

Expanding the Activities of the Aida Camp Environment Unit in the West Bank

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Water: Systems, Science and Society Program
Tufts University
May 15, 2016





Rooftop water tanks in al Azza refugee camp

Acknowledgments

We would like to thank 1for3 for inviting us to Palestine, as well as all of the staff and volunteers at the Lajee Center for their support. We would also like to thank our wonderful interpreters for giving us a voice and preventing us from getting lost in the narrow streets of al Azza camp: Shoruq, Rana, Lubna, and Wi'am; our fellow travelers for their bonfireside conversation: Jude Glaubman, David Scales, and Tom, Ed, and Claire Schneider; and the Al-Azza and Al-Ajarma families for hosting us in Aida camp.

We are also grateful to all those who took the time to meet with us from the Applied Research Institute – Jerusalem, the United Nations Relief and Works Agency for Palestine Refugees in Dheisheh camp, the Palestinian Water Authority, and Caritas Hospital in

Bethlehem, as well as the residents of Aida, al Walaja, and al Arroub camps for taking us on tours of their communities.

We would also like to thank all of the individuals and organizations who provided the funding that made our trip possible, including: the Friedman School of Nutrition Science and Policy and its Agriculture, Food and Environment program; the Tisch College of Civic Life; the Tufts Institute for the Environment; the Department of Urban and Environmental Policy and Planning; the School of Engineering; and all those who purchased water bottles and made donations on our fundraising page.

We would like to give a special thanks to our faculty advisor and WSSS steering committee member, John Durant, for his guidance. We would especially like to thank the residents of Alzza camp for welcoming us into their homes with tea, coffee, cake, and infinite patience for all of our questions.

Special thanks to:



Jonathan M. Tisch
College of Civic Life



Executive summary

The Lajee Center and 1for3, two nonprofit organizations dedicated to improving the lives of Palestinian refugees living in the West Bank, invited us – a group of five graduate students from the Water: Systems, Science and Society (WSSS) program at Tufts University – to help assess water quality in al Azza refugee camp in March 2016. Previous groups of WSSS students helped 1for3 and the Lajee Center establish a water quality monitoring program in nearby Aida refugee camp between 2012-2014. This program served as the model for our work in al Azza camp. The Lajee Center and 1for3 plan to expand the program to other West Bank refugee camps in the future.

Al Azza camp, like most communities in the West Bank and Gaza, faces regular water shortages due in part to underinvestment in the water sector, deteriorating water infrastructure, and inequitable distribution of water resources between Israel and Palestine. The assessment consisted of administering a household survey and testing water samples collected from homes in al Azza camp for *E. coli* and total coliform bacteria, two common measures of sewage contamination. One of the objectives of the assessment was to obtain data on water quality, availability, and use as well as on potential health issues associated with poor water quality.

We divided the camp into quadrants and randomly sampled a total of 32 homes in the four quadrants. We collected 38 water samples and conducted 33 surveys over the course of five days. Significant levels of *E. coli* and total coliform bacteria were not found in any of the household tap water samples (n=32). Residual chlorine samples (n=6) showed significant chlorine levels, which may help to explain the absence of sewage indicator bacteria. Survey responses indicated a low rate of symptoms commonly associated with waterborne illness and relatively neutral assessments of water taste, color, and smell. Water shortages were generally of greater concern to camp residents than quality issues, particularly during the dry summer months. Additional tests should be conducted during those months to determine whether dry season conditions have an impact on water quality in the camp.

Another one of our objectives was to help the Lajee Center develop a plan for expanding the activities of its Environment Unit, which currently oversees the water quality monitoring program at Aida camp, to other refugee camps and villages in the West Bank. This expansion would begin with the water quality monitoring program and eventually

extend to the Unit's other environmental health and education initiatives based on each community's individual needs. The Environment Unit's director and team of student-volunteers have actively engaged the residents of Aida camp in its work there and would seek to engage residents in other camps and villages through their local community centers.

In order to determine the needs of each of these communities, staff from the Lajee Center and 1for3 will visit each location to conduct an initial assessment in consultation with community partners and residents. The Lajee Center and 1for3 are currently organizing a six-month training program for new part-time staff hired to collect and test water samples and to coordinate the water quality monitoring program and future Environment Unit initiatives in al Walaja village and refugee camps in the Bethlehem area. The Lajee Center and 1for3 are also in the process of identifying new donors to help fund the expansion of the Environment Unit.

