Evaluation of Intervention Methods Used to Reduce Preventable Illnesses in Rural and Impoverished Communities

By Rocio Diaz

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Abstract

The disproportionate negative impacts of preventable diseases on impoverished communities are often due to lack of resources needed to instill safe and hygienic practices. Provision of resources and education, in addition to an improvement in water quality, hand washing, and oral hygiene practices could decrease the prevalence of preventable diseases, such as diarrheal and respiratory illnesses. To alleviate these health concerns in the rural village of Gracias a Dios, Honduras, a literature review was conducted to evaluate different existing intervention methods. The methods evaluated included using emotional drivers for behavior change, educational interventions, theory-based interventions, and combination interventions. Through the review of existing literature concerning various intervention methods used in rural and impoverished areas worldwide, it was deduced that there is no method that clearly yields greater results than others. Therefore, to maximize the impact of a health intervention, a combination of the most successful parts of all interventions should be implemented.

Introduction

Diarrheal illness coupled with the absence of preventative care measures continues to be detrimental to the lives of rural and impoverished populations around the world, resulting in up to two million deaths per year (Chaponniere et al., 2013). Preventable diseases such as gastrointestinal infections, periodontitis, and respiratory infections affect the lives of those in rural areas at higher rates and to a more harmful degree (Biran et al., 2014). Infections acquired in the oral cavity are associated with negative health outcomes, such as cardiovascular and respiratory diseases, and are linked to the oral-systemic health connection (Alpert, 2017). Diarrheal illnesses and respiratory infections are most harmful in children and are the two most important causes of child death globally (Biran et al., 2014). Preventable illnesses, including

diarrheal disease contribute to Honduras' under-five mortality rate, which stands at 16.77% (World Health Organization, 2019). Evaluating the prevalence of diarrheal illnesses and the overall standard of health from a global perspective, rural and impoverished areas are negatively impacted at higher rates than urban and high-resource areas (Pan American Health Organization, 2008).

The small and impoverished community of Gracias a Dios, located in the rural mountainous region of Olanchito in the Yoro Department of Honduras, suffers from these ailments. According to the Pan American Health Organization, Honduran rural areas have below average national indicators regarding answers of an unmet basic needs assessment. This assessment showed 10.7% of children did not attend primary school, 16.8% lived in overcrowded conditions, 31.7% did not have proper sanitation facilities, 18.0% of households did not have a water supply system, and 21.2% of adults were unemployed (Pan American Health Organization, 2008). Furthermore, while a reported 49.32% of the population uses safely managed sanitation services, more than half of Honduras' inhabitants are left without access to safe and sanitary facilities, most of which are in rural areas (World Health Organization, 2019). With most of the population lacking basic needs, the community of Gracias a Dios was identified as an area of need.

Morbidity rates, which are rates at which a disease or illness occurs in a population, are found to be higher in rural areas with lack of healthcare access. In Honduras' poorest municipalities, acute respiratory infections, such as pneumonia, were the cause of "one out of five deaths in children between 1 and 4 years of age" (Pan American Health Organization, 2008). Additionally, of all annual reported cases of acute diarrhea in Honduras, prevalence rates are

higher in rural areas, particularly in Gracias a Dios, and 77% are attributed to children under the age of five (Pan American Health Organization, 2008). Interventions focusing on frequent handwashing with soap, increasing sanitary disposal of fecal matter, and improving preventative care measures are realized by several organizations worldwide to address the morbidity and mortality rates associated with preventable diseases.

Interventions are put into motion by research teams, humanitarian societies, and government agencies to address global health concerns. Interventions specific to ameliorating the overall health outcomes of rural areas and decreasing diarrheal illness differ from one another. These strategies include emotional drivers to induce behavior change, education in and out of the classroom, research-based interventions focused on limited health outcomes, and combination interventions using mixed methods to maximize their success. Preventative care focusing on oral hygiene, hand hygiene, feces management, and safe food preparation is also used in these interventions.

Evaluating each methodology's effectiveness, limitations, and sustainability is helpful in creating an intervention for Gracias a Dios, Honduras. To reduce the prevalence of preventable diseases and improve the health of the community, the review aims to evaluate existing literature on interventions conducted in rural areas and assess the impact of preventative care methods. Reflections made on what a successful intervention should entail through discussion of intervention strategy effectiveness and sustainability can aid researchers implement these findings moving forward.

