

A Qualitative Study on the Interconnected Nature of HIV, Water, and Family

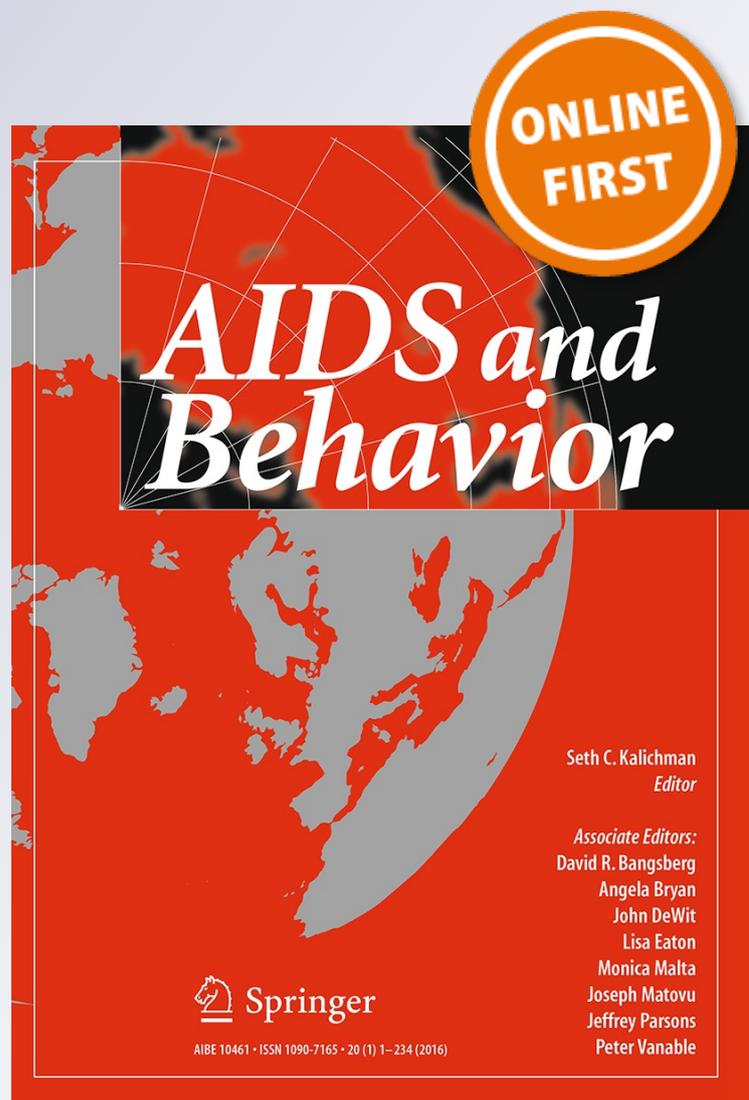
**Daisy Ramirez-Ortiz & Tara Rava
Zolnikov**

AIDS and Behavior

ISSN 1090-7165

AIDS Behav

DOI 10.1007/s10461-016-1334-9



Your article is protected by copyright and all rights are held exclusively by Springer Science +Business Media New York. This e-offprint is for personal use only and shall not be self-archived in electronic repositories. If you wish to self-archive your article, please use the accepted manuscript version for posting on your own website. You may further deposit the accepted manuscript version in any repository, provided it is only made publicly available 12 months after official publication or later and provided acknowledgement is given to the original source of publication and a link is inserted to the published article on Springer's website. The link must be accompanied by the following text: "The final publication is available at link.springer.com".

A Qualitative Study on the Interconnected Nature of HIV, Water, and Family

Daisy Ramirez-Ortiz^{1,3} · Tara Rava Zolnikov^{2,3}

© Springer Science+Business Media New York 2016

Abstract Human immunodeficiency virus infection/acquired immunodeficiency syndrome (HIV/AIDS) and poor access to water are two primary global health issues. Poor access to water may significantly affect families infected with HIV and result in adverse social and health consequences. A qualitative study used semi-structured interviews to understand health and social outcomes of families after the implementation of water interventions in rural Kenya. One major sub-theme emerged during this research, which included the effects of water on an HIV-affected family. Prior to the water interventions, common adverse health effects from lack of nutrition, water, and poor hygiene were experienced. After receiving access to water, nutrition and hygiene were improved and additional time was gained and used to reinforce relationships and spread awareness about HIV/AIDS. This study provides need-based evidence for access to safe drinking water in order to decrease adverse health outcomes and improve the quality of life for HIV-affected individuals.

