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Stakeholder Engagement as a Foundation for the Evaluation of Implementation Science

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Bachelor of Arts, Neuroscience
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2018

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Abstract

Stakeholder Engagement as a Foundation for the Evaluation of Implementation Science
By Shivani Dayal

Implementation science is a relatively new field that studies the methods to translate scientific research into routine practice and policy. Implementation science aims to bridge the research-policy gap and this thesis explores the proposition that achieving this aim will require a more evidence-based stakeholder engagement framework. However, there is a lack of clarity in the relationship between stakeholder engagement and the dominant frameworks of implementation science (IS). One of the most dominant implementation science evaluation frameworks, RE-AIM, has no existing strategy to evaluate stakeholder engagement (SE).

The purpose of this thesis, therefore, was to explore the feasibility and potential impact of incorporating stakeholder engagement into the RE-AIM framework for the evaluation of implementation science. The aims of this study were to: 1) analyze the RE-AIM framework to determine how it could be amended to include SE, 2) enhance the RE-AIM framework by incorporating elements from SE theory, 3) design tools for the utilization of RE-AIM(S) that allow for the evaluation of SE, and 4) apply the adapted RE-AIM(S) framework to the case of the Maldivian National TB Screening Program.

A diagnostic analysis of the RE-AIM framework was conducted, along with the creation of an adapted framework and the design of new complimentary tools. The framework and its associated tools were then retrospectively applied to a Maldivian case study. Findings showed that creative designs in IS evaluation allow for the categorization, monitoring, and tracking of changes to a program's design or budget that are due to stakeholder engagement. The frameworks and tools resulting from this thesis should improve the evaluation of implementation science by allowing IS projects/programs to be evaluated based on how responsive they are to stakeholder input. The analysis also found that preserving interests as the unit of analysis proved difficult when attempting to design practical tools and, therefore, determined the need to use stakeholders' inputs as a proxy for their interests. This thesis ultimately determined that not only is it feasible to incorporate stakeholder engagement into implementation science evaluation frameworks, but also that this integration could create new forms of evidence and advance the goals of implementation science.

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Most of all, I am grateful to my parents, Poonam and Atma Dayal, for providing everything I have needed to flourish during my MPH and life in general. Their never-ending love, support, and sacrifices have made all of this possible. I submit this thesis in honor of them.

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Glossary

TERM	DEFINITION
Atoll	An administrative unit of islands
CAB	Community Advisory Board
CBPR	Community Based Participatory Research
CHW	Community Health Worker
HELP	Human Engagement Learning Platform for Global Health
IS	Implementation science
Lh. Atoll	Lhaviyani Atoll
MNTSP	Maldivian National TB Screening Program
MoH	Ministry of Health
RE-AIM	Reach, Effectiveness, Adoption, Implementation, Maintenance
SE	Stakeholder engagement
TB	Tuberculosis
WHO	World Health Organization

Purpose

The purpose of this thesis is to explore the feasibility and potential impact of incorporating stakeholder engagement into the RE-AIM framework for the evaluation of implementation science.

Specific Aims

To fulfill its purpose, this thesis has four specific aims:

1) Analyze the RE-AIM framework and its guiding rationales to determine how it could be amended to include stakeholder engagement
2) Enhance the RE-AIM framework by incorporating key elements from stakeholder engagement theory
3) Design tools for the utilization of RE-AIM(S) that allow for the evaluation of stakeholder engagement within programs
4) Apply the adapted RE-AIM(S) framework to the case of the Maldivian National TB Screening Program

Context

The Origin of the Thesis

I began thinking critically about the role of stakeholder engagement when I was working as an assistant program manager for the Ministry of Health in the Republic of the Maldives in 2019. Having both professional and personal connections to South Asia, I was interested in doing my Master of Public Health practicum in a part of South Asia where I would both understand some of the cultural context and be challenged with a new environment. As a public health student interested in program management, governmental work, and implementation sciences, I

was eager to work at a national level. I wanted to see how research was translated into action and to provide resources that would strengthen a country's overall health system. Through the gracious connections of Humphrey Fellow Abdul Malik, working for the Ministry of Health in the Maldives presented the perfect opportunity to achieve my goals through experiential learning.

The Head of the HIV/TB Division, Mr. Abdul Hameed, decided that he wanted my work to focus on implementing the National Tuberculosis (TB) Screening Program, which was designed to achieve the WHO goal of eliminating tuberculosis in the Maldives. Although the program had been officially launched in two locations in March of 2019, the Ministry of Health (MoH) faced many implementation challenges and the Head of the HIV/TB Division wanted to re-evaluate the implementation strategy for the program. The two initial locations had large populations that needed to be screened and pressure to launch the program by World TB Day meant that the HIV/TB Division did not have adequate time to properly train the community health workers, provide the districts with accurate population target estimates, or build substantial relationships with local administration. To address these challenges, I was asked to help improve the program's training, monitoring, and partnership building activities.

The program re-launch required approvals from the Health Protection Agency (an agency within the Ministry of Health) and the WHO country office before beginning. I worked closely with a variety of stakeholders, including the Head of the HIV/TB Division (Abdul Hameed), a MoH public health officer (Guraa), a hospital manager (Jaufar), and a hospital service coordinator (Reem). Each person contributed significantly to the success of the program and my job was to be the lead coordinator of all these efforts. After a few weeks of work, I noticed the emphasis the HIV/TB Division Head placed on stakeholder engagement and relationship

building. When the MoH staff discussed WHO program evaluation procedures, I began thinking about the relationship between stakeholder engagement, program design/evaluation, and implementation science.

Geographical and Program Context

The Maldives is a small archipelago nation in South Asia, consisting of 1,192 small tropical islands. The country's population of around 515,696 people are dispersed across 188 inhabited islands that are grouped into rings of islands called atolls (World Bank, 2020). The Maldives has been cited as a "development success" with a literacy rate of nearly 100% and a life expectancy of over 78 years (World Bank, 2020). The country has made great public health strides over the last several decades by eliminating a multitude of infectious diseases, such as malaria, measles, and lymphatic filariasis (Ministry of Health, 2016). Despite these incredible advancements, tuberculosis (TB) continues to be present in vulnerable high-risk populations such as the elderly, drug users, and chronic disease patients. The Maldives continues to have an increased risk of transmission due to increasing migrant populations from high TB-burden countries (Ministry of Health, 2016). In 2018, the incidence of TB was 33 per 100,000 people, with around 138 new and relapsed cases annually (WHO, 2018). A 2016 report from the Ministry of Health identified that overcrowding and poor housing conditions in the capital city, where over 30% of the population lives, present a high risk for increasing disease transmission (Ministry of Health, 2018; World Bank, 2020).

In 2018, President Abdulla Yameen Abdul Gayoom pledged to end TB in the Maldives by 2022, ahead of WHO's South East Asia Regional Target (Ministry of Health, 2018). The Maldives National Strategic Health Plan, created by the Ministry of Health and WHO Maldives,

aimed to reduce the incidence rate of TB in the Maldives by 50% and TB deaths by 75% by 2022 (Ministry of Health, 2018). The plan specifies that the EndTB campaign needs to be initiated one atoll (administrative group of islands) at a time (Ministry of Health, 2018). The Maldivian National TB Screening Program (MNTSP) was launched in two locations in early 2019; however, the program was not implemented systematically because, according to employees, the launch was rushed in order to launch on World TB Day on March 24th, 2019. It was not evident that an implementation framework was used to guide the program launch. By June 2019, the MoH noted that the first two locations still had not begun screening activities. The Ministry, therefore, wanted a manual on how to improve and then implement this mass screening program at an atoll level. The Head of the HIV/TB Division, Mr. Abdul Hameed, cited the large population size of the first two atolls as one of the major reasons for challenges in initiating screening activities. Although health workers were trained on how to perform the skin test for TB, Mr. Hameed also noted that health workers were likely not given enough training on how to organize mass screenings on their islands and were not given specific screening targets (i.e. the number of people in each high-risk group on each island they needed to screen) by the MoH.

Thus, the HIV/TB Division team decided to choose a small atoll, Lhaviyani, with only four inhabited islands, to be the location of a pilot for the improved screening program. The overarching goal of my work, therefore, as assistant program manager was to improve the National TB Screening Program, implement it within Lhaviyani Atoll, and write an implementation manual that could be used to scale the program nationally.