As the Lajee Center considers its expansion into other camps, we recommend that the organization:

- Conduct comprehensive needs assessments before determining which of the Environment Unit's programs should be adapted for each new camp. Needs assessments should use mapping, surveys, water samples, and potentially focus groups to capture the most relevant information.
 - Ensure consistency and continuity by standardizing and recording protocols for surveying, collecting water samples, building rooftop gardens, and other practices that will be replicated.
 - Improve the survey to incorporate a broader range of questions related to health, water quality, and food security. Field test the survey to ensure questions obtain the desired results before initiating survey collection more widely.
 - Monitor programs and evaluate regularly to ensure they are meeting the needs of camp residents. Incorporate an anonymous and user-friendly feedback mechanism.
 - Use results of monitoring and evaluation efforts to articulate accomplishments of the Environment Unit to potential donors.
 - Find innovative, cost-effective ways to use both Palestinian and American university students to collect data and help in the scaling up process without overburdening Lajee and 1for3 staff with administrative tasks and oversight.
 - In working with partner organizations, clearly and formally articulate and document the roles of partner organizations and the Lajee Center, setting specific financial and administrative responsibilities, while remaining open to changes if partners express a need for more or less autonomy.
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Overview of report

The report that follows will begin with an overview of the objectives of the 2016 WSSS Palestine practicum. We will then provide background information about the WSSS program and the work of previous WSSS practicum groups in Palestine, water issues in the West Bank, al Azza camp, and the Lajee Center's current activities. Next, we will discuss some of the practical considerations for scaling up community development projects. We will then review the methods and results of our water quality assessment in al Azza camp. We will end with a discussion of the considerations for expansion of the Lajee Center's Environment Unit and our specific recommendations for achieving this goal.

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The right to safe and clean drinking water and sanitation [is] a human right that is essential for the full enjoyment of life and all human rights.

-UN Resolution on the Human Right to Water and Sanitation

”

Introduction



Motivations

Access to clean drinking water is a human right; however, in the Palestinian refugee camps of arid Bethlehem, drinking water often becomes contaminated with illness-causing bacteria, particularly during the summer months when water supplies dwindle. As graduate students in the Water: Systems, Science and Society program at Tufts University, we had the opportunity to partner with [1for3](#), a US-based nonprofit organization and the [Lajee Center](#), a Bethlehem-based nonprofit

organization, to improve access to safe drinking water for residents of Palestinian refugee camps in Bethlehem.

Between 2012-2014, the Lajee Center, 1for3 and other WSSS students established a water quality monitoring program, a student-centered Environment Unit, and installed rooftop gardens in Aida Camp. These programs could serve as a model for other refugee camps in the West Bank, and the primary reason 1for3 asked WSSS students to expand the program started in Aida Camp. Thus, the 2016 WSSS practicum employed a similar framework to that taken in prior years to assess the possibility of expanding the Lajee Center's Environment Unit to the neighboring refugee camp of al Azza.

In a water-stressed region of the world, this work is useful for improving health outcomes related to water supply. Through direct engagement with community stakeholders, we hope to inspire a new generation of water advocates. In addressing these issues, we aim to emulate the mission of 1for3, to “empower people throughout Aida camp and beyond by creating sustainable projects that include academic and cultural education, media, water and food security, the right to play and to health care.”

Objectives

Our project involves the design, planning, and implementation phases of all work for our client, 1for3. Our objectives can be broken down into three categories: technical, programmatic and organizational, and community engagement.

Technical

During our time in al Azza camp, we aimed to study 10 percent of the households in the camp in order to better understand water availability, quality, and use. Also, we collected water samples in each household surveyed, as well as from communal sources, to test for total coliform and *E.coli* bacteria in the water.

In addition, we produced maps of the water distribution system and access points throughout the camp. By incorporating publicly available Geographic Information Systems (GIS) data, we are able to paint a more robust picture of such issues to better inform future decision-making.