Resumen El virus de inmunodeficiencia humana (VIH)/síndrome de inmunodeficiencia adquirida (SIDA) y la falta de acceso al agua son dos problemas primarios de salud

global. La falta de acceso al agua puede afectar significativamente familias infectadas con el VIH y resultar en efectos adversos sociales y de salud. Un estudio cualitativo utilizó entrevistas semi-estructuradas para entender los resultados sociales y de salud en familias después de la implementación de intervenciones de agua en la zona rural de Kenia. Un principal sub-tema surgió durante esta investigación, el cual incluyó los efectos del agua en una familia afectada por el VIH. Antes de las intervenciones de agua, las familias experimentaron efectos adversos a la salud desde la falta de nutrición, agua y pobre higiene. Después de recibir acceso al agua, la nutrición e higiene mejoraron y más tiempo se ganó para reforzar relaciones y difundir conciencia sobre el VIH/SIDA. Este estudio proporciona evidencia basada en la necesidad de acceso al agua potable, con fin de disminuir resultados adversos a la salud y mejorar la calidad de vida de las personas afectadas por el VIH.

Keywords HIV · Water access · Social effects · Health effects · Quality of life

Introduction

Poor access to quality water and human immunodeficiency virus infection/acquired immunodeficiency syndrome (HIV/AIDS) are two significant global health issues. Approximately 780 million people continue to lack access to quality water worldwide [27]. This inadequate access causes various health problems, such as increased exposure to waterborne diseases. In low- and middle-income countries, one-third of deaths are associated with the consumption of contaminated water [25]. This is a particularly serious threat in Sub-Saharan Africa because this region

Daisy Ramirez-Ortiz and Tara Rava Zolnikov have contributed equally to this manuscript.

✉ Tara Rava Zolnikov
tarazolnikov@gmail.com

¹ Department of Public Health Sciences, University of Miami, Miami, FL, USA

² Department of Community Health, National University, San Diego, CA, USA

³ Kenya Red Cross, Red Cross Road, Bellevue, “South C”, Nairobi, Kenya

only has 61 % water supply coverage and continues to face inequities in access to water and sanitation [25]. Alongside water-related issues, HIV infection and transmission are also critical public health concerns. Throughout the world, HIV has claimed more than 34 million lives and continues to be a major global public health issue [31]; U.S. Department of Health & Human Services [HHS] [22]. However, the most affected region in the world is Sub-Saharan Africa with almost 70 % of total new HIV infections (1.4 million) worldwide and 25.8 million people currently living with HIV [22].

Access to water and HIV-infection may initially appear to have little in common, though that is not the case. There are numerous methods that promote positive health gains in HIV-infected individuals. Antiretroviral therapy (ART) is one such factor; in fact, an estimated 9.7 million HIV patients were receiving ART in low- and middle-income countries in 2012 [31]. In addition to ART, other factors contribute to maintaining a healthy lifestyle, including access to water. Having access to quality water is a basic human necessity and a fundamental determinant of health (Pan American Health Organization (PAHO) [15]. Improvements in water supply quality minimize negative health impacts, including waterborne diseases, such as cholera, hepatitis, dengue fever, malaria, and other parasitic diseases [29]. Additionally, access to quality water is an important predictor of ART adherence and HIV-health related outcomes [25]. Inadequate access to water complicates medication adherence by limiting the ability to swallow medications and increasing the vulnerability to opportunistic infections, such as skin and diarrheal diseases, which escalate morbidity and mortality in this population [25]. In Africa, 90 % of HIV-infected individuals suffer from chronic diarrhea caused by waterborne diseases [25]. Additionally, poor access to water affects hygiene and sanitation practices, thereby compromising general comfort and dignity of people living with HIV/AIDS. In households with HIV-infected individuals, an additional 20–80 l of water are needed per day for cleaning and sanitation purposes [25].

For immune-compromised individuals, including those living with HIV/AIDS, access to water is important for maintaining homeostasis and proper nutrition [8]. Nutritional status has been shown to be a significant predictor of survival rate and a significant prognostic in advanced cases of HIV-infection [3, 16]. Poor access to water not only limits individual water consumption, but can also contribute to insufficient agricultural crops produced in an area, thereby contributing to food insecurity. Unfortunately, the prevalence of food insecurity is high among this affected population; for example, the majority of people living with HIV/AIDS in Kenya are moderately to severely food insecure [24]. The consequences of HIV-infected

individuals experiencing food insecurity include having an increased risk of HIV transmission and disease progression, lower ART adherence, decreased viral suppression, and poor immunologic and physical health statuses [3, 7, 16, 24].

Factors such as decreased caloric intake and high-energy expenditure can contribute to malnutrition in this population [2, 13]. According to the World Health Organization [28], HIV-infected adults are recommended to increase their normal energy intake about 20–30 % and decrease physical activity during periods of symptomatic disease or opportunistic infections to maintain a healthy weight. This is because health problems may arise for physically active individuals who have limited access to water, specifically water consumption and for food preparation. Furthermore, people living in hot climates gathering water at far distances may experience physical demands, increased sweating, and fluid loss causing dehydration and weight loss. Weight loss in HIV-infected individuals is associated with a higher risk of mortality [1, 9, 12, 17]. This information suggests that both reduced physical activity and a healthy nutritional status are beneficial for HIV-infected individuals experiencing a low CD4 count or high viral load in order to provide stability to the body's immune responses, and decrease the potential for opportunistic infections [23].