Stakeholder Engagement Goals within the Program

There were multiple aspects of stakeholder engagement at play within this program, despite the fact that no one used the word "stakeholder," or had an explicit stakeholder engagement (SE) strategy.

The goals of the SE within the program were to 1) use stakeholder input to determine how to improve the existing program and 2) build new public-private partnerships with local business leaders to increase program funding and expand program reach. The HIV/TB Division Head, Abdul Hameed, explained the traditional hierarchy of power between key stakeholders and indicated that the most important stakeholder we needed to engage to ensure an effective program was the atoll hospital manager, Jaufar. It would be his leadership that would drive this program forward at a local level in the atoll.

The first goal was achieved by organizing a strategic planning meeting with key local Lhaviyani stakeholders. This meeting not only included key management figures, but also included people such as the hospital HR department, medical records officer, and chief community health worker. It was in this meeting that stakeholders identified ways to improve the existing program, an implementation plan was established, and stakeholder responsibilities were divided up.

The second goal was achieved by hosting a Partners Forum between resort managers, hospital staff, and MoH staff. The tourism industry accounts for two-thirds of the country's GDP and a substantial portion of government tax revenue, which made resorts an important stakeholder in the program (World Bank, 2020). More significantly, resorts are one the biggest employers of migrant workers coming from high-TB-burdened countries and workers on resorts made up an estimated 28% of the total Lhaviyani Atoll population (Burke, 2015). It was therefore crucial to develop a partnership with resort management in the atoll in order to be able to expand screening

activities and reach the high-risk migrant population. This Partners Forum resulted in the first public-private financial partnership between the Ministry of Health and local resorts.

Remaining Questions and Thesis Topic

By the time I left the Maldives in August 2019, the National TB Screening Program had been vastly improved, with new training resources, monitoring plans, and partnerships, and was ready to be officially launched in Lhaviyani Atoll. The Director of the Health Protection Agency (an agency within the MoH) was impressed at how much we accomplished in such a short amount of time. After being the one responsible for facilitating the meetings between business leaders, hospital management, and MoH staff, I experienced first-hand how stakeholder input shaped the implementation of the program. This immersive learning experience in the Maldives drove me to consider the role of stakeholders in program design and implementation. I felt that the team I worked with showed extraordinary leadership and adaptability, and I felt that these qualities all played an important part in the success of the program. My experience left me with questions about how stakeholder engagement is understood within the field of implementation science, what the role of stakeholder engagement is in implementation science evaluation, and how the Maldivian screening program could be evaluated to account for stakeholder engagement. These remaining questions eventually became the guiding questions of my thesis, which are explored in-depth in the following "Background and Significance" section.

Background and Significance

The purpose of this section is to briefly summarize the literature on implementation science and program evaluation, in regards to stakeholder engagement. More specifically, this background section will set up the importance of the thesis aims by answering the following questions:

1) What are stakeholders and what tools exist to analyze stakeholder engagement?
2) What is the relationship between the field of implementation science and stakeholder engagement?
3) How are implementation science programs evaluated?
4) What have been traditional stakeholder engagement strategies, and how have they been incorporated in implementation science?
5) Why is it important to integrate stakeholder engagement in implementation science?

1) What are stakeholders and what tools exist to analyze stakeholder engagement?

In this thesis, stakeholders are defined as "individuals or groups who have an interest or some aspect of rights or ownership in the project, and can contribute to, or be impacted by, either the work or the outcomes of the project" (D. Walker & Rowlinson, 2007). These stakeholders typically include those involved in program operations, those served or effected by the program, and those who intend to use the findings of the program (CDC, 2012). Furthermore, stakeholder engagement is defined in this thesis as a strategy for engaging relevant stakeholders in determining how their interests will be addressed by a program/research (Lavery, 2018a).

There are many ways to organize and characterize stakeholders within a program. Stakeholder mapping is a common technique that involves visualizing the program's stakeholders. There are many variations of this technique, with some mapping stakeholders along

axes of "interest" and "power" and others using concentric circles to represent similar ideas (Murray-Webster & Simon, 2006; D. H. Walker, Bourne, & Shelley, 2008). Stakeholder mapping is promoted by a wide variety of institutions and organizations. For example, the World Bank suggests creating a matrix to categorize stakeholders by their power and salience and then to label stakeholders according to the attributions of "promoters, defenders, latents, or apathetics" (World Bank). The Centers for Disease Control and Prevention present three simple tables as tools to identify key stakeholders, determine which stakeholders to engage, and determine what matters to each stakeholder (CDC, 2012). The World Health Organization (WHO) offers a comprehensive stakeholder analysis toolkit, which includes a table that requires in-depth interviewing to identify each stakeholder's knowledge, position, interests, alliances, resources, power, and leadership role (Schmeer, 1999).

While a variety of tools for stakeholder analysis exist, ranging from simple to complex, there are no known tools that capture the adaptations that programs make based on stakeholder input. The majority of these tools are used for planning purposes and are designed to be utilized by the implementing organization to determine the "level of engagement" required for each stakeholder. While these tools all have their own value, it would be useful to have a tool that could be used to analyze how *responsive* a program is to stakeholder input/feedback and to hold a program accountable for being responsive to the input of other stakeholders.

2) What is the relationship between the field of implementation science and stakeholder engagement?

First presented in the early 2000s, implementation science is a relatively new field that studies the methods "to promote the systematic uptake of…evidence-based practices into routine practice" (Eccles & Mittman, 2006). Although originally meant to improve the quality of health

services, the field of implementation science has boomed in popularity and now includes research across a multitude of health sectors. For example, in 2019, the Consortium of Universities for Global Health's annual conference was on the theme of "Translation and implementation for impact" (Martin, Mullan, & Horton, 2019). Furthermore, the editors of The Lancet recently published a call to action to bridge the research-policy gap, arguing that "our central challenge is not a knowledge gap but a translation deficit" (Martin et al., 2019). One proposition is that bridging this research-policy gap will require a more evidence-based and nuanced stakeholder engagement model. Research conducted in highly controlled and idealized settings rarely engages a broad range of stakeholders since stakeholder engagement interactions present an "unpredictable" factor that could potentially distort program results. However, this often creates challenges when the time comes to translate that research into national policy or scale it up nationally and the program has not addressed the interests of key stakeholders.

The problem is that we do not fully understand the relationship between stakeholder engagement (SE) and dominant frameworks of implementation sciences. For over a decade, academics have written commentaries critiquing the fact that we invest millions of dollars in program development and trainings and yet "leave the process of community engagement largely to trial and error" (Newman, 2006). This is problematic considering that the implementation science literature includes substantial rhetoric about stakeholder engagement and yet does not provide a concrete method to practice "engagement." For example, the USAID MEASURE Evaluation Learning Center provides an 80-page manual on implementation research, which includes only two pages on engaging stakeholders (MEASURE Evaluation, 2012). Those two pages primarily emphasize the importance of engaging stakeholders, but do not provide specific

tools for either conducting the engagement or evaluating the impact of the engagement on program outcomes.

An NIH-funded webtool called "Dissemination and Implementation Models in Health Research and Practice" lists over 100 different models and frameworks, highlighting the fact that there is no unified framework within implementation science (Rabin, 2015). There is little consensus about the elements that should be included in a framework and there is limited "how to" support for the program managers who might be required to utilize such frameworks. Furthermore, most frameworks have not been empirically tested and do not provide an empirical basis for best practices in stakeholder engagement (Newman, 2006). It is for these reasons that Richard Horton, editor-in-chief of the Lancet, tweeted in 2019 that, "It's so sad to see an otherwise intelligent man seduced by the blandishments of implementation research, which…is an exercise in meaningless banality" (Horton, 2019). In other words, Richard Horton is concerned that implementation science is just a repackaging of the traditional ideas into a variety of new frameworks with new labels, but without substantial innovation or real improvement over existing methods and strategies.

3) How are implementation science programs evaluated?