Expansion assessment

Since this is the first assessment of the Environment Unit's expansion to a new refugee camp, this work allows us to develop a sustainable plan and toolkit for 1for3 and the Lajee

Center. This work is assessing the cost of maintaining a water quality testing unit, as well as the initial needs assessment of each camp they are looking to expand into. Preliminary surveys provided a clearer picture of community needs in al Azza and demonstrated a unique set of challenges in comparison to Aida. Incorporating institutional knowledge of what has been effective in Aida camp, as well as what challenges arose in the initial years of the Environment Unit and in al Azza camp, we can establish a blueprint for moving forward.

Community engagement

A cornerstone of the water quality monitoring project is empowerment of the community (and ourselves) to tackle water quality problems as they arise in the future. In Aida camp, this aspect of the project has been widely credited for its success. With that in mind, we distributed information on how to test and improve water quality to all households surveyed. The hope is that this information can inform families about water-related issues in the present, and pique their interest in future water quality programming with the Lajee Center. We also held a community meeting in al Azza at the end of our stay to share preliminary results from our work. The purpose of this was to jumpstart community discussions related to water, and to share information with the study participants and the al Azza community as a whole. Eventually, the goal is for communities to take ownership of a water testing program in their communities.

We also hope to share the narrative and missions of 1for3, and the reality of the water crisis in the Palestinian refugee camps beyond the extent of this project, to our own communities here in the United States. We shared our experiences and results with the Tufts community through a presentation and discussion about water in the West Bank in early May. By collaborating with the Boston Alliance for Water Justice and 1for3 to put on this event, we were able to engage with a larger community of people interested in water-related issues.

Although our relationship strengthening will not be expanded upon in our report, this engagement with, and understanding of, the breadth of issues in these communities was a primary motive for our involvement in this project.



The WSSS team with student members of the Lajee Center's Environment Unit

Background

Tufts WSSS and previous WSSS practica

The Water: Systems, Science and Society (WSSS) program at Tufts University is an interdisciplinary graduate certificate program created in 2004 to provide students with the perspectives and tools needed to confront water-related problems in a variety of settings and scales (WSSS 2016a). WSSS students have the opportunity to enroll in one of two tracks to complete their certificate: the research track and the practicum track. Each year, practicum track students choose from practicum options offered in the spring semester to gain experience working with real-world clients to address water-related problems on the ground (WSSS 2016b, 2016c). Students in the practicum track have traveled to Palestine

three times in the past to develop a water quality monitoring program in Aida refugee camp, located near Bethlehem in the West Bank, in coordination with the Lajee Center, a community-based cultural and advocacy organization located within the camp (Lajee Center 2016).

The first WSSS practicum team traveled to Aida camp in May 2012 to assess the water quality situation on the ground in preparation for establishing a water quality monitoring program. Seven graduate students conducted community surveys related to public health and water quality and tested water samples collected from household taps and community water sources throughout the camp for *E. coli* and total coliform bacteria, which were found in 13% and 47%, respectively, of 75 samples collected. In addition to conducting water quality tests and public health surveys, the WSSS team conducted workshops to teach women and children in the community the procedure for collecting water samples and testing them for the presence of bacteria. The team also trained the Lajee Center's new water program coordinator to continue the water quality monitoring program (WSSS 2012).

The 2013 WSSS Palestine practicum team built upon the foundation of the water quality monitoring program established in 2012 by organizing community workshops to identify strategies for strengthening the program, increasing knowledge of water quality issues within the camp, and improving water conservation efforts. Following their visit to Palestine and informed by key findings from the community meetings and water quality tests and surveys, the practicum team members developed a plan for establishing a water program at the Lajee Center that would offer additional water quality testing and point-of-use interventions, as needed, to camp residents and engage them around water quality issues (WSSS 2013).

The 2014 Palestine practicum group expanded the educational component of the water program plan proposed in 2013 to include a water education program for young people. The WSSS team developed a plan to conduct a workshop for 15 to 20 youth on topics that included water testing methods and health impacts of poor water quality (WSSS 2014).

Water in the West Bank

Water rights have been a major source of contention in the Palestinian-Israeli conflict due in part to the inequitable distribution of water resources between Palestinians and Israelis. Palestinian access to the Jordan River, the most important surface water source in the West Bank, has been cut off since the Israeli occupation began during the 1967 Arab-Israeli War.