Aside from the nutritional and physical impact, additional negative consequences can occur without having nearby access to water and may challenge people living with HIV/AIDS. Poor access to water or having to worry about water gathering can be stressful for primary water gatherers [35]; as a result, this situation may contribute to an increase in adverse mental health outcomes. In fact, insecure access to water is associated with psychosocial distress [20, 33]. Unfortunately, HIV-infected individuals are already at an increased risk of developing mental health disorders, including depression and depressive symptoms [18]. Weiser and colleagues [24] confirm that depression has been associated with worsened HIV treatment outcomes, CD4 count, and an increased probability of AIDS-related illnesses and mortality. This suggests that water gatherers who are HIV positive may be at a heightened risk of experiencing emotional distress, which predicts subsequent disease progression [6].

Objectives

In Kenya, HIV/AIDS and poor access to water are two primary public health issues. Around 6 % of the Kenyan population is estimated to be HIV positive, while 46 % of the population continues to have inadequate access to safe water (World Bank [10, 26, 34]. Communities throughout Kenya have been beneficiaries of various water

interventions throughout the last several years. The type of water intervention selected to be constructed varied based on village needs and availability of natural water supply. Shallow wells, earth and sand dams, water kiosks, spring protection, and a water supply system were built throughout the Kitui district (B. Okotch, personal communication, January 15, 2013).

Social and health outcomes were reviewed in families experiencing implemented water interventions. The paradigm supporting this research was a phenomenological approach, which seeks to understand the experiences of participants in a particular situation. Access to water and HIV should be explored due to the inextricable link between the nutritional deficiency of inadequate water consumption and physical difficulties of gathering water alongside disease progression. As such, two major questions were addressed: "What types of benefits occurred after having access to water?" and "Did relationships change after receiving access to water?" Responses to these questions provided a deeper understanding of how one fundamental public health intervention may impact people on individual and social levels. The expectation of participant interviews was that these personal experiences would provide a greater understanding of health and social changes experienced by family members after receiving access to nearby, safe water. Previous research had not simultaneously reviewed both of these aspects in a qualitative perspective. Thus, the objective of this study was to provide an understanding of health and social outcomes of families located in a dry and arid setting that experienced nearby access to water after an implemented water intervention in rural Kenya. This was a worthwhile investigation due to the promising reciprocal nature of access to water and beneficial outcomes experienced by various populations in Kenya, including those affected by HIV.

Methods

This study took place throughout the semi-arid eastern district in Kitui, Kenya, where community members have been beneficiaries of various types of water interventions for the last several years. Previously, the district had very few reliable water sources to use for household or agricultural needs. Water gathering was a difficult household chore and could take hours per day. Access to water significantly affects women throughout Sub-Saharan Africa, as water is known to be a woman's or girl's responsibility (UNDESA, 2010). During drought, water gatherers could spend up to 6 to 15 h a day in search of any available water. Prior to the implemented water interventions throughout the Kitui district, the available water sources were largely from unimproved sources such as seasonal

streams, earth dams or pans, and traditional wells dug alongside river bends (B. Okotch, personal communication, January 15, 2013). For the aforementioned reasons, villages throughout Kitui district were the beneficiaries of various water interventions (B. Okotch, personal communication, January 15, 2013). The type of water intervention selected to be implemented varied based on village needs and availability of natural water supply. Shallow wells, earth and sand dams, water kiosks, spring protection, and a water supply system were constructed throughout the Kitui district from 2007 to 2013 (B. Okotch, personal communication, January 15, 2013).

An overarching goal of this study was to acquire a greater understanding of the health and social benefits faced by families living in a dry, semi-arid region in Kenya, after community members received access to nearby water. This research goal was accomplished through a qualitative study design. Qualitative research is useful for gathering multiple perspectives and differences across cultures and settings with regard to a target phenomenon [14]. Interviewing allows the researcher to obtain a deeper understanding of participant's experiences, thoughts, and perceptions [14]. The study protocol was reviewed and approved by the university's Institutional Review Board as well as an Institutional Review Board in Kenya.

Fifty-two semi-structured interviews of heads of households, children, and community members were used in this study to assess information related to changes in health and social relationships. The Kenya Red Cross Kitui branch coordinator and volunteers provided the liaison to families previously exposed to lack of water. Convenience sampling was used to provide a sample of age, gender, education level, occupation, and varied responsibilities or positions in the household (male head of household, female head of household, children) of individuals within a community. Interviews were conducted using a qualitative question guide and audio recorded. The qualitative question guide included open-ended questions pertaining to benefits and changes experienced after the implementation of the water intervention. Conventional constructs were also included in the interviews, including age of household member, marital status, length of time lived in the community, and education level. Each study participant provided informed consent, which was read in the native language, Kamba. Incentives were not provided in this study and confidentiality was assured through random numerical assignments to each participant.