Over the decades, multiple frameworks have been developed for implementation science evaluation and the RE-AIM framework has emerged as one of the most popular. In fact, according to a 2017 publication on research guidelines, RE-AIM was the most common implementation framework used in grant applications to the NIH and CDC between 2000 and 2016 (Vinson, Stamatakis, & Kerner, 2017). It was designed in 1999 by researchers in response to a need for a "comprehensive evaluation framework" to assist in both the planning and

evaluation of public health programs and policies (Russell E Glasgow, Vogt, & Boles, 1999). Glasgow et al. argued that previous implementation frameworks did not take into account how factors at the individual, organizational, and community levels would impact the implementation of a program or policy. Glasgow et al. therefore presented the RE-AIM framework as a pushback against the dominance of clinical studies at the time that were focused solely on efficacy and failed to examine how programs would be implemented under non-ideal conditions (Starfield, 1998).

Other research groups at the time had defined the impact of an intervention only as the reach of the program (% of population receiving the intervention) multiplied by the program's efficacy (I=R x E) (Abrams et al., 1996). However, Glasgow et al. argued that there were more dimensions that needed to be evaluated to determine the impact of an intervention in real-world settings, and therefore proposed the five dimensions of the RE-AIM framework: (R) reach, (E) effectiveness/efficacy, (A) adoption, (I) implementation, and (M) maintenance (Russell E Glasgow et al., 1999). Since 1999, the framework has been used to plan and evaluate programs on a variety of public health issues, largely because the framework is considered to be intuitive for both practitioners and policymakers to use (Harden et al., 2018). The RE-AIM framework has now been applied in over 450 publications, cited over 2,800 times, and continues to grow in popularity (Russell E Glasgow et al., 1999; Tabak, Khoong, Chambers, & Brownson, 2012). This thesis focuses its analysis on RE-AIM due to its popularity and dominant use in implementation science evaluation.

4) What have been traditional stakeholder engagement strategies, and how have they been incorporated in implementation science?

Traditional approaches to stakeholder engagement have focused heavily on establishing Community Advisory Boards (CABs); however, practitioners are now more aware of the fact that CABs often do not have appropriate community representation and have many power imbalances both *within* the CAB and *between* the CAB members and the practitioners (Reddy, Buchanan, Sifunda, James, & Naidoo, 2010). Very little attention has been given to examining the extent to which community members themselves actually *feel engaged* in the program/research process (Goodman et al., 2017). As a result, researchers/program managers can organize a CAB or host a community meeting and believe that these actions sufficiently satisfy the "community engagement" requirement of their grant/program, when in fact they have done nothing to elicit or address the interests of those stakeholders.

Researchers have often used qualitative research to try to capture this "feeling" of engagement, using qualitative research almost as a form of stakeholder engagement. The RE-AIM framework actually necessitates such qualitative research in order to understand the underlying reasons for a program's success or failure in each of its five dimensions (Holtrop, Rabin, & Glasgow, 2018). Despite this fact, most studies place a greater emphasis on quantitative methods, with one review article finding that only 3.5-15.6% of publications using RE-AIM included a qualitative measure (Gaglio, Shoup, & Glasgow, 2013). Holtrop et al. have argued that qualitative research is valuable because it can "engage participants in a collaborative manner" and help understand the emic perspective of stakeholders. However, listening to stakeholders through qualitative research is not the same thing as stakeholder engagement because it does not create any obligation to address the interests of stakeholders (Holtrop et al.,

2018). In contrast, SE includes a strategy for engaging relevant stakeholders in determining how their interests will be addressed by a program/research (Lavery, 2018a).

Community-based participatory research (CBPR) is another methodology that has traditionally focused on stakeholder engagement by creating "culturally-centered interventions" and engaging the community as partners in research/program design (Minkler, 2004). Despite its rise in popularity, there is a dearth of literature regarding how to evaluate CBPR outcomes (Cargo & Mercer, 2008). Existing evidence is largely based in case studies that describe CBPR interventions and recommendations for how to maintain partnerships, but there is little evidence for how to determine outcomes that can be attributable to CBPR interventions (Sandoval et al., 2011). Sandoval et al. reports that one of the largest challenges in linking CBPR to direct outcomes is "the lack of valid instruments for documenting CBPR systems" (Sandoval et al., 2011). In response, Goodman and colleagues presented a new classification model to evaluate stakeholder engagement and argue that SE exists on a spectrum with three primary categories: (1) non-participation, (2) symbolic participation, and (3) engaged participation (Goodman & Sanders Thompson, 2017). MacQueen et al. goes one step further in proposing potential indicators to evaluate the role of SE in achieving ethical goals (MacQueen, Bhan, Frohlich, Holzer, & Sugarman, 2015).

Overall, there is a growing awareness that stakeholder engagement needs to be much more than simply gathering community members to review informed consent protocols and extract contextual information about the community for the betterment of research alone. Traditional ways of conceptualizing stakeholder engagement trap us in old-fashioned ways of thinking about the role and value of SE. Instead, stakeholder engagement needs to be viewed as the key to program implementation by "providing a means of navigating, and responding to, the

complex social, economic, cultural, and political settings in which science programs are conducted" (Lavery, 2018a). However, many aspects of SE still need to be researched for it to gain a more robust evidence-base. Key questions include determining how to measure levels of engagement and assess the impact of that engagement on research/program outcomes.

5) Why is it important to integrate stakeholder engagement in implementation science?

The intersection of implementation science and evaluation strategies for stakeholder engagement is important because there is a paradigm shift happening that is pushing back against historically colonial approaches to global health. Stakeholder engagement may offer a way, through implementation science, to help in this transition. This approach would allow us to see how the interests of stakeholders can be actionable and contribute to organizational learning about the broader impact of a program's activities.

Currently, implementation science is viewed as something that is both revolutionary and nothing new. One way to reconcile these two contradicting views is to consider a more explicit model of how stakeholder engagement could be the necessary set of mechanisms that would drive the effectiveness of implementation science. In other words, our new focus should be on exploring stakeholder engagement as a vehicle for effective implementation science. However, the current gap in knowledge is in understanding how to feasibly integrate stakeholder engagement into implementation science evaluation frameworks. The purpose of this thesis, therefore, is to explore the feasibility and potential impact of incorporating stakeholder engagement into the popular RE-AIM evaluation framework.

Methods

Diagnostic analysis of the RE-AIM framework

After reviewing a myriad of implementation science evaluation frameworks, I focused my analysis on the RE-AIM framework due to its popularity and dominance in the field. I then performed a diagnostic analysis of the framework to determine how RE-AIM understands stakeholder engagement and to identify gaps in the utility of the framework. I began the analysis by reviewing core literature on PubMed about RE-AIM and then critically reviewing the literature on the subsequent utilization of the framework in public health case studies. I examined the way the literature on RE-AIM wrote about stakeholder engagement and how papers that utilized RE-AIM incorporated stakeholder engagement into evaluations. I also reviewed literature on stakeholder theory and implementation science to analyze how these two fields could be feasibly integrated. I then organized my findings into categories that answered the important questions discussed in the "Background and Significance" section, which established the foundation for achieving the specific aims of this thesis.

Enhancement of the RE-AIM framework through exploratory analysis

After diagnosing the gaps in the RE-AIM framework, I conducted an exploratory analysis to determine how to integrate elements of stakeholder engagement into the framework. This involved an exploratory process of attempting to adapt the framework to include stakeholder engagement components. The first iteration added stakeholder engagement as just another dimension to be analyzed in a program evaluation. However, through multiple iterations, I discovered that stakeholder engagement could be conceptualized as the foundation of the entire RE-AIM framework and needed to be visually represented as such. Through several more cycles

of iteration, I ultimately created an adapted framework called RE-AIM(S) that integrates stakeholder engagement, represented by an (S), as a cross-cutting element across the five dimensions of the RE-AIM framework.

Design of the Stakeholder Feedback Mapping and Adaptive Learning Matrix tools

In order to further operationalize the proposed RE-AIM(S) framework, I developed the Stakeholder Feedback Mapping (SFM) and Adaptive Learning Matrix (ALM) tools. I began by reviewing the existing tools for stakeholder mapping. While a variety of tools for stakeholder mapping do exist, there were no tools that captured the adaptations that programs made based on stakeholder input. The majority of tools were used for planning purposes and were designed to be utilized by the implementing organization to determine the "level of engagement" required for each stakeholder. While these tools all have their own value, I determined that it would be useful to have a tool that could be used, either by external evaluators or a program's management, to track a program's responsiveness to stakeholder interests in real time and to hold the program accountable for being responsive to those interests. I determined that the core elements I wanted to visualize on the map were the traditional elements of stakeholder authority and classification, as well as a new element of feedback loops that would capture stakeholder input to a program. I then made a preliminary map with these components and, through multiple iterations, added more nuance through color-coding and additional text. The final result is a new mapping tool called Stakeholder Feedback Mapping (SFM) that visualizes how implementation science programs adapt to stakeholder input.