The framework for the current groundwater-sharing system was established under Article 40 of the Oslo II agreement in 1995. This agreement determined the water allocations from West Bank aquifers to Israel and Palestine, and established the Joint Water Committee to oversee water- and wastewater-related issues in the West Bank. Under these arrangements, Israel gained authority over all groundwater infrastructure projects in the West Bank and more than three-quarters of the water from the West Bank aquifers. Although initially intended to apply for only a five-year interim period until a broader peace agreement could be reached, Article 40 still governs the management of groundwater resources in the West Bank today (Oslo II Accords 1995; World Bank 2009; Selby 2013; Zeitoun, Messerschmidt, and Attili 2009; Brooks and Trottier 2010).

Under Article 40, the Palestinian Authority was allocated only 17 percent (118 million cubic meters) of the estimated annual potential of the three shared aquifers underlying the West Bank, plus an additional allocation of 28.6 million cubic meters per year to meet the immediate needs of the Palestinian population. The two sides also agreed that another 70-80 million cubic meters per year would be required to meet future Palestinian needs. Despite this, the World Bank has calculated that Palestinian abstractions from West Bank aquifers has actually decreased over the years, while the population has continued to grow. As of 2009, the Palestinians were abstracting only 17-20 percent of the total estimated potential of the three aquifers annually while Israel abstracted the balance and overdrew on the total estimated potential of 679 million cubic meters by more than 50 percent, which has caused many Palestinian wells to run dry (Oslo II Accords 1995; World Bank 2009; Zeitoun, Messerschmidt, and Attili 2009).

The World Bank has reported that the water shortages suffered by the Palestinians are in part attributable to the weakness of the Palestinian Water Authority, which must contend with underinvestment and deteriorating water infrastructure, and the ineffectiveness of the Joint Water Committee, through which the Israelis have rejected or delayed implementation of water infrastructure projects proposed by the Palestinian Authority. Israel has even made approval of such projects conditional upon Palestinian approval of water and wastewater projects for Israeli settlements in the West Bank. According to the World Bank, although Israel has an effective veto over Palestinian groundwater extractions through the Joint Water Committee, the Palestinian Authority does not hold similar power over Israeli use of West Bank aquifers. The World Bank concluded that the “fundamental asymmetry – of power, of capacity, of information, of interest – in the [Joint Water Committee] puts in question its status as a genuinely ‘joint’ institution.” In addition to having de facto authority over Palestinian water infrastructure projects in those areas

under full and partial control of the Palestinian Authority (Areas A and B, as established under the Oslo II agreement), Israel also has the authority to impose additional restrictions on Palestinian water infrastructure in Area C, which comprises over 60 percent of the West Bank and is under Israeli civil and military authority (World Bank 2009; Selby 2013; Oslo II Accords 1995).

The Israeli authorities have accused Palestinians of deliberately wasting water, refusing to treat and use wastewater for irrigation purposes, demanding rights to water resources over which they have only limited claims under international law, drilling unauthorized wells, and refusing to cooperate with the Israelis to develop a mutually beneficial solution to water scarcity in the region, while the Israelis are making strides in the treatment of wastewater, desalination of seawater, reduction of water losses, and conservation of available resources through improved efficiency. The Israeli Water Authority holds up the 1995 interim agreement with Palestine as an example of a “practical, imaginative and just agreement” related to water (State of Israel Water Authority 2009; Gvirtzman 2014).

An assessment conducted by the World Bank in 2009 determined that unauthorized wells are drilled by Palestinians in the West Bank as a result of long delays in approval of infrastructure projects by the Israeli authorities. The Israel Defense Forces regularly destroy these wells. The World Bank also concluded that efficiency losses are due in part to degraded water infrastructure. Constraints placed on the Palestinian Water Authority by Israel are partly responsible for the lack of much-needed upgrades to improve the water infrastructure and the lack of approval for additional wastewater treatment facilities (World Bank 2009; Selby 2013).