Literature Review

I. Interventions using Emotional Drivers for Behavior Change

Interventions based on the emotional drivers of behavior are one of the most successful types of interventions since they are sustainable and scalable in rural communities. Emotional drivers such as disgust, nurture, affiliation, and status are used to promote positive health behaviors like handwashing and sanitation. Since health-related information is not enough to persuade communities to adopt new practices, this method's aim is to increase the practice of preventative health behaviors using emotional drivers (Biran et al., 2014).

Disgust relies on "the desire to avoid and remove contamination" and is one of the most influential drivers in these interventions (Biran et al., 2014). Only 76% of the Honduran population is reported to have regular access to a latrine, leaving nearly a quarter of the populace to defecate through other means, including open defecation (WHO & UNICEF, 2019). People become more likely to change their behavior by introducing disgust towards an activity previously regarded as the norm, such as open defecation, and cease defecating in open areas. Nurture is another emotional driver which relies on "the desire for a happy, thriving child" and is targeted specifically towards mothers and other primarily female caretakers (Biran et al., 2014). Women become more invested in the success of the intervention with nurture as a driver for behavioral change because they are responsible for children's development and well-being.

Affiliation is another emotional driver used towards behavior change and is defined as "the desire to fit in with what others in a reference group as perceived to be doing". Affiliation is closely related to the psychological concept of social belongingness and is vital in preserving a person's mental health (Biran et al., 2014). Through the driver of affiliation, it is expected that members in the community will change their behaviors by observing influential residents publicly practice positive health behaviors. Another emotional driver is status, which is "the

desire to have greater access to resources than others in the group" (Biran et al., 2014). Status is important in this methodoly because status change within a community is a factor resulting after new, positively regarded behaviors are adopted (Brewis et al., 2019).

In Biran et al.'s intervention conducted in rural Indian villages, emotional drivers for behavior change were successful. In the design of a handwashing campaign named "SuperAmma", which portrayed a "rural mother who had a loving, nurturing relationship with her son, teaching him good manners and ensuring they both used soap for handwashing" nurture, disgust, affiliation, and status, were used (Biran et al. 2014). Part of the SuperAmma intervention relied on the driver of affiliation, as they held public ceremonies where women pledged to practice handwashing. The emphasis on tuning into nurture – a mother's emotional connection with her child and want for their well-being – was successful in changing mothers' behaviors towards handwashing. Using a baseline comparison, villages using the SuperAmma intervention and emotional drivers increased occasions of handwashing with soap by 40%. However, the sustainability of these types of interventions varies. For the SuperAmma intervention, it was found that 12 months post-intervention, both intervention and control groups had the same overall percentage increase in handwashing. The sustainability of the intervention was challenged as the intervention group decreased their hand washing behaviors from the 6-month to 12-month post intervention marks (Biran et al. 2014).

Although interventions using emotional drivers are successful, moral and ethical concerns are raised. As discussed by Brewis, the use of human disgust and the desire for social acceptance can cause further social stratification within a community, and increased stigma against those who do not comply with the newly enforced hygiene standards. These interventions

are highly successful because of the use of “hygiene policing” where community members are vigilant on who practices hygiene and who does not (Brewis et al., 2019). This type of policing can lead to a negative stigma regarding those who are “hygiene violators” and are not able to meet new sanitation and hygiene standards (Brewis et al., 2019).

The effects of being singled out as a hygiene norm violator are plenty. According to Brewis, these can include the loss of job opportunities, exclusion from community events or social events, and an overall social devaluation of the individual – regardless of gender. As people begin to tie their social identities with their perceived hygiene standards, this can lead to negative effects on mental health (Brewis et al., 2019). An intervention in Gracias a Dios using emotional drivers for behavior change must take into consideration possible negative repercussions on the community and question the ethics and morality of the project.

Using nurture as an emotional driver for behavior change in interventions is often targeted towards mothers or mothers-to-be. In Kamm’s study, pregnancy as a teachable moment for handwashing promotion was studied in rural Bangladesh. The study identified primiparous women, or women who were giving birth for the first time, who had been previously enrolled in a handwashing intervention trial. These women’s hand washing behaviors were observed in the perinatal and post-neonatal stages of their pregnancy. It was found that handwashing remained low in both stages. Thus, using nurture as an emotional driver for behavior change alone is not enough for an intervention to be successful. Assessing social, individual, and environmental influences on the study population is necessary to understand motivators and deterrents regarding hand washing behaviors (Kamm et al., 2016).