After developing the SFM, I determined there was also a need to design a matrix tool that would be complementary to the SFM, but would be able to capture more information and

nuance. The World Bank suggests that matrices are good methods of organizing stakeholders; however, no matrix existed that captured how stakeholder input changed the budget or design of a program. I, therefore, designed the Adaptive Learning Matrix (ALM), which is a tool that is complementary to the SFM and allows for the evaluation of program adaptations based on stakeholder input. The ALM began as a simple matrix to reflect how stakeholders' input changed a program's budget or protocol. The tool went through multiple iterations based on external feedback and became more nuanced in the information it was designed to capture through the addition of more sub-columns and a numerical coding system. Further iterations occurred after I attempted to retrospectively apply it to the Maldivian National Tuberculosis Screening Program case study, which I discuss later. I then realized the need to include structured space to explain the context of decisions represented within the matrix. Ultimately, I integrated what I learned experientially from the Maldives with what I learned from the literature to create a new tool that displays the influence of stakeholder input on a program's budgeting and design.

Application of the RE-AIM(S) framework to a Maldivian Case Study

In order to demonstrate the unique type of evidence created by the RE-AIM(S) framework, I applied the framework to the Maldivian National Tuberculosis Screening Program (MNTSP). The implementation of the Maldivian National TB Screening Program was chosen as a case study for this thesis because there was a high level of stakeholder engagement that I believe allowed the program to progress rapidly in a short amount of time. Using the MNTSP as a case study, I retrospectively applied the new Stakeholder Feedback Mapping (SFM) and Adaptive Learning Matrix (ALM) tools associated with the RE-AIM(S) framework to demonstrate their utility. My personal experience observing and participating in the decision-

making process of the MNTSP meant that I had access to internal information about the program. Therefore, to apply these two tools, I reviewed program documents and personal notes from my time working for the MNTSP to identify specific examples of stakeholder input influencing the program. Retrospectively applying RE-AIM(S) and its associated tools to the Maldivian program provided a simple method to gather evidence on the way responsiveness to stakeholder input may have influenced program outcomes, without having to collect new data. Due to the level of insight I gained about the program's decision-making process during my time working in the Maldives, the MNTSP serves as a good case study to assess the framework and tools developed in this thesis.

Results

Aim 1 Results

My first aim was to analyze the RE-AIM framework and its guiding rationales to determine how it could be amended to include stakeholder engagement (SE). Fortunately, the creator of RE-AIM recently acknowledged how much RE-AIM has been "modified and [has] evolved to address emerging issues" and needs to continue to do so, and I believe stakeholder engagement is one of the crucial elements that RE-AIM must now incorporate (Russell E. Glasgow et al., 2019).

My analysis found that one of the RE-AIM framework's major limitations is that it currently has no existing metrics within its five dimensions that explicitly evaluate stakeholder engagement. In fact, a systematic review of the use of RE-AIM over the past 14 years did not even use the word "stakeholder" once (Gaglio et al., 2013). Stakeholder engagement, defined here as a strategy for engaging relevant stakeholders in determining how their interests will be addressed by a program/research, has increasingly been recognized as the "missing link" in

improving disease prevention programs and research studies (Goodman et al., 2017; Lavery, 2018b; Minkler, 2004; Minkler & Wallerstein, 2011). The World Health Organization itself has stated that community engagement is "central to any public health intervention" and created its own "community engagement framework for quality, people-centered and resilient health services" in 2017 (WHO, 2017). Additionally, large global health funders such as the Wellcome Trust and the Bill and Melinda Gates Foundation have funded work in the last decade on the ethical aspects of community engagement in international research (Singer et al., 2007). Despite this recognition, there is currently limited empirical evidence "on the best practices for stakeholder engagement and even less on evaluation of engagement demonstrating the association between the quality and quantity of engagement and research outcomes" (Goodman & Sanders Thompson, 2017).

In other words, little evidence links SE directly to improvements in health outcomes (Popay et al., 2007). This lack of evidence is partially due to the lack of adequate instruments to evaluate SE within the context of implementation science evaluation. This can be seen within the RE-AIM framework, which focuses almost entirely on outcomes rather than on strategies/processes. It encourages researchers to consider factors such as the fidelity to protocol, but it does not explicitly consider how addressing stakeholder interests can help achieve the program's goals. Considering that RE-AIM is a tool to evaluate implementation science programs and that SE is a potential "missing link" in program implementation, my analysis found that RE-AIM is limited by its current lack of ability to integrate SE within evaluations (Goodman & Sanders Thompson, 2017). In the next section, I will present my results on how this integration can be achieved.

Aim 2 Results

My second aim was to enhance the RE-AIM framework by incorporating key elements from stakeholder engagement theory. My initial strategy was to simply add stakeholder engagement as a sixth dimension upon which programs would be evaluated, giving the new framework the name RE-AIMS (using no parenthesis on the "S"). This would require the development of new metrics and indicators on which the "S" dimension could be operationalized. However, this approach risked reducing SE to a series of checkbox activities, the way that some traditional stakeholder engagement strategies suggest, which would not reveal anything meaningful about the effects of SE on program outcomes. After further consideration and research on stakeholder engagement, it became evident that SE could be conceptualized as an underlying factor crosscutting all five RE-AIM dimensions, rather than as an additional 6th dimension. This conceptualization better represented the idea that SE is essential to achieving success in the five dimensions of RE-AIM.

The final result of my analysis is the creation of an adapted framework called RE-AIM(S), which integrates stakeholder engagement into the framework and represents a new step in the evolution of RE-AIM (Table 1) (Russell E. Glasgow et al., 2019). This framework creates a unique form of evidence that can be used to answer the guiding questions of the original five RE-AIM dimensions. In other words, SE is not a separate sixth dimension; rather, it informs how the five RE-AIM dimensions can be achieved. Considering that RE-AIM is currently one of the most dominant implementation science evaluation frameworks, adopting the RE-AIM(S) framework that reflects stakeholder engagement (S) could have widespread impact.

Table 1: The adapted RE-AIM(S) framework

Framework Dimensions	Guiding Questions (Harden et al., 2018)	(S) – Stakeholder Engagement
R – Reach	How do I reach those who need a specific intervention?	*How can insights about stakeholder interests contribute to answering each of the RE-AIM guiding questions?*
E – Effectiveness/Efficacy	How do I know my intervention is working?	
A – Adoption	How do I design for dissemination and develop organizational support to deliver my intervention?	
I – Implementation	How do I ensure the intervention is feasible and delivered properly?	
M – Maintenance	How do I ensure long-term benefits and institutionalization of the intervention and continued community capacity for D&I?	

Aim 3 Results

My third aim was to design tools for the utilization of the RE-AIM(S) framework that allow for the evaluation of stakeholder engagement within programs.

RE-AIM(S) provides a conceptual framework for implementation science evaluations that places stakeholder engagement at the foundation of its analysis. The challenge was how to operationalize the "S" component of the RE-AIM(S) framework. The guiding question for the "S" component of RE-AIM(S) was "how can insights about stakeholder interests contribute to answering each of the RE-AIM guiding questions?" (Table 1) However, I discovered that using interests as the unit of analysis did not lend itself well to designing practical tools that would allow a program manager or external evaluator to utilize this framework. The initial guiding question was also too broad to design tools around. I, therefore, focused on one aspect of the question, regarding how a program's responsiveness to stakeholder input impacts the program's

budget or design. To answer this question, I decided to use inputs as a proxy for interests since inputs were easier to visualize and because interests are difficult to determine retrospectively.

Although assessing the "S" component of the framework required relying on the more traditional concept of stakeholder input, rather than interests, the process still focused on new ideas of organizational learning and responsiveness, which have not been highlighted in traditional implementation science evaluation frameworks. Assessing responsiveness to stakeholder input required the development of new tools that would emphasized the adaptive nature of stakeholder engagement. My analysis thus resulted in the development of two tools, Stakeholder Feedback Mapping (SFM) and the Adaptive Learning Matrix (ALM), both of which analyze how responsive a program is to stakeholder input.

Stakeholder Feedback Mapping (SFM)

The Stakeholder Feedback Mapping (SFM) tool emerged as the result of a need to visualize the patterns in stakeholder feedback and depict the program adaptation that occurred due to stakeholder input. Many methods of stakeholder mapping have been developed over the years, focusing on elements such as a stakeholder's authority (D. H. Walker et al., 2008). However, no known stakeholder mapping technique focuses on mapping the feedback loops between the program and stakeholders to visually depict the program's adaptability and responsiveness to stakeholder inputs. I therefore created the Stakeholder Feedback Mapping (SFM) tool to address this gap in knowledge (Figure 1). This tool maps key stakeholders on the X axis according to their classification (i.e. international, governmental) and on the Y axis according to their level of authority over the program, defined as their ability to terminate the

program. The level of authority increases on the Y axis. Thus, stakeholders with a higher level of authority over the program are shown higher up on the map.

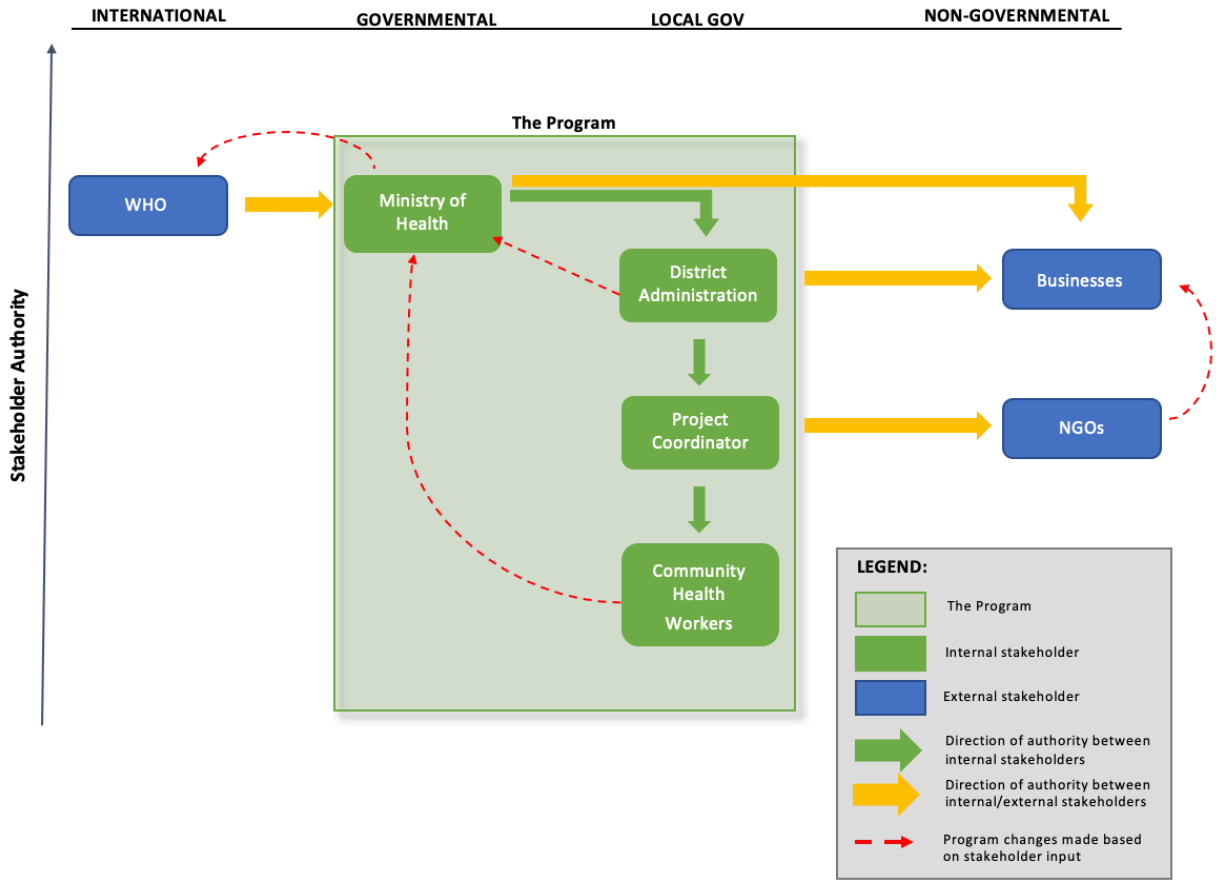

Figure 1: Stakeholder Feedback Mapping (SFM). Key stakeholders are organized according to their classification of organization and level of authority over the program. The transparent box indicates the internal stakeholders that are within the program. Solid arrows show the established protocol of supervision and information flow. Dotted red arrows show program changes based on stakeholder input.

In any public health program, there are a myriad of stakeholders with different roles and each have a different type of authority or influence over the people who have the final decision on a program's budget or design. I chose to simplify this complex web of stakeholders by defining stakeholders as either internal or external to the program. Internal stakeholders are

defined as those within the organization that are primarily responsible for implementing the program and external stakeholders are defined as those who are outside the main implementing organization but are still a part of program implementation. For example, a program that is being implemented by a Ministry of Health will have internal stakeholders, such as local district administration and community health workers, and it will also have external stakeholders, such as WHO or partner NGOs. For clarity, this thesis will refer to internal stakeholders as "the program" since they have a more legitimate authority over the program's budget and design. The transparent green box in Figure 1 indicates the stakeholders that are part of the program. Internal stakeholders within the program have an internal influence on decisions regarding budgeting and design, while external stakeholders outside of the program can also influence this decision-making. The SFM denotes the difference between external stakeholders (shown in blue) and internal stakeholders (shown in green) through color-coding (Figure 1).

The green arrows in Figure 1 depict the direction of authority between internal stakeholders, while the yellow arrows depict the direction of authority between external and internal stakeholders. It is important to differentiate these two types of relationships because the feedback mechanisms between internal stakeholders is likely to be very different from the mechanisms in place between external and internal stakeholders. For example, community health workers may have a special form or procedure through which they can give input to the program, while NGOs may have to take initiative to directly contact the program manager.

Key ways in which the program changed due to stakeholder input are denoted by the red-dotted arrows. These arrows show the direction of stakeholder input to the program. Inputs can be given between internal and external stakeholders, or solely between the internal stakeholders that are responsible for the program. By denoting the difference in types of relationships, as well

as the red dotted-arrows, we can more easily identify potential barriers to feedback loops. For example, if there are fewer red arrows coming from community health workers (CHWs) and many arrows coming from NGOs, then this might indicate that more mechanisms need to be put in place to combat the potential power dynamics that are making CHWs less likely to give feedback.

The Adaptive Learning Matrix (ALM)

The Adaptive Learning Matrix (ALM) is a matrix that reflects the changes made to a program's design or budget based on stakeholder input (Table 2). The first column indicates all the internal and external stakeholders involved in the program. The stakeholders do not need to be listed in any hierarchical order. The second column indicates the ALM score of each individual stakeholder, which is calculated after the entire matrix has been filled and which I explain in depth later.

		CHANGES TO BUDGET			**CHANGES TO PROGRAM DESIGN/ PROTOCOL**		
Stakeholder	**ALM Score**	***Input***	***Implementation***	***Why?***	***Input***	***Implementation***	***Why?***
Stakeholder 1		A	2	…	G	0	…
Stakeholder 2		B	2	…	H	2	…
Stakeholder 3		C	0	…	I	2	…
Stakeholder 4		D	2	…	J	1	…
Stakeholder 5		E	1	…	K	2	…
Stakeholder 6		F	0	…	L	0	…
TOTAL ALM SCORE	**= X**						

Table 2: The Adaptive Learning Matrix (ALM). The ALM depicts key suggestions made by relevant stakeholders regarding both budget allocations and program design. Suggestions that were fully implemented are shown in green, those that were partially implemented are in orange, and those that were not implemented are shown in red. The total ALM score is represented by X.

When designing the ALM and considering all the different ways in which stakeholders provide input to programs, I determined that all stakeholder feedback essentially fell into two main categories: changes to program budget and changes to program design/protocol. These two categories compose the core of the matrix. Internal stakeholders within the program have an internal influence on decisions regarding budgeting and design, while external stakeholders outside of the program can also influence this decision-making. Thus, both internal and external stakeholders are represented in the ALM.

Within each one of the two categories of changes to a program's budget or design, there are three sub-columns. The first sub-column is titled "Input" and refers to the input the program received from a stakeholder to change either the program budget or design. Inputs can be given between internal and external stakeholders, or solely between the internal stakeholders that are responsible for the program. The source of the input (i.e. the stakeholder giving the suggestion) should be noted within the "Input" column. Furthermore, the matrix can be expanded as needed to include multiple inputs that a single stakeholder received.

The original ALM table was organized based on the inputs that each stakeholder *gave,* rather than the inputs that each stakeholder *received.* However, after further consideration, I decided that the matrix should be redesigned to focus on inputs the program *received* because the purpose of the matrix is to draw attention to whether or not the program was responsive to the inputs of stakeholders. This simple yet profound change was an important step in developing the final ALM.

The next sub-column is titled "Implementation" and it denotes the level to which a suggestion was implemented by the program. This part of the matrix is color-coded according to a point value on a scale of 0-2. Two points indicates that the corresponding suggestion was

completely implemented by the program and is coded green in the matrix. One point indicates that the suggestion was partially implemented by the program (i.e. some components of the input were used, or a modification of the original idea was implemented) and is coded orange. Zero points indicates that the suggestion was not implemented by the program at all and is colored red in the matrix. The color-coding is used as a visual tool so that the matrix can be easily examined and used as a visual indicator of how responsive the program was to stakeholder inputs. More work is needed in the future to create more operational definitions for the scoring of these three implementation levels.

My original ALM had only red or green colors to indicate whether a suggestion was implemented or not. However, this system was too binary since some suggestions may be partially implemented, which then gave rise to the numerical coding system. It is these numbers that are summed together to create a total ALM score for the program and individual stakeholders. Future work could incorporate a weighting system within the ALM score calculations, since not all suggestions will have equal value or create obligations of equal weight.

The final sub-column is titled “Why?” and includes the rationale behind the decision to implement a suggestion or not. This column was added in a later iteration of the ALM because I realized that the rationale behind these decisions needed to be presented alongside the implementation numerical score to provide important context. Since the program may have very legitimate reasons for not implementing a suggestion, this column can account for that nuance.

The final row of the matrix is the total ALM score for the program, which is the sum of all the points in the matrix. While I originally was only going to have an ALM score for the entire program, I later realized that having ALM scores for individual internal and external stakeholders would highlight which stakeholders were the most responsive and would therefore

allow for a new type of accountability. The individual ALM scores are a summation of the points for each stakeholder (summed across rows). The ALM score can thus serve as a new form of indicator for responsiveness to stakeholder engagement at both a program and individual stakeholder level.

Aim 4 Results

My fourth aim was to apply the adapted RE-AIM(S) framework and its two associated tools to the case of the Maldivian National TB Screening Program. My findings show the visualization of feedback patterns through the SFM and provide ALM scores for all stakeholders in the program.

The Maldivian National TB Screening Program Stakeholder Feedback Mapping (SFM)

I applied the SFM tool discussed in my Aim 3 results to the Maldivian National TB Screening Program (MNTSP). The template shown in Figure 1 was adapted to include the specific stakeholders that were part of the MNTSP (Figure 2). Key ways in which the TB screening program changed due to stakeholder input are noted by the red dotted arrows between stakeholders. A brief description of the change that was implemented as a result of the stakeholder input accompanies each red arrow.

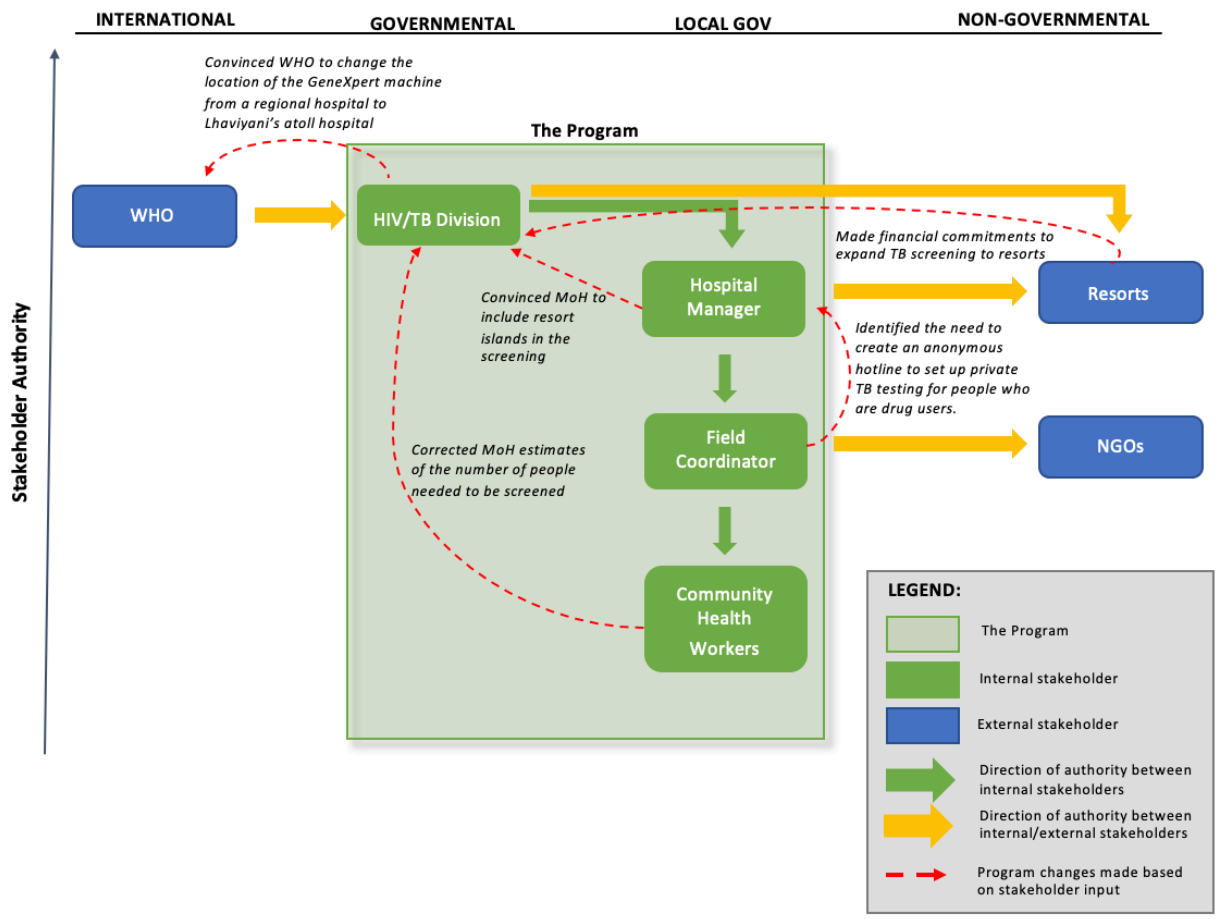

Figure 2: Stakeholder Feedback Mapping (SFM) of the Maldivian National TB Screening Program. Key stakeholders are organized according to their classification of organization and level of authority over the program. The transparent box indicates the internal stakeholders that are within the program. Solid arrows show the established protocol of supervision and information flow. Dotted red arrows show program changes based on stakeholder input. The text briefly describes the changes that occurred.

The Maldivian National TB Screening Program Adaptive Learning Matrix (ALM)

After the Stakeholder Feedback Mapping figure was produced, I applied the Adaptive Learning Matrix (ALM) to the Maldivian National TB Screening Program based on program documents and personal notes I recorded on site in 2019. The matrix indicates major suggestions that the program received from internal and external stakeholders and then I assigned a score from 0-2 for the level to which each suggestion was implemented (Table 3). Greyed-out boxes

indicate that either there was no data available or that no input was identified. For example, WHO received a suggestion from the HIV/TB Division to change the location of a GeneXpert machine from a regional hospital to Lhaviyani's local hospital. This suggestion was implemented fully by the WHO and thus received a score of two and was color-coded green. In contrast, the resorts received input from the hospital manager to make a financial commitment to expand TB screening to resorts, and since only some resorts acted on this suggestion, it received a score of one and was color-coded orange. Since programs naturally undergo many minor changes throughout the implementation process, only suggestions/inputs that would significantly change the program's budget or design/protocol were included in the ALM. This threshold of "significance" must be determined by the individual responsible for applying the matrix. Suggestions included in the ALM could have been made either during the planning or the implementation of the program, since stakeholders are engaged for both processes. The full results are shown in Table 3 below.

The ALM scores of individual stakeholders are shown in the second column and the total ALM score of the program is shown in the last row. These results show that the WHO, HIV//TB Division, and the Hospital Manager were all equally responsive to stakeholder feedback because they all received the same individual ALM score. However, it is difficult to determine whether the program's total ALM score of 18 is considered a high score without having ALM scores of other case studies to compare it to.

		CHANGES TO BUDGET			CHANGES TO PROGRAM DESIGN/ PROTOCOL		
Stakeholder	**ALM Score**	***Input***	***Implementation***	***Why?***	***Input***	***Implementation***	***Why?***
WHO	5	From HIV/TB Division: fund activities for MoH staff to launch the screening program in Lhaviyani atoll	1	WHO agreed to pay for many activities, but not for the launch ceremony expenses	From TB /Division: approve capacity-building activities in Lhaviyani despite the fact that this had not been previously agreed upon in the annual Work Plan	2	Lack of worker training and large populations was cited as a reason why the screening had not begun in the first two locations, so WHO approved more training in a smaller location
					From HIV/Division: change the location of the GeneXpert machine from a regional hospital to Lhaviyani's atoll hospital	2	Even though GeneXpert machines were only supposed to be at regional hospitals, since the Lhaviyani hospital had more patients than the nearest regional hospital, this was a more fair distribution of resources
HIV/TB Division (MoH)	5	From hospital manager: fund more training of health staff	2	MoH agreed to send staff for a 1-day training to improve staff capacity	From Hospital Manager: include resort islands in the screening	1	MoH agreed resorts were a key stakeholder, but not all resorts wanted to partner with the government
					From CHWs: correct the estimates of the # of people needed to be screened	2	MoH reviewed the data and corrected the estimates
Hospital Manager	5	From HIV/TB Division: hire a field coordinator to manage atoll screening activities	1	Manager appointed a staff member to be the coordinator, but didn't pay them more	From Field Coordinator: create an anonymous hotline for private TB testing for people who are drug users	2	Manager saw the value of having an anonymous screening option to reach the drug user population, and the hotline did not cost the hospital additional money
					From Field Coordinator: create a secret symbol to place on the promotional flyers to allow for anonymous testing	2	Manager saw the value of having an anonymous screening option to reach the drug user population, and the symbol did not cost the hospital additional money
Field Coordinator	2				From Hospital Manager: create a video to advertise the screening	2	Coordinator was excited about organizing youth in the creation of this video
CHWs	2				From Resorts: conduct on-site visits to screen resort workers	2	CHWs were willing to travel to resorts to conduct screening as long as costs were covered by MoH
Resorts	1	From Hospital Manager: make a financial commitment to expand TB screening to resorts	1	Not all resorts felt it was their responsibility to contribute to the program, since their only obligation was to their workers			
		From HIV/TB Division: fund the purchase of a new GeneExpert machine for Lh. atoll	0	Machine was too expensive considering that TB prevalence on resorts is low			
Total ALM Score	**= 20**						

Table 3: The ALM for the Maldivian National TB Screening Program. Green indicates the input was fully implemented. Yellow indicates the input was partially implemented. Red indicates the input was not implemented. Greyed boxes indicate no data was available or no input was identified.

Discussion

Distinction Between Stakeholder Input and Interests

During the analysis for this thesis, I needed to distinguish between stakeholder inputs and interests. In its simplest form, interests are categories of things that matter to people. For example, people have security interests, opportunity interests, stewardship interests, and many others. Since these categories of interests reflect things that matter to people, they provide an anchor to value and obligations to avoid harm. Inputs can contain interests (i.e. someone can give input to try and protect or advance their interests), but interests do not necessarily need to be verbalized into the concrete form of input or feedback to a program.

I initially wanted to use an interests-based framework that would place the onus on a program to engage in some form of meaningful relationship with stakeholders to determine if their interests in the conduct or outcomes of the program create specific opportunities to create value and/or obligations to prevent setting back the interests of stakeholders (i.e. creating harm). However, I discovered that using interests as the unit of analysis did not lend itself well to designing practical tools that would allow a program manager or external evaluator to utilize the RE-AIM(S) framework. Therefore, I decided to use inputs as a proxy for interests and accept the limitations that this would bring since inputs were easier to discuss and conceptually visualize. By prioritizing inputs for the purposes of this thesis, I was able to focus my analysis specifically on how responsive a program is to stakeholder input.

The Value of RE-AIM(S)

While some publications are calling for metrics to evaluate stakeholder engagement as an independent process, I advocate for making SE part of routine implementation science evaluation through the adapted RE-AIM(S) framework. This new approach could have high utility because it is an adaptation of an existing widely used standard framework. Using this adapted RE-AIM(S) framework will help provide the evidence-base needed to empirically study the role of SE in implementation science. By utilizing the adapted RE-AIM(S) framework, I propose that a new way to think about SE in implementation science is as a learning ecosystem for programs that allows them to identify and respond to key stakeholder interests in the design and implementation of the program in real time.

This way of thinking has not yet been embraced because it requires a more comprehensive commitment to embrace complexity than most researchers and funders are willing to do. It challenges conventional thinking about what constitutes evidence and requires that implementation science evaluation includes how well (i.e., how constructively, how creatively, how effectively) programs address stakeholder interests in the program design and implementation. Perhaps most importantly, it requires that programs have both budgetary and protocol flexibility to actually make changes or refinements in light of insights generated about stakeholder inputs through various forms of engagement (Lavery, 2018a).

In this way, framing SE as a learning ecosystem emphasizes the need for evidence on how SE creates value for both implementers and funders. This adaptive requirement of SE is what is required for implementation science to live up to its promise of bridging the research to action gap. At the core of the RE-AIM(S) framework is the idea that organizational learning is the vehicle for stakeholder engagement. In this way, my framework helps implementation

science not just repackage old approaches of SE into new frameworks, but actually take a substantial step forward. Implementation science needs stakeholder engagement to realize its aspirations. This new way of approaching SE within program evaluation could contribute substantially toward building a solid foundation of evidence for stakeholder engagement, which may in turn transform how future public health research and programs are conducted.

Stakeholder Feedback Mapping (SFM)

Stakeholder Feedback Mapping (SFM) is a new form of stakeholder mapping that visually depicts the program adaptation that occurred due to stakeholder input (Figure 2). For example, when this tool was applied to the Maldivian National TB Screening Program (MNTSP), it showed three arrows going to the HIV/TB Division, which suggests that the MoH was quite adaptive to internal and external stakeholders. This map provides the template to subsequently show the ways in which stakeholders created programmatic change, as denoted by feedback loops on the map. The feedback loop arrows overlaid on this map allow us to document where exactly the adaptation is occurring, thereby serving as a way of documenting and measuring accountability. For example, it can help us determine if the input from community health workers is only being implemented by the field coordinator or if it is also being incorporated into MoH planning. This new form of stakeholder mapping is a valuable precursor to the ALM because the visualization allows us to also easily see which stakeholder appears to have been the most responsive to feedback from other stakeholders.

One significant development that the SFM makes, as compared to traditional stakeholder mapping, is that it does not place the implementing organization at the center of its analysis. While traditional stakeholder mapping typically has the purpose of determining which

stakeholders need to be "satisfied, managed, monitored, or managed" by the program, the SFM looks more holistically at the interactions and feedback loops occurring between *all* stakeholders (D. H. Walker et al., 2008). The SFM allows for easy visualization of how programs are responsive to stakeholder feedback, and for those stakeholders to see how their input has been acknowledged or responded to by the program. The map, however, is limited in visual space and cannot easily depict all the changes made in a large-scale program. The ALM, therefore, allows for the documentation of much more detail on a larger scale. In this way, the SFM and ALM are complementary to each other.

The Adaptive Learning Matrix (ALM)

The ALM can be used to provide several different types of useful information. First, there is the total ALM score of the program, which indicates how responsive all the stakeholders were to each other and can ideally be linked to overall program outcomes. This places the onus of responsibility for action on the program to respond to stakeholder input, which could potentially change how donors invest if program responsiveness can be linked to the program's outcomes. Second, the matrix provides individual ALM scores of each stakeholder, which indicates how responsive individual stakeholders were to suggestions and can hold them accountable for their responsiveness.

Since program responsiveness can now be documented, the ALM score can also be a tool to help stakeholders communicate and assert their interests to programs and to hold implementing organizations accountable for their decisions. In this way, the ALM generates two types of value. It allows us to easily see how programs are responsive to stakeholder feedback,

and for those stakeholders to see how their input has been acknowledged or responded to by the program.

Qualitative interviewing is often considered a part of traditional stakeholder engagement, but it can be very time-intensive and it is not the most useful if the right questions are not asked. While this matrix cannot tell us precisely what questions to ask, it can be a useful tool for focusing an interview on asking questions about changes to a program's budget or design that the person filling out the ALM might not have been previously aware of. In other words, since qualitative interviewing is a standard part of stakeholder engagement, I recommend using this technique to obtain the information necessary to fill out the ALM. For example, the "Why?" column on the ALM is supposed to explain a stakeholder's rationale behind the decision of whether to implement a suggestion. This information is important to obtain because there may be very legitimate reasons for not implementing a suggestion. It is therefore recommended that the evaluation team privately interview all the internal and external stakeholders to ensure the documentation of all major stakeholder suggestions, including those that were ignored. Thus, qualitative interviewing is a crucial methodology for utilizing the ALM and RE-AIM(S), more broadly.

Although global health programs are typically quite iterative, the changes that are made based on stakeholder input are typically not published or publically available. Therefore, the ALM could help start to change the culture so that we evaluate programs based on how *responsive* they are to stakeholder input. If this culture shift included new expectations for research/programs to publish their ALM score, then we could begin to make progress in prioritizing stakeholder engagement as a driver of program implementation.

Overall, the ALM is a tool to categorize, monitor, and track the changes to a program's budget and design that are due to stakeholder engagement. Similar to the SFM, one important step forward that the ALM takes compared to traditional stakeholder matrices is that it does not place the implementing organization at the center of the analysis. The tool does not exclusively capture the input that stakeholders give to the implementing organization, it captures input that *all* stakeholders give to each other. It is the first step in trying to quantify program responsiveness and generate empirical evidence for the impact of stakeholder engagement on a program's outcomes. Ultimately, the ALM is evidence that there are opportunities for creative design in implementation science evaluation. The next step in this research is to link ALM scores to positive program outcomes.

The Maldivian National TB Screening Program Case

Attempting to apply the RE-AIM(S) framework to the Maldivian National TB Screening Program (MNTSP) helped highlight the need to further operationalize the framework, which gave rise to the SFM and ALM. The case, therefore, was a catalyst for understanding how SE could be evaluated within implementation science. Without other case studies to compare it to, it is impossible to determine whether the Maldivian program's total ALM score is high or low. However, individual stakeholders can be assessed in comparison to each other. The HIV/TB Division, WHO, and the hospital manager all had the highest ALM score, indicating that they were responsive to suggestions made by other stakeholders. The ALM therefore promotes a new and different type of accountability, one that is focused on adaptability and responsiveness to stakeholder input.

On a more granular level, analyzing this case to understand how SE contributed to achieving the MNTSP's programmatic goals is important because the MNTSP will be scaled nationally. Thus, taking time to understand the mechanisms by which the screening program was able launch so rapidly is critical for the program's success. This analysis has shown, for example, that the first public-private financial partnership between resorts and the MoH was largely responsible for expanding the program's reach and could open the door to a hugely beneficial relationship for both parties in the future. This public-private partnership, largely driven by the hospital manager, whose background was in hospitality, also signals the way in which being responsive to stakeholders and taking an organizational learning approach to program implementation can be beneficial for all stakeholders.

Limitations

The RE-AIM(S) Framework:

This thesis has focused on analyzing the RE-AIM framework; however, RE-AIM does not represent the full scope of implementation science evaluation frameworks. An analysis of a different framework may have led to the development of different tools. Similarly, mine is not the only framework of SE and the results might have looked quite different if I had used the UNICEF minimum standards approach, the HELP SE model, or other frameworks.

Stakeholder Feedback Mapping (SFM):

Stakeholder Feedback Mapping (SFM) uses authority as the main unit of analysis, whereby stakeholders are placed along an axis of hierarchical authority. One of the limitations of

this method of organization is that, by using the axis of authority, it draws on a more conventional unit of analysis. Furthermore, the SFM does not visualize the *interests* of stakeholders, nor does it determine how interests create value or help identify and assess the obligations of the program to fulfill stakeholder interests. A more interests-based framework is presented in the HELP SE model (Lavery, forthcoming), which places the onus on the program to engage in some form of meaningful relationship with stakeholders to determine if their interests in the conduct or outcomes of the program create specific opportunities to create value and/or obligations to prevent setting back the interests of stakeholders (i.e. creating harm). Future work needs to be done to determine how the SFM could be utilized in the HELP SE model.

The Adaptive Learning Matrix (ALM):

There are several limitations to the ALM tool that are important to recognize. The first is that the utility of the ALM depends largely on creating operationalized definitions and guidelines that allow the user to know what type of suggestions should be included within the matrix. Public health programs are typically created through an iterative process where feedback from many individuals and groups are incorporated into program design. However, the ALM is not intended to capture every minute change that is made. Rather, it is intended to capture larger changes that influence overall program design or budget. However, the determination of what to include in the ALM is ultimately left to the discretion of the individual responsible for filling out the matrix.

The second limitation is that the ALM could be distorted if not used by third party evaluators. For example, if someone within the Ministry of Health was responsible for completing the ALM, then they might have an incentive to add only suggestions that the MoH responded to in order to give the MoH a higher ALM score.

Lastly, the ALM allows for the categorization and analysis of stakeholder input, but the input does not equate to a stakeholder's interests. I discovered that using interests as the unit of analysis did not lend itself well to designing practical tools that would allow a program manager or external evaluator to utilize the ALM. I, therefore, had to limit the ALM to capturing stakeholder inputs as a proxy for interests. However, capturing stakeholder input does not reveal why the stakeholder made that suggestion and what interests they have at stake in the program. The ALM does not provide guidance on whether suggestions put forward by stakeholders create an ethical obligation that the program staff must fulfill. While the ALM does not allow for a way to elicit stakeholder interests themselves, it does lay the potential groundwork for that to be done. Future work needs to consider how tools like the SFM and ALM can be adapted to elicit stakeholder interests.

Conclusion

Today, every global health program involves multiple stakeholders and yet we still lack sufficient explanatory power about how stakeholder engagement works and how it contributes to various outcomes in global health programs. Therefore, it continues to be difficult for funders to determine under what circumstances stakeholder engagement is required and what value they can expect to derive from investments in it. Currently, the design and organization/strategy for SE are determined largely by convention rather than by clear evidence.

This thesis has explored the feasibility and potential impact of incorporating stakeholder engagement into the RE-AIM implementation science evaluation framework. Despite the limitations discussed previously, this thesis has presented a new way of thinking about SE in implementation science and has both developed and demonstrated how to apply the RE-AIM(S)

framework, the SFM, and the ALM, which all take the first steps in categorizing, tracking, and monitoring adaptations based on SE. The next step is to link the responsiveness shown in the Adaptive Learning Matrix to program outcomes that are evaluated using the original five RE-AIM dimensions. This would then provide evidence for how SE drives implementation science and creates effective public health programs.

Over time, if high ALM scores could be correlated with more successfully implemented programs using the RE-AIM(S) framework, then we could take a substantial step forward in generating empirical evidence for the value of stakeholder engagement. Evidence that links a program's responsiveness to stakeholder interests with better program outcomes might motivate implementers to develop an explicit SE strategy. Such evidence could also motivate funders to invest more in programs that have explicit SE strategies and/or have high ALM scores. Overall, this thesis has demonstrated that not only is it *feasible* to incorporate SE into the evaluation of implementation science, but also that this integration could create new forms of evidence and advance the goals of implementation science.

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