According to a 2014 survey conducted by the Palestinian Central Bureau of Statistics (PCBS), nearly 97 percent of household members sampled in the West Bank were using improved sources of drinking water. Only eleven percent of those using unimproved drinking water were using an appropriate treatment method, which means that the West Bank population is still unnecessarily vulnerable to health problems associated with poor water quality (PCBS 2015).

Al Azza refugee camp

Al Azza refugee camp is located approximately one kilometer north of Bethlehem within the Bethlehem Governorate in the West Bank. The camp is home to approximately 1900 residents, many from families displaced from Beit Jibrin village near Hebron in 1948. At only 27,000 m², al Azza is the smallest refugee camp in the West Bank and among the most

densely populated camps in the region. The camp lacks even basic services, such as schools, health facilities, community-based organizations, and playgrounds or other open spaces. Camp residents rely on nearby Aida refugee camp and Bethlehem to meet these needs, although the United Nations Relief and Works Agency for Palestine Refugees (UNRWA) has claimed that travel and safety concerns prevent many women and children from being able to take advantage of services outside of the camp (PCBS 2016; UNRWA 2015; Applied Research Institute – Jerusalem 2010).

Most camp residents receive their water from the Palestinian Water Authority, which serves most of the West Bank and Gaza. Both the water and wastewater infrastructure are deteriorating throughout the camp due to lack of much needed upgrades, and are insufficient to meet the needs of the camp at its current population level. Since water delivery is intermittent, camp residents store water in plastic and/or metal tanks, usually located on rooftops, when water is not available from the main supply line (UNRWA 2015; Applied Research Institute – Jerusalem 2010).

Current operations

The Lajee Center runs a wide variety of programs in Aida camp that encompass sports, music, traditional dance, media, and the environment, among others. The Lajee Center's Environment Unit primarily conducts activities related to environmental health and education. Students in the Environment Unit play an active role in water quality testing and engage with a variety of topics including biodiversity, agriculture, and recycling through a curriculum that incorporates lessons, workshops and field trips.

In 2014, the Lajee Center began a food security project to build rooftop greenhouses in Aida camp, a project that now falls under the purview of the Environment Unit. The Lajee Center and 1for3 collaborated with a Tufts University graduate student on the project, which began with surveys throughout Aida camp and al Azza camp to assess the severity of food security problems. Staff members then used this information to determine which households were eligible to receive rooftop greenhouses. Since then, 10 rooftop gardens have been installed in Aida camp. One prototype garden was installed on the roof of the Lajee Center, and is now cultivated by the Environment Unit students.

The Environment Unit's program director would like to boost student interest by taking them on regular field trips, either once a month or once every two months, but is restrained by limited funds. "The students will get bored if it's just lectures (and) no workshops," the program director said during an April 2016 interview. Taking students on trips, however,

can get expensive. Hiring a bus, particularly to take the students to a distant location, can cost between 500-1,000 shekels — about \$130-\$270 US dollars. The program director would like to provide food during field trips, which adds to the total expense of the trip.

In early April, instead of taking students on a field trip, the director invited an engineer from Nablus to conduct a two-day workshop with students about recycling tires and bottles. The Lajee Center covered the cost of his travel, materials, and accommodation, which totaled about 1,000 shekels (\$260). “The workshop (with the engineer) at that time was more important than a trip,” she said, but her students constantly ask when they can embark on their next excursion. Until the spring of 2016, students had not taken a field trip in about six months.

At this time, the Environment Unit’s major expenses include paying personnel, rooftop gardens, and field trips. Operating out of the Lajee Center in Aida helps keep operating costs low, as the Unit does not have to pay to rent office or laboratory space and Lajee saves money by maintaining multipurpose spaces.

Now, the Lajee Center and 1for3 have a vision to expand their programs to other refugee camps in the West Bank, beginning with the water quality testing program and eventually the entire Environment Unit. The Tufts 2016 WSSS practicum that is the subject of this report is a contribution to the Lajee Center’s initial assessment of expanding the water quality program to the neighboring refugee camp, al Azza. Beyond this, leaders hope to expand to al Walaja, a village to the west of Aida Camp, and al Arroub, a camp to the south, eventually establishing a presence in a total of ten refugee camps and two villages throughout the West Bank (Al-Azraq 2016).