II. Educational Interventions

Interventions based on an educational approach focus on targeting educational settings such as schools, teachers, children, and influential people in the community. Educational interventions tend to be more sustainable and scalable because as community members learn the behaviors and feel empowered by the positive changes they make, it is more likely they will share what they learned. These interventions focus on teaching why increased sanitation and hygiene is useful and how to put it into practice. They are culturally appropriate and rely on the involvement and empowerment of members of the community, which yields higher success and sustainability rates.

A study in a rural community in Cameroon concluded that participatory teaching resulted in a decrease in prevalence of diarrheal illness in children under five. Participatory teaching involves students learning through "hands-on experience, persistence, and the empowerment of women" (Chaponniere et al., 2013). This was supported by a 6% decrease in incidence of diarrheal illness since the implementation of the intervention. This intervention was conducted in a 7-year span which contributed to its sustainability and included a "see-one do-one teach-one" approach to learning (Chaponniere et al., 2013). The intervention, taught to primarily female educators, consisted of health education modules created by nursing and education students after gathering data on community health and cultural values. Using teachers to disseminate information on health education modules was successful because it created a sense of empowerment, increased exposure to children, and emphasized community involvement and participation in the intervention. Alongside the implementation of water filters, exposure to

"education on proper clean water, and breaking the fecal-oral cycle through hygiene practices" was responsible for the decrease in diarrheal illness in the community (Chaponniere et al., 2013).

A school-based educational intervention in Rural Kenyan primary schools demonstrated the impact of a hygiene curriculum on student health and hygiene practices. This intervention consisted of an educational curriculum aimed for school-aged children and was implemented in 42 Kenyan schools. The curriculum was composed of safe water and hand hygiene practices and was taught to school children alongside the installation of water stations in the intervention schools. After two years, there was an increase in knowledge among students about water treatment, decreased rates of overall illness and acute respiratory illness, and increased access to safe drinking water in schools. However, there was not a reduction in the rates of diarrheal illnesses, possibly due to "concurrent water interventions in project communities" (Patel et al., 2012). This could be attributed to different methods used in the cooccurring interventions, or an overwhelming amount of information at once, making it difficult for project communities to adapt and see changes.

Although educational interventions have high success and sustainability rates due to their community-based approach, there are limitations. These is a lack of information targeting extraneous factors affecting diarrheal illness, proper translation, and cultural/language barriers (Kamara, 2017). Educational interventions were evaluated in Ejemot-Nwadiaro's literature review. In childcare centers and schools in low-income communities, the encouragement of hand washing behaviors was found to "probably" reduce the number of times children had diarrhea, according to 9 studies (Ejemot-Nwadiaro et al., 2021). This probable correlation between increased education regarding hand washing behaviors and diarrheal instances in schools in low-

income countries was due to extraneous factors not accounted for in the educational interventions. Educational interventions often fail to account for other variables affecting the high incidences of waterborne illnesses, such as water storage and usage, access to clean water and soap, safe feces disposal and management (Kamara et al., 2017).

A cross-sectional study conducted to examine the impact of a four-year intervention in rural communities in Sub-Saharan Africa found that an educational campaign and an improved water supply are not enough to influence the prevalence of waterborne diseases. The intervention was aimed at reducing diarrhea in children under 5 years and used an education-based approach with an improved water supply, and sanitation. After four years, hand washing facilities at latrines increased by 13.2%; however, diarrheal incidence amongst children under five increased. Thus, increased access to and education regarding "water storage and usage, safe excreta disposal, and other hygiene practices are critical for interventions negating the spread of waterborne diseases" (Kamara et al., 2017).

III. Research-, Evidence- and Theory-Based Interventions

Research, evidence, or theory-based interventions are interventions that are based on solely one aspect of health or a specific theory. For example, this method would only focus on sanitation, or solely water filtration and quality. These interventions are not as sustainable as others because they are implemented to find if certain theories are useful. Whilst alone these interventions do not lead to high success rates, they are beneficial in adding new information in the global health literature and when combined with other theory-based interventions.

These interventions are unique because they focus on a hypothesis and test if a specific solution works. As shown in Contzen's interventions in four Ethiopian villages, the focus was improving hand-washing behaviors. This intervention found which combination of methodologies worked best in promoting hand-washing behaviors, which was using education, tippy-tap promotion, and public commitment. It stressed the importance of tailoring an intervention to its target population as generic interventions do not produce the same effectiveness. While these findings are important to researchers designing an intervention, this study shows that a theory-based intervention focusing solely on a particular aspect of health does not correlate directly to improved diarrheal outcomes in the community (Contzen et al., 2015).

A limitation to using a theory-based method is that it may only be used to collect data on a specific problem or population rather than creating an intervention. Nizame's study focused on hand washing after food preparation. This study focused on the steps of food preparation, handwashing opportunities presented during preparation and the current practices and community perceptions of food contamination. This intervention was conducted using qualitative and observational data from three Bangladeshi villages and concentrated on contamination in high-risk foods such as mashed food and salads, which were common in the villagers' diets. It was found that out of 85 opportunities for handwashing, it only occurred twice (Nizame et al., 2016). While this evidence-based study does not introduce a methodology that could result in a successful intervention, it helps future researchers by collecting data regarding hand-washing behaviors and existing attitudes towards food contamination. This study also offers insight on what current food preparation practices may be like in Gracias a Dios and allows for an intervention that anticipates this as a problem.

IV. Combination Interventions

A combination intervention utilizes mixed methods, such as: emotional drivers for behavior change, education-based, research-based, evidence-based, or theory-based methods. This intervention can minimize the effect of extraneous variables, and through mixed methods may be successful in addressing several health concerns, educating the community, providing a continuous supply of resources, and in adding to the existing body of knowledge. Combination interventions experience greater success and sustainability rates than other methodologies; however, limitations exist.

An example of a successful combination interventions one focused on improving hand hygiene to reduce diarrheal and respiratory diseases in children under the age of five. This study consisted of two interventions, both used the "RANAS (Risk, Attitudes, Norms, Abilities, Self-Regulation)" approach and targeted primary caregivers in four rural southern Ethiopian villages (Contzen et al., 2015). Different approaches were used per village; each a different combination of intervention techniques such as education alone, education and public commitment, education and "tippy-tap" promotion, and education, public-commitment, and "tippy-tap" promotion. Using the RANAS approach coupled with education, public-commitment, and "tippy-tap" promotion, resulted in the installation of tippy-taps, water, and soap in 83% of the households in the 4th village (Contzen et al., 2015). In the two villages where education was coupled, tippy-tap promotion rates and public commitment of tippy-tap installation was highest, and the community had the greatest access to the resources necessary for increased hand-washing behaviors.

A combination intervention conducted in rural Bangladesh used the "WASH (Water, Sanitation, and Hygiene)" method, emotional drivers, and preventative care measures (Dey et al.,

2019). The prevalence of diarrheal illness in children under five experienced an overall 11.1% reduction from baseline to end. Although this intervention was highly successful, it experienced challenges in terms of sustainability. Researchers note that after four years of post-intervention, progress stalled, due to "lack of improvement in unsafe disposal of child feces and unclean latrine conditions after the intervention period." (Dey et al., 2019). To improve upon this, the creation of a small-scale "Water and Sanitation Committee" was established to encourage continued cleanliness and adherence to positive health behaviors (Dey et al., 2019).

Although combination interventions experience the effects of extraneous variables to a lesser degree, their success may be hindered by them. In an intervention that combined research- based methods, preventative care, and emotional drivers for behavior change, there was a "significant effect on the reduction of diarrheal disease in children under five years" (Morse et al., 2020). Nonetheless, the addition of research-based methods focused on feces and water management produced only limited effects. These limitations were due to existing environmental contamination (Morse et al., 2020). Thus, unforeseen circumstances play a large role in an intervention's success or whether time and resources spent on a combination intervention were futile.

Combination intervention methods such as RANAS or WASH, are highly successful in decreasing the prevalence of preventable illnesses in rural and impoverished communities. Nonetheless, there were shortcomings and challenges present in both. In addressing limitations and improving upon these existing intervention structures, more precise and targeted interventions can be constructed for specific communities.

V. Preventative Care Methods

Preventative care consists of behaviors done by an individual to prevent or decrease the risk of negative health outcomes. Preventative care plays a major role in the global health community, as a focus on disease prevention leads to more successful and less resource intensive interventions. Focusing on preventative care measures leads to higher overall health outcomes in rural and impoverished communities since disease prevalence and mortality rates decrease. This decrease has positive impacts on communities as individuals can experience less disruptions in their daily lives and an improved quality of life.

An important component of preventative care is keeping the oral cavity clean and healthy. The importance of oral care and hygiene lies with the oral-systemic health connection The oral-systemic health connection is the link between a person's oral health and the person's overall health. The quality of a person's oral health can serve as a clue about other systemic disorders such as diabetes, chronic kidney disease, metabolic syndrome, cardiovascular disease, rheumatoid arthritis, cardiovascular disease, respiratory diseases, some cancers, and infections such as HIV and HPV (Alpert, 2017).

This connection is important to recognize as the mouth serves as an "incubator for more than 700 species of bacteria that double in a few hours if left undisturbed" and if left untreated over time can lead to periodontal disease (Alpert, 2017). Periodontal disease is a severe form of gum disease caused by bacteria accumulation that leads to tooth loss. Periodontitis, a severe gum infection, is a complication of periodontal disease and is associated with diabetes, HIV infection, and cardiovascular disease. Oral infections are particularly dangerous to systemic health because of the direct pathway into the circulatory system through which bacteria can enter. An increase in preventative oral health measures, especially in geriatric populations, can reduce the risks of

periodontal disease and detriment of the oral-systemic health connection. These preventative measures include increased toothbrushing, the use of antibacterial mouthwash, flossing, and regular visits to the dentist (Alpert, 2017).

Patient and dentist awareness of the oral-systemic health connection would improve overall patient access to oral care. Awareness of the consequences poor oral health can lead to could improve patient performance of basic oral care procedures such as toothbrushing, flossing, and dental examinations. However, not all responsibility should be placed on patient awareness, but also dentist and national awareness of the oral-systemic health connection. Promotion of oral care behaviors and their relation to overall systemic health must be improved at the countries' public health level (Nazir et al., 2019).

Risk factors for developing poor oral health outcomes include advanced age, smoking, lack of access to dental care, and belonging to a poor or low-resource area (Alpert, 2017). In rural and impoverished places, where health interventions are commonly conducted, almost all community members suffer from at least one of the aforementioned risk factors. Hence, why preventative care measures catered towards maintaining and improving oral health and hygiene practices are important and a vital part in the creation of an intervention for Gracias a Dios. In a study evaluating oral health and its impact on general health in Latin America, periodontal disease was higher in Latin America than in Europe or the United States. This difference was attributed to the lack of oral health promotion and education campaigns created by the governments' public health sectors. Thus, patient self-monitoring and education catered towards prevention and early diagnosis of oral diseases can be beneficial in improving the overall oral health of Latin Americans (Carvajal et al., 2020).

Another aspect of preventative care that can ameliorate the health of a community is routine handwashing, especially in critical moments. Moments such as food preparation and child feedings are considered critical because they are when pathogen contamination occurs most frequently (Nizame et al., 2013). It is proven that hand washing with soap and water decreases the prevalence of disease-causing pathogens, and the promotion of handwashing before and after critical moments could improve diarrheal disease rates (Nwokoro et al., 2020). Therefore, the inclusion of soap and water available near food preparation and child feeding areas are necessary components of an integrated intervention. Promotion of hand washing behaviors using nurturing themes at critical moments also serve as key learning moments for children present, encouraging habit formation (Nizame et al., 2013).

Disease-causing pathogens are plentiful in fecal matter; thus, fecal contamination of food and water supplies are some of the most significant ways pathogens enter the body. Unsafe feces management practices such as open defecation, lack of sanitary sewage disposal methods, and the absence of hand washing after defecating can cause fecal contamination (Nwokoro et al., 2020). According to Islam, the "unsafe feces management may present a source of fecal exposure for young children". As the risk of fecal exposure heightens, the higher the chances of cross-contamination with food sources (Islam, 2020). Fecal contamination is associated with higher mortality and diarrheal illnesses rates in young children than adults (Dey et al., 2019). Suffering from a diarrheal illness may lead to a decrease in school attendance, and an increase in dehydration and malnutrition rates in children (Dey et al., 2019).

Additionally, an increase in interventions targeting improved sanitary sewage disposal methods, such as the installation of pit latrines, and promotion of hand washing post-defecation,

could improve rates of diarrheal illness (Nwokoro et al., 2020). A village health worker with proper emergent care training, stationed within the community, and working closely with village leaders could help implement these changes and promote positive health behaviors (Edward et al., 2019).

Methods

To ensure the completion of an extensive literature review, there were criteria that the literature had to meet for consideration. The inclusion criteria were that articles had to be conducted in a rural or low resource area, and interventions had to examine the relationship between hand hygiene and diarrhea or oral health and preventable diseases. Articles discussing preventative care methods, the oral-systemic health connection, and oral health interventions in impoverished areas were selected.

The exclusion criteria used while conducting the literature search included articles published before 2005, interventions conducted in urban or high-resource areas, and if the article was an editorial, a commentary, or a case study. Articles that did not establish the relationship between hand hygiene and diarrhea or oral health and preventable diseases were not included in the literature search.

After the completion of the literature review, each intervention methodology's effectiveness, limitations, and sustainability were discussed. To create an intervention appropriate for the community of Gracias a Dios, Honduras, a combination of all methods analyzed should be implemented. The intervention would adopt the parts yielding the greatest results from each intervention methodology, while addressing the limitations found in each.

Limitations and hardships faced in previous interventions will be avoided or improved upon in the intervention, such as adverse psychological effects after using emotional drivers for behavior change, or not providing continuous access to resources necessary for an educational intervention to thrive. Preventative care methods regarding hand and oral hygiene and the use of village health workers would also be implemented in this intervention.

Discussion

Interventions using emotional drivers for behavior change are largely successful due to their use of human emotions and the innate need to belong. While these interventions show strong results, there also long-term negative psychological consequences that may arise. Thus, using emotional drivers for change must be a part of a greater-scale intervention, and not the primary methodology used.

Education-based interventions increase knowledge regarding positive health behaviors and are highly effective when introduced in schools. These behaviors can become sustainable and widespread through dissemination of knowledge. Nonetheless, education-based interventions may not be effective if they lack information regarding all aspects of positive health behaviors beyond the basic mechanisms and their importance. These interventions must also be continuously supplied with the necessary resources and materials needed. Additionally, access to clean water and soap are not widespread in the low-resource communities where the interventions take place; thus, increased access to resources paired with education-based interventions may lead to higher success and sustainability rates.

Research based interventions are shown to be successful in accumulating data targeting a specific health concern. However, these experience numerous limitations as an independent intervention method since extrinsic factors are often not considered or addressed. Examples of extrinsic variables could be co-occurring interventions, lack of resources, unexpected environmental conditions, the community's willingness to participate or cultural/linguistic factors. Research-based methods may prove to be highly successful when combined with other methods that address extraneous variables.

The combination of different intervention strategies tends to yield greater positive results in communities with high rates of diarrheal disease and respiratory illnesses. Using mixed methods would be ideal for the development of an intervention for Gracias a Dios. Methods such as preventative care measures like proper oral hygiene through regular toothbrushing and flossing could be useful in preventing illnesses through the oral-systemic health connection. The desire to remain or increase one's status within the community can form an integral part of an intervention for Gracias a Dios, and positive health behaviors could be portrayed as a simple and effective way to achieve social mobility. The dissemination of educational materials regarding handwashing, safe food preparation, and sanitary feces management in conjunction with the help of village health workers, local leaders and teachers would also be part of the intervention. The intervention would include covered pit latrines, water filtration systems, and any other necessary materials such as personal hygiene products. Lastly, the intervention would consider cultural and linguistic differences.

Conclusion

In analyzing the existing literature comprised of different intervention methods, it was concluded that no one methodology clearly yields the greatest success and sustainability rates without experiencing serious limitations. An intervention comprised of a combination of emotional drivers, educational campaigns, and evidence-based data findings would maximize its success and ensure long-term sustainability in the community. Preventative care methods regarding hand and oral hygiene would be at the forefront of the intervention methods.

Future Directions

Alongside Florida State University and Florida Agricultural and Mechanical University's Global Health Collaborative Project's research team and the findings of this literature review, an intervention can be designed to cater to Gracias a Dios's needs. Intervention design would include the procurement of funds, resources and materials needed for the implementation of village health workers and engineered solutions.

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