The data were analyzed using a constant comparison method based in phenomenological theory to allow for the emergence of themes and sub-themes, which were then used to describe the experiences of participants [19]. The analysis first included coding. The researchers identified

codes or “topics” in the transcripts that occurred across interviews and were relevant to the primary research question. With these codes, a codebook was generated to provide descriptions and quotes which supported and provided the basis for themes and patterns [19]. Codes allowed the researcher to provide direct and indirect information to support potential themes and patterns. There were five main codes generated into a codebook, including “relationships,” “community,” “time,” “economics,” and “family.” Themes were then generated from the codebook; additionally, sub-themes were formulated. The main sub-theme providing context to this manuscript was labeled as “HIV awareness.” Themes and sub-themes were then re-analyzed and verified by the researcher.

Trustworthiness is a primary concern in qualitative research. Trustworthiness of qualitative research addresses issues of credibility, transferability, dependability, and confirmability [11]. The researcher established trustworthiness through credibility, peer debriefing, reflexive journaling, and field notes [4]. Credibility was achieved through trust the researcher established through recollections of connections to Kenya including tribal-bestowed names, Kenya Red Cross (KRC) status (volunteer for three years), and previous work and visits to Kenya that occurred either with the KRC or a personal nonprofit 501(c)3 organization. Multiple participant perspectives also added to the credibility of the data; information included household role, age, gender, marital status, and total time living in the region, in order to provide a more comprehensive perspective. Peer debriefing occurred during the initial writing, reviewing, and developing of interview questions. Reflexivity occurred in the field notes and included the researcher’s thoughts on the participants and environment, data collection, interview questions, and general participant reactions to the questions asked. A final plausible threat to validity may result from sampling and the researcher’s decision to stop interviewing; however, due to the similarity of answers, it is believed that theoretical saturation was achieved [21].

Results

There were 52 community members (25 males and 27 females) recruited for this study. The average family size was nine individuals, including approximately one female head of household, one male head of household, and seven children. All participants were from the Kamba tribe. Participants lived in ranges of low socioeconomic conditions (e.g. low–low in this context would be a household with semi-permanent or a mud-based house, whereas moderate-low was considered for families with a permanent house, a farm, and animals).

Participants were broken up into three groups: head of household, primary water collector, and children. Each group received interview questions that was unique to their status in the household (e.g. for the primary water collector, “Tell me what getting water was like before the water project.”) There were 16 heads of households that were not primary water gatherers interviewed (15 male and 1 female); the average age of the household head was 52 (range 28–78), the primary occupation was farming, and education ranged from none to form 4 (equivalent of high school). There were 15 primary water gatherers interviewed; 4 were children and 11 were female head of household, the average age of children was 18 years old (range 15–25) and the average age of the female head of household was 42 years old (range 24–70), the average education ranged from none to form 4. There were 24 children interviewed; they included 12 males and 12 females, the average age was 16.7 (range 9–34), education levels ranged from class 4 to polytechnic school.

Prior to the implementation of the water intervention, participants experienced a myriad of common adverse health effects from lack of nutrition, water, and poor hygiene; additional hardships included insufficient income, poor housing structures, and lack of time to strengthen familial relationships. These health, social and economic factors all contributed to participant’s view of the water intervention as a key factor improving both social and health outcomes in the families.

Time, Physical Burden, and Consequences

Participant’s interviews emphasized additional time gained from collecting nearby water as one of the primary factors contributing to positive health and social outcomes. Prior to the water intervention, primary water gatherers spent hours away from their family while collecting water for basic household needs, specifically for cooking and drinking. The shortened distance to collect water alleviated water gatherer’s time spent on this singular household duty as well as the physical burden associated with it. In one household, time dedicated to water gathering was reduced from 4 h to 30 min after the implementation of the water intervention.

Before the water intervention, I used to collect water from Athi. It was very far from here, it used to take three or four hours to get there and collect water. It was quite hard at that time... And, I even lack words to explain... because as I said, previously I used to go to Athi River for four hours and come back with 25 liters of water. Imagine 25 liters of water with a family of 10 people. This... you wouldn’t have water to bath, to clean the clothes, it was only for cooking and

drinking. So, I can't fail to love and like this water. And everybody in this community is like me because we were all facing the same thing. (Participant 12.4)

The primary water gatherer would collect water every other day, spend hours away from the household, and then return with water only for basic household use, "We used to skip bathing- even at times, we might not cook because we lacked water to cook the food. The food was there, but no water to cook it." (Participant 14.2). In some cases, children would miss school to gather water.