Practical considerations from the literature on scaling up

The literature on scaling up community development projects, while limited, supports the gradual process that Lajee and 1for3 has undertaken in establishing the Environment Unit in Aida camp, during which staff promoted community engagement and ownership of the project. A 2003 World Bank analysis of community-based development warned against rapid scaling up of projects, as building community participation is a long-term interaction that should not become subject to routine or the push for rapid results. Overall, the review finds that, “in fact the best practice here may be the absence of a best practice. Effective [community based development] has to involve slow, gradual, persistent learning-by-doing where project design gradually adapts to local conditions by learning from the false starts and mistakes that are endemic to all complex interventions” (Mansuri and Rao 2004).

Additionally, some scholars have attempted to integrate lessons from for-profit models and qualitative studies of nonprofits to enumerate some key considerations. Audrey Morgenbesser examined some of the literature and proposed a preliminary nonprofit geographic expansion model to reflect the iterative process for such growth (Morgenbesser 2004). Morgenbesser notes research shows that building strong, healthy, productive relationships between the headquarters and local sites is key to geographic expansion. Entities that expand often have to grapple with the dual challenges of managing an existing business and a “start-up” simultaneously, but researchers note that a “healthy tension” between headquarters and affiliates is normal. Entities that expand successfully redefine roles effectively and are able to find a balance between affiliation and autonomy that makes sense for their organization (Morgenbesser 2004; Grossman and Rangan 2001). Additionally, research on five Indian organizations’ expansion processes found that decentralization was key to ensuring program quality and sustainability as it builds dynamism into organizational structure (Nair and Howlett 2015).

According to Grossman and Rangan, operational and management actions tend to determine the amount of autonomy or affiliation field offices seek. For instance, local units will seek more or less affiliation based on the value-added services from network cooperation. The authors also contend that this relationship between the headquarters and

affiliates needs to be established through an organization's operational strategy early on (Grossman and Rangan 2001).

Jeffrey Bradach notes that when nonprofits consider expansion or replication, they must first consider whether there is enough substantive success to justify this. Success, however, must be determined by the entity based on its goals. Bradach argues that nonprofits should determine which pieces of the program should be replicated and that the greater the number of elements can be standardized, the more likely replication will succeed (Bradach 2003).

Regarding nonprofit funding models, Foster, Kim, and Christiansen wrote that no effective ways existed for nonprofits to articulate their organizational model. The authors enumerated 10 nonprofit models based on the way organizations connect with their supporters and raised funds, but added that philanthropists may not always understand the impact or limitations of their donations (Foster, Kim, and Christiansen 2009). Nonprofits, therefore, need to articulate such connections in a sophisticated fashion to ensure continued support from donors. Bradach argues that a key to growing financially is standardizing the program to make underlying economics transparent and being able to articulate the unit cost for effecting change (Bradach 2003).

Morgenbesser added that, when considering expansion, nonprofits need to consider the extent to which they would like to expand, or how big is big enough (Morgenbesser 2004). There is also some discussion in the literature about ways in which non-governmental organizations (NGOs) can increase their impact without actually increasing in size. While NGOs commonly expand their impact by increasing their reach, financial capacity and staff, organizations can also have a larger overall impact by influencing the behavior of other organizations and assuring their own organizational sustainability (Nair and Howlett 2015).

Unfortunately, there is little in the literature surrounding the behavior or expansion of organizations in countries in protracted crises, such as Palestine (Macrae and Harmer 2004). While case studies can be helpful to the Lajee Center and 1for3, the conditions these two organizations face may be somewhat different than what is described in the literature. There are numerous challenges to operations in this context beyond the scope of this report. However, in reference to food security initiatives in particular, Maxwell, Russo and Alinovi (2012) stated that, "the very nature of protracted crisis calls for contextual learning and flexibility and makes operational blueprints unlikely and often distinctly not useful."



Water testing and household surveys in al Azza

Methods

In March 2016, our team visited the West Bank to conduct household surveys and collect and analyze tap water samples to assess water quality and availability in al Azza camp. We split al Azza camp into quadrants (Figure 1) and randomly sampled houses and floors within houses in each section over 5 days (n=33). Surveys were conducted in Arabic with local translators and in accordance with a Tufts IRB approved protocol. Water samples were collected at the same time as surveys were conducted. Water samples were also collected from the camp's mosque and community center.



Water samples were taken from either a kitchen or bathroom tap, after disinfecting the faucet with a flame for 10 seconds and running the cold water tap for 30 seconds. This protocol was designed to be similar to that of the United Nations Relief and Works Agency for Palestine Refugees (UNRWA). Positive controls were taken from two local springs and a puddle in the camp. Negative controls were taken from unopened bottles of drinking water. Cleaned sample collection bottles were rinsed three times with sample water before water was collected.

Residual chlorine was measured immediately upon collection with a portable spectrophotometer. For *E. coli* and total coliform, 125 mL of sample water was filtered through a sterile 0.45 μm filter within 6 hours of collection. The positive control sample from the puddle was diluted 1:10. The filters were plated with m-ColiBlue 24 media and placed in an air incubator at 35 ± 0.5 °C for approximately 24 hours. Plates were counted by two team members.

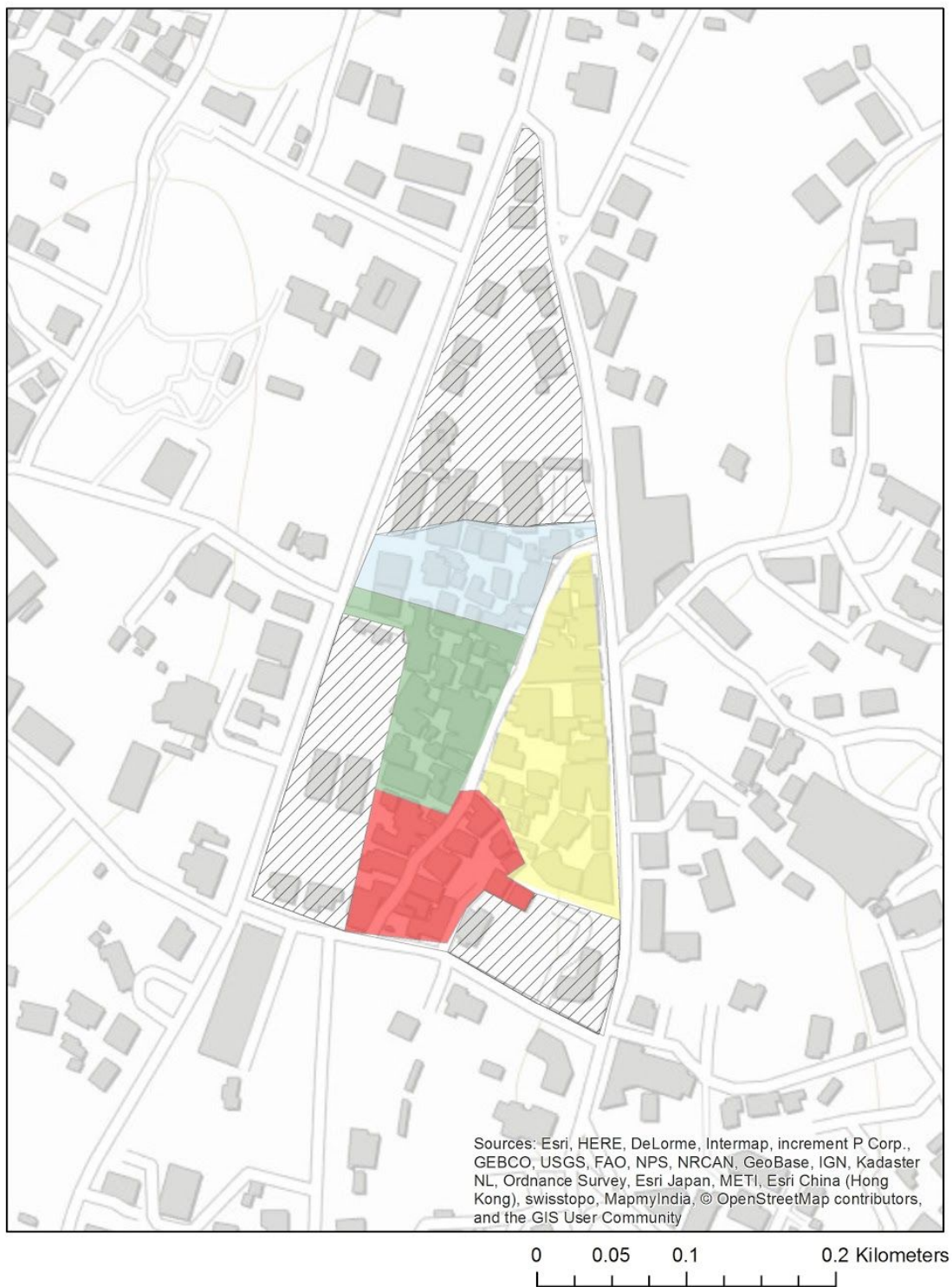


Figure 1: Sampling quadrants in al Azza refugee camp.

Results

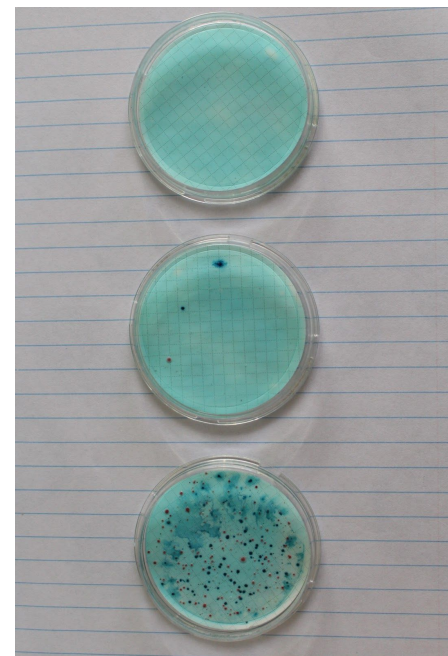
Table 1. Water quality test results

# of samples	# of samples with colonies			Mean residual chlorine (mg/L) (SD)
	<i>E. coli</i>	Total coliform	>3 <i>E. coli</i> and total coliform colonies	
3 + controls (2 springs, 1 puddle)	3	3	3	-
3 - controls (bottled water)	0	0	0	-
32 households (6 for residual chlorine)	0	2*	0*	0.17 (0.06)
2 community sites (mosque, community center)	1	1	1	-

*Two household water samples had numerous unidentifiable colonies, and two other household samples had 1 or 2 total coliform colonies. These samples fall below the decision rule threshold that requires retesting or notifying residents when more than 3 total *E.coli* + total coliform colonies are found.

Table 1: 33 households and 2 community sites were tested for total coliform *E. coli*. One household sample was discarded because the sample was plated incorrectly. None of the household samples had elevated levels of total coliform or *E. coli* while one community site showed elevated levels of both *E. coli* and total coliform. This site was retested after our departure and the initial result was confirmed.

No significant *E. coli* or total coliform bacteria was found in household tap water samples (n=32), and residual chlorine samples (n=6) showed significant chlorine (Table 1). Coupled with the survey responses showing relatively low rates of symptoms commonly associated with waterborne illness (Figure 2) and relatively neutral assessments of water taste, color and smell (Figure 3), the results suggest that bacterial contamination of drinking water may not be a widespread problem at this time in al Azza camp. Residents' current use of water disinfection practices may contribute to this outcome (Table 3), as well as shorter storage times due to fewer springtime water shortages.



Residents also seem relatively aware of the potential for quality problems to arise. A majority of respondents (78%) said they monitored their household's water quality in some way, usually by visually assessing the inside of the storage tanks or judging the taste, smell, and color of tap water. If a water quality problem were to be identified, 57% of respondents said they would contact the Palestinian Water Authority (PWA) for help, while 36% would call UNRWA. This may indicate that residents trust PWA to handle the problem more effectively than UNRWA.

Table 2. Household demographics

Question	Mean	Min-max	% of sample pop.	Total # represented
How many people live in your household? (n=33)	6.66	2-21	-	232
How many <5 years old? (n=33)	0.79	0-4	11.2	26
How many >65 years old? (n=33)	0.18	0-1	2.6	6

Table 2: Out of 33 households surveyed, more than 11% were children under the age of 5. The surveyed families represent 232 people, or about 12% of al Azