunities for optimal health and well-being.	semi-structured individual interviews; consecutive sampling by reviewing administrative data	directed content analysis because we used our a priori Health Equity Imp. Framework and the interview guide to develop codes; ATLAS.ti	use of comm. engagement helps ensure imp researchers assess determinants unique to certain vulnerable pops	**LOE:** II **Strengths**: novel approach/design **Weaknesses:** did not assess the degree to which imp would be adapted to this healthcare disparity challenge; did not evaluate if there was a reduction in healthcare disparity in the application of the framework. **Conclusions:** proper planning is needed to ensure that participant burden is minimized given assessment of healthcare disparities in addition to typical imp factors, and that knowledge and research team skills are adequate for vulnerable pops **Application to Practice:** shows that looking at multilevel factors is essential - the uptake of treatments is affected by multiple variables in complex healthcare systems; frameworks must also address health equity determinants.
Beauchamp, A. (2017). Systematic development and implementation of interventions	Plan Do Study Act (PDSA). OPHELIA	**Design:** mixed methods, 3 phases **Purpose:** to develop and test a structured approach that	N= 9 **Setting:** clinics providing home and comm. health care, chronic care in	**proof-of-concept**: successful application of 8 underlying principles to achieve the	Health Literacy Questionnaire (HLQ), semi-structured interviews with convenience samples of participating	hierarchical cluster analysis was undertaken using Ward's	service redesign occurred and some short-term outcomes for selected int.s were achievable.	**LOE:** III **Strengths:** systematic approach, clearly defined, mixed methods **Weaknesses:** ability to generalize is limited by sample size and composition

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to Optimize Health Literacy and Access (Ophelia) **Funding:** Australian Research Council (ARC) Linkage Project grant **Bias:** **Country:** Australia		org.s can use to enhance equitable engagement of consumers in health and health care.	Victoria, Australia **Sample Demographics:** The sites were rural/metropolitan, small/large hospitals, comm health centers or municipalities **Inclusion criteria:** unclear- assume convenience sample	development of health literacy-informed int.s to impact on health and equity outcomes.	clients and volunteers, focus groups with practitioners	method for linkage; Cohen's d effect size with 95% confidence intervals	Impacts upon HLQ scale scores were less consistent	**Conclusions:** Changes were observed at org., staff, and comm. member levels. The Ophelia approach can be used to generate health service improvements that enhance health outcomes and address inequity of access to healthcare. **Application to Practice:** shows the strength of co-design processes in complex settings with varied stakeholders; ability to create local/culturally relevant int.s
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Analysis	Findings/Results	Level/Quality of Evidence; application to practice
Dent, E. (2016). Translating a health service intervention into a rural setting: lessons learned **Funding:** National Health and Medical Research Council project grant (Grant	Knowledge Translation (KT); Co-creating of KT (Co-KT)	**Design:** Review of imp and translational stages of the LINKIN pop. health study (longitudinal cohort study) and imp. process of Co-KT in rural pops **Purpose:** describe learnings from	**Setting**: Port Lincoln, AU **Sample demographics:** People with musculoskeletal conditions- not otherwise described in this paper	**Process level Factors**: components that can be altered during the Imp process **Individual factors:** difficult to change, related to stakeholder values and	Data set review; Computer Assisted Telephone Interview	Barriers & enablers: de Goede's KT methodology	co-designed a pop health int to address unmet health service needs; Co-KT framework itself linked locally generated knowledge with academic input, but couldn't achieve sustainability phase	**LOE:** IV **Strengths:** Able to consider sustainability of int/Co-KT; sample selected from large pop. **Weaknesses:** Retrospective review; unable to fully utilize CO-KT framework **Conclusions:** Collaborative relationships with key stakeholders in the comm are vital to sustainability of a Co-KT Framework; The importance of a flexible intervention. **Application to Practice:** Shows the importance of stakeholder involvement at

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| Number: 627240) **Bias:** none identified by authors **Country:** Australia | | imp of a pop health int study in rural setting using a Co-KT; id barriers and facilitators | | the study context | | | | all phases, need for flexible and individualized frameworks. |

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Analysis	Findings/Results	Level/Quality of Evidence; application to practice

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Analysis	Findings/Results	Level/Quality of Evidence; application to practice
Glynn, L. (2018). Implementation of the SMART MOVE intervention in primary care: a qualitative study using normalisation process theory. **Funding:** European Union's Northern Periphery Programme through the Implementing Transnational Telemedicine Solutions project **Bias:** none identified **Country:** Ireland	Normalisation Process Theory (NPT)	**Design:** Qual analysis that describes a multi-perspective exploration of SMART MOVE: open label RCT **Purpose:** to conduct a theoretically informed analysis, using NPT, of the potential barriers and levers to the imp of a mhealth (SMARTMOVE) int. to promote physical activity in primary care.	**n**= 500,000 patients **Setting:** West Ireland; network of over 180 family practices; **Sample Demographics:** mixed urban-rural population of approximately 500,000 patients **Inclusion Criteria:** None given	**Cognitive participation:** stakeholder engagement. **Coherence:** sense making **Reflexive monitoring:** appraisal and evaluation **Collective action:** actions & interactions that are demanded of both service providers & service users for the int to be utilized successfully	Focus groups, NPT generated interview guide, open-ended questions,	Coding themes: QSR International NVivo 10 software; NPT for qual analysis	-**5 stages:** familiarization, thematic framework id, indexing, charting, mapping and interpretation -t**hemes:** personal and professional exercise strategies; roles and responsibilities to support active engagement; utilization challenges; and evaluation, adoption and adherence.	**LOE:** IV **Strengths:** sampling framework which included a balance of views from all stakeholders; use of NPT to guide process gave validity, **Weaknesses:** problematic translational gaps continue to exist between demonstrating the positive impact of healthcare tech int.s and the imp and normalization of such int.s into routine daily practice **Conclusions:** for tech. int to be successful, it must address unresolved healthcare need in a context that has strong usability attributes for both disseminators & target users; coheres strongly with the core objectives and culture of the healthcare environment in which it will operate. **Application to Practice:** co-design process of interventions increases adaptability, adoption rate, and likely sustainability.

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Sustainable Development Goals (SDGs), instituted by the United Nations	**Design:** Systematic Review **Purpose:** Fill in gap on QIC effectiveness in systematic reviews for low- and middle-income countries (LMICs).	**N=29** **Sample:** most (21/29, 72.4%) were interrupted time series studies; most studies (24/29, 82.7%) were from Africa **Inclusion Criteria:** RCTs, interrupted time series studies, and Controlled before- and- after trials; papers that compared usual practice with QICs alone or combined with other int.s **Type of intervention:** intervention arm exposed to QIC with/without other strategy components compared to a non-exposed control arm	**Effect sizes:** absolute percentage-point differences; positive values = improvement.	Cochrane methods, the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach for quality of evidence grading, and the Preferred Reporting Items for Systematic Reviews and Meta analyses (PRISMA)	weighted median & interquartile range of MES values, standard random-effects meta-analysis used to estimate the weighted mean MES and 95% confidence interval (CI) of the mean MES of each	- studies of health facility-based HCPs, for the "QIC only" strategy, effectiveness varied highly across outcome groups, with no effect for patient health outcomes - For the "QIC + training" strategy, effectiveness might be very high for patient health outcomes, HCP practice outcomes, and care-seeking - The effect of "QIC + training + strengthening infrastructure + supervision + other management techniques" or "QIC + strengthening infrastructure + regulation	**LOE: I** **Strengths:** study design/rigor **Weaknesses:** the random effects meta-analysis in this review was limited by the low quality of studies and wide diversity of outcomes **Conclusions:** The effectiveness of QICs varied considerably in LMICs. QICs combined with other int components, such as training, were more effective than QICs alone. The low evidence quality and large effect sizes for QIC plus training justify additional high-quality studies assessing this approach in LMICs; *the overall quality of the evidence on the effectiveness of QICs in LMICs was low.* **Application to Practice:** multifaceted and structured approaches to int. imp are needed for increased efficacy in all global communities and can be used to address healthcare disparities

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Garcia-Elorrio, E. (2019). The effectiveness of the quality improvement collaborative strategy in low- and middle-income countries: a systematic review and meta-analysis.

Funding:
HQSS Secretariat - Bill and Melinda Gates Foundation; World Bank–Netherlands Partnership Program grant P098685 to AKR

Bias: none identified

Country: Argentina

and governance" strategies seemed small to modest.

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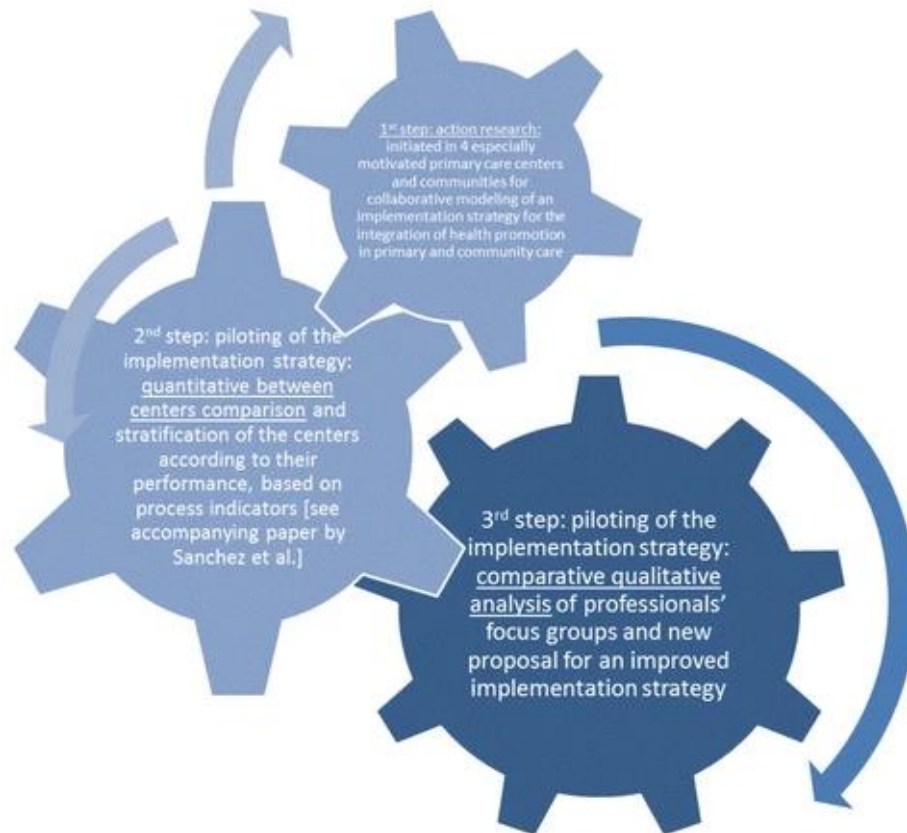
Appendix B

Prescribe Vida Saludable Model
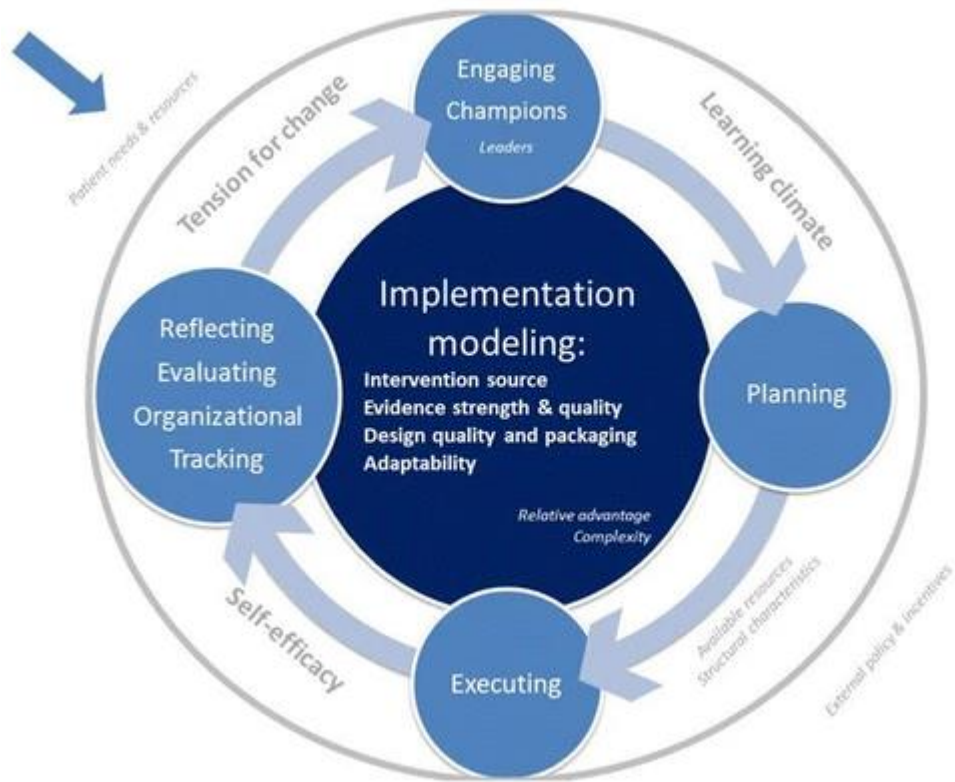
Appendix C

Prescribe Vida Saludable Initial Steps

PVS research steps

Appendix D

Developmental Evaluation Framework