Gathering water could be physically tiring.

We went as a group at 4 am and at noon we would be back, but very tired. It is quite far. Going took about four hours, the process of collecting, then coming back... And coming back was the hardest because you were climbing- it was very hard. (Participant 4.3).

Even if the water was accessible, it could be contaminated or unclear. For HIV-affected families, insufficient access to safe water increases vulnerability to opportunistic diseases such as diarrheal and skin diseases and compromise sanitation practices. Family members lacked safe water for drinking and to maintain proper hygiene and sanitation practices. "Water was sparsely dispersed. During this time, I can't say my kids were bathing... People will not be comfortable with you because you have a smell. Most of my kids had skin disease, which I feel was a result of not bathing." (Participant 4.4)

They say the water is good. And some claim that... after taking this water, will not get tapeworms, because there were a lot of tapeworms when they were taking water from Athi... This water is safe because it's borehole water- it's not contaminated in the source. So, you just have to take precaution in carrying the water and you will not get any water-related diseases. Storage and a clean container, covered, are important... and you will not get any disease from this water. (Participant 12.1)

Moreover, HIV-affected families experienced a loss of productivity from household members who were ill and debilitated, "I am a farmer and I also have some animals, so those are my jobs. I cannot do hard work because I am HIV positive." (Participant 12.1)

All these difficult experiences provide some background to the unfortunate circumstances surrounding water gathering and confirms how negative outcomes occurred not only in typical families within the area, but were likely heightened in those families affected by HIV. These types of situations created a substantial strain on relations in the family. Family members experienced difficulties in irregular meal times and food availability,

inability to converse with the mother on household or school-related issues, irritation with lack of bathing and cleanliness, and general discontent with not having the helping hand of one able-bodied family member available. "We had little opportunity to talk because I was busy-I had to cook, had to go to the farm, had to prepare... there was no time to talk and be together." (Participant 13.2)

Having additional time to use towards relationship development was a primary element that was discussed by the primary water gatherers. "I have more time now to be with the kids and the other family members." (Participant 1.3)

The distance has been shortened and also, the time taken to fetch water. The time I have saved from getting water from this project is used to do other duties at home. (Participant 12.2)

Quality of Life and Health Improvements

Receiving nearby access to water provided more time for the primary water collector; as a result, families experienced improvements in housing, income, food availability, and cleanliness. With increased water availability, some families were able to improve upon many aspects of their lives, including housing, farming, and nutritional needs.

I love the project because it's development for the area... and when I say development... when water is near and you take less time to collect it, you are able to do other gainful activities, like farming. I can say it's development that now I am in my own home-stead. I have constructed my own house. That is development. (Participant 13.1)

This type of development was especially encouraging for some families, as they were able to live in better housing structures, have more food available for their families, and also received supplemental income.

We also make bricks. And that is how we have been able to make decent houses. Previously, our houses were semi-permanent and that is the result of having water far...

Now on my job, I can plant vegetables and use these during the dry spell every year- and that has nutritious value for my family and also we sell some and get some income. (Participant 12.1)

Access to water improved the body conditions of animals, thereby increasing earnings when selling the animals.

The animals, especially during the dry spell, used to die on the way to Athi because of their poor body condition, but now they get water from the project here.

Like, a goat, this size... it goes for nearly 6000 [KSH]. That is good money! Because it's healthy from drinking water, you take to the market and you will be able to get good money. You can use for your other needs, pay school fees or buy food. (Participant 12.3)

Some family members also experienced substantially improved nutrition, sanitation, and hygiene that, in turn, benefited their health.

Also with the cleanness, it's quite important because in our counseling session, people with HIV/AIDS, it's encouraged that we eat nutritious foods and also maintain hygiene to prevent infection and to build up our CD4 count. (Participant 12.1)

HIV, Water, and Relationships

Similarly, the implementation of the water intervention has provided additional time used to reinforce relationships within household family members. Before, the majority of time was used specifically for water collection and families lacked time to strengthen and enhance relationships within the household unit.

It has brought us more together as a family because whoever is going for water will only take 30 min and he/she will be back. We are able now to discuss duties and responsibilities as a family in our home. That has enhanced and strengthened our relationship as a family. We have more time as a family and this is the result of the short time taken to go and collect water and this time, we are able to do other duties here in the home. (Participant 12.1)

Having additional time to use towards relationship development was a primary element that was discussed by the primary water gatherers. "Our relationship is more strong in the family since the inception of this project... we will be laughing, very happy- it shows we are closer together as a family." (Participant 12.4)

I have more time now to be with the kids and the other family members... As I perform other duties, I can communicate with them easily. I think this has brought us closer together as a family. I am also more with the kids- even those in school, they come back at 1 and don't go back because they are in the lower classes, so I have time to spend with them. (Participant 1.3.)

Also, family members experienced an enhanced relationship with community members after the implementation of the water intervention.

My neighbors and friends are able to form groups to help each other, especially on brick making, farming,

land preparation before the rainy season- and all this is possible because the water is nearby and nobody will refuse to come and help you... So, our relationships are enhanced.... Also, on our relationships, we are more together because we are sharing the same benefits from the water. As we discuss and meet, we can appreciate together that we are clean and happy and as a community, we think this is a positive change for having the project here (Participant 12.1).

Nearby water access and additional time reinforced relationships with family and community members. This improved interaction and outreach between community members may have created the context for conversations focusing on solutions to other community challenges, such as HIV/AIDS transmission.

HIV Awareness

HIV/AIDS awareness was discussed without any prompts, even though questions primarily focused on access to water. It was mentioned how additional time created the opportunity for individuals to spread awareness about living with HIV/AIDS and on maintaining health-conscious techniques to avoid initial exposure to HIV or opportunistic infections for individuals infected with HIV.

I can now create awareness about people living with HIV/AIDS, it's because water is nearby. ... now, I can go with my friends, create awareness, and encourage them- those who are living positively on good practices. Also, the people who are not maintaining cleanness, personal hygiene, when we meet in our groups for awareness, we emphasis on these factors. We tell them they don't have a reason for being dirty because water is nearby and they usually change. So, that is advising each other as a group to show that we are together- because if you see your neighbor is not cleaning the children's clothes, they are dirty, you can tell them in a polite way. That shows we are together as a group and as a community (Participant 12.1).

Discussion

In low- and middle-income countries, sufficient access to water is primarily determined by distance and/or time for collection [5]. Unfortunately, populations throughout the world continue to suffer from negative outcomes resulting from poor access to quality water; however, water interventions seek to change this scenario. For example,

improved water infrastructure presents an opportunity to improve HIV-related outcomes. This study provides evidence of the multiple paths through which nearby access to water improves the quality of life for people living with HIV. In one family scenario, the time dedicated to collecting water was reduced from 4 h to 30 min daily after the water intervention. Participant's experiences after the implementation of water interventions throughout the Kitui district revealed health and social benefits from access to water, including increased financial revenue and improved housing conditions, proper hygiene maintenance, improved nutrition from readily available food, and enhanced family and community relationships. These experiences provide evidence of an increased need for access to potable water to improve the quality of life of HIV-infected individuals and HIV-affected families. Eliminating adverse health effects from environmental contaminant exposures and waterborne diseases is a primary outcome when implementing a water intervention; however, additional beneficial outcomes also occur.

Improved access to water led to improvements in agriculture, contributing to enhanced food security as well as improved hygiene practices; both improvements can reduce a person's exposure to opportunistic infections and increase general comfort and dignity of HIV-infected individuals. Reduced time dedicated to water gathering allowed families to engage in income-generating work and enhance family and community relationships. At the same time, community engagement was improved by providing opportunities to family members to cooperate and collaborate on creating solutions to daily problems, such as lack of sustenance or poor housing structures. Outcomes resulting from access to water create a synergistic effect in improving the health of HIV-infected individuals by enhancing treatment and care, thereby reducing morbidity and mortality [3, 16, 24, 25].

The burden of HIV is high in many low- and middle-income countries, inclusive of more than 95 % of HIV infections [30]. Sub-Saharan Africa is the most affected region with 71 % of the people living with HIV [32]. Effective HIV care and prevention strategies have decreased AIDS-related deaths worldwide; however, other factors are also needed to complement existing strategies. With the simple solution of providing communities with water, practitioners can alleviate many economic, health, and social issues in this population. With access to water, population health can be improved, families and communities can come together for support, and HIV-prevention education can be disseminated. This is one easy opportunity to contribute to the dispersal of information and to improve the quality of life of HIV-infected families and HIV-affected families, while reducing disease burden of an infectious virus.

One of the most persistent public health challenges is applying existing knowledge to develop preventive strategies to reduce disease burden. Essential information may not be adequately dispersed, thereby creating challenges in developing appropriate strategies for disease management and prevention. Adapted programs focusing on reducing opportunistic infections within this population remains vital for protecting the health of people living with HIV/AIDS. This study has presented evidence for reducing opportunistic infections by providing nearby access to water, which ultimately maintains a person's healthy status and improves their quality of life. These positive health and social outcomes may provide valuable information for programs focusing on access to water in areas with a high prevalence of HIV/AIDS. Efforts should be allocated to consider these factors when evaluating the impact of an implemented water intervention.

Limitations and Future Research

Possible limitations to the study included: data were retrospective, third parties, inefficiency in translation, social desirability, English as a second language (ESL), and deficient translation of answers among interviewee, translator, and transcriptionist. The issue of third parties was addressed by declining outside influence or direction aside from employees or volunteers of the Kenya Red Cross. The interview translator later became the audio-tape translator; the translator for the interview tape was able to review and re-listen to the audio tapes and provide an accurate translation for the transcription by the researcher. Translation from Kamba to English was used due to poor usage of English as a fluent second language throughout the community. One unanticipated issue and possible limitation that arose was the group or community attunement to the interviews that were occurring in the family. While one person was being interviewed at a time, generally, every family member sat nearby, though did not participate. However, social desirability could be considered a limitation and participant may have answered the questions in a way to please the interviewer and other family members present at the time.

While the responses of the interviews were similar among the HIV-affected family members, a sub-theme primarily concluded the results of this study and thus, may not be extrapolated to other individuals who participated in this study. The original research questions focused on outcomes that occur in families who experienced implemented water interventions; thus, this manuscript was a secondary analysis intended to review HIV/AIDS specifically. Additionally, these findings may not be representative of all Kenyans, HIV-affected families, or HIV-infected individuals living in low- and middle-income countries that

benefit from implemented water interventions. If additional families were interviewed, it is possible that different experiences may arise; therefore, the information obtained through this study may not be generalizable.

That said, this qualitative study provides need-based evidence for nearby access to safe drinking water in order to decrease adverse health effects and improve the quality of life in HIV-infected individuals and HIV-affected families. Furthermore, social effects were improved as a result of access to water and may contribute to improved mental health in families. We believe that water interventions implemented in HIV/AIDS-affected communities would be beneficial on a myriad of levels. Access to water is one factor contributing to health, but education on the usage (e.g. frequent baths, house gardens, trees for shade) as well as the social factors (e.g. restored relationships, improved mental health) could significantly improve health outcomes as well. These interventions could lead to a decreased need for healthcare resources and more independence in caring for one's own self. Finally, future research could focus on the additional benefits from water interventions in order to provide insight on other public health-related issues.

Compliance with Ethical Standards

Conflict of Interest Author Daisy Ramirez-Ortiz declares that she has no conflict of interest. Author Tara Rava Zolnikov declares that she has no conflict of interest.

References

- Forrester JE, Tucker KL, Skinner S, Terrin N. Drug use and weight loss in HIV-infected hispanic men. *AIDS Care*. 2008;20(7):868–75. doi:10.1080/09540120701767174.
- Grunfeld C, Pang M, Shimizu L, Shigenaga JK, Jensenm P, Feingold KR. Resting energy expenditure, caloric intake, and short-term weight change in human immunodeficiency virus infection and the acquired immunodeficiency syndrome. *Am J Clin Nutr*. 1992;55:455–60.
- Guenther P. The impact of nutritional status and HIV disease progression on survival in patients with HIV infection. Ann Arbor: ProQuest, UMI Dissertations Publishing; 1993.
- Hays DG, Singh AA. Qualitative inquiry in clinical and educational settings. New York, NY: The Guilford Press; 2011.
- Howard G, Bartram J. World Health Organization, Geneva. Domestic water quantity, service, level and health. 2003. Available at http://www.who.int/water_sanitation_health/diseases/WSH0302.pdf. Accessed 6 May 2014.
- Ironson G, Friedman A, Klimas N, et al. Distress, denial, and low adherence to behavioral interventions predict faster disease progression in gay men infected with human immunodeficiency virus. *Int J Behav Med*. 1994;1:90–105.
- Johannessen A, Naman E, Ngowi BJ, Sandvik L, Matee MI, Aglen HE, Bruun JN. Predictors of mortality in HIV-infected patients starting antiretroviral therapy in a rural hospital in tanzania. *BMC Infect Dis*. 2008;8(1):52. doi:10.1186/1471-2334-8-52.
- Kleiner SM. Water: an essential but overlooked nutrient. *J Am Diet Assoc*. 1999;99:200–6.
- Koyanagi A, Humphrey JH, Moulton LH, Ntozini R, Mutasa K, Iliff P, Group ZS. Predictive value of weight loss on mortality of HIV-positive mothers in a prolonged breastfeeding setting. *AIDS Res Hum Retrovir*. 2011;27(11):1141–8. doi:10.1089/aid.2010.0293.
- Kyobutungi C, Ziraba AK, Ezeh A, Yé Y. The burden of disease profile of residents of Nairobi's slums: results from a demographic surveillance system. *Popul Health Metr*. 2008;6:1.
- Lincoln YS, Guba EG. Establishing trustworthiness. *Nat Inq*. 1985;289:331.
- Maia BS, Engelson ES, Wang J, Kotler DP. Antiretroviral therapy affects the composition of weight loss in HIV infection: implications for clinical nutrition. *Clin Nutr*. 2005;24(6):971–8. doi:10.1016/j.clnu.2005.06.012.
- Melchior JC, Coulaud JP, Raguin G, et al. Resting energy expenditure in human immunodeficiency virus-infected patients: comparison between patients with and without secondary infections. *Am J Clin Nutr*. 1993;57:614–9.
- Nastasi BK, Schensul SL. Contributions of qualitative research to the validity of intervention research. *J Sch Psychol*. 2005;43(3):177–95. doi:10.1016/j.jsp.2005.04.003.
- Pan American Health Organization (PAHO). Equity & health: views from the Pan American Sanitary Bureau, vol. 8. Washington, DC: Pan American Health Organization; 2001.
- Salomon J, De Truchis P, Melchior J. Nutrition and HIV infection. *Br J Nutr*. 2002;87:S111–9.
- Sawka MN, Montain SJ. Fluid and electrolyte supplementation for exercise heat stress. *Am J Clin Nutr*. 2000;72(2 Suppl):564S.
- Schadé A, Van Grootheest G, Smit JH. HIV-infected mental health patients: characteristics and comparison with HIV-infected patients from the general population and non-infected mental health patients. *BMC Psychiatry*. 2013;13:35.
- Stake RE. The art of case study research. Thousand Oaks: Sage Publications; 1995.
- Stevenson EG, Greene LE, Maes KC, Ambelu A, Tesfaye YA, Rheingans R, Hadley C. Water insecurity in 3 dimensions: an anthropological perspective on water and women's psychosocial distress in Ethiopia. *Soc Sci Med*. 2012;75(2):392–400. doi:10.1016/j.socscimed.2012.03.022.
- Strauss AL. Qualitative analysis for social scientists. New York, NY: Cambridge University Press; 1987.
- U.S. Department of Health & Human Services. Global Statistics. 2015. Retrieved from <https://www.aids.gov/hiv-aids-basics/hiv-aids-101/global-statistics/>.
- Wang Y, Chen X. How much of racial/ethnic disparities in dietary intakes, exercise, and weight status can be explained by nutrition- and health-related psychosocial factors and socioeconomic status among US adults? *J Am Diet Assoc*. 2011;111(12):1904–1911.
- Weiser SD, Young SL, Cohen CR, Kushel MB, Tsai AC, Tien PC, Bangsberg DR. Conceptual framework for understanding the bidirectional links between food insecurity and HIV/AIDS. *Am J Clin Nutr*. 2011;94(6):1729S–39S. doi:10.3945/ajcn.111.012070.
- West BS, Hirsch JS, El-Sadr W. HIV and H2O: tracing the connections between gender, water and HIV. *AIDS Behav*. 2013;17(5):1675–82. doi:10.1007/s10461-012-0219-9.
- World Bank. Improved water source. 2013. Available at <http://data.worldbank.org/indicator/SH.DYN.AIDS.ZS>. Accessed 6 May 2014.
- World Health Organization (WHO)/United Nations International Children's Emergency Fund (UNICEF) Joint monitoring programme for water supply and sanitation. Progress on drinking water and sanitation. 2012. Available at <http://www.unicef.org/media/files/JMPReport2012.pdf>. Accessed 6 May 2014.
- World Health Organization. Nutrient requirements for people living with HIV/AIDS Report of a technical consultation, Geneva. 2003a. Available at http://www.who.int/nutrition/publications/Content_nutrient_requirements.pdf. Accessed 6 May 2014.

29. World Health Organization. Nutrients in drinking water. World Health Organization European Center for Environment and Health, November 2003. Rome: World Health Organization Library Cataloguing-in-Publication Data; 2003. p. 11–160.
30. World Health Organization. Immunization, vaccines and biologicals. HIV/AIDS. 2008. Available at <http://www.who.int/immunization/topics/hiv/en/>. Accessed 6 May 2014.
31. World Health Organization. HIV/AIDS. Fact sheet N°360. 2013. Available at: <http://www.who.int/mediacentre/factsheets/fs360/en/>. Accessed 6 May 2014.
32. World Health Organization. Global Health Observatory (GHO). HIV/AIDS. 2014. Available at <http://www.who.int/gho/hiv/en/>. Accessed 6 May 2014.
33. Wutich A, Ragsdale K. Water insecurity and emotional distress: coping with supply, access, and seasonal variability of water in a bolivian squatter settlement. *Soc Sci Med.* 2008;67(12):2116–25. doi:10.1016/j.socscimed.2008.09.042.
34. Ziraba AK, Mills S, Madise N, Saliku T, Fotso J. The state of emergency obstetric care services in Nairobi informal settlements and environs: results from a maternity health facility survey. *BMC Health Serv Res.* 2009;9:46.
35. Zolnikov TR. Improved relationships in Eastern Kenya from water interventions and access to water. *Health Psychol.* 2015;12(34):1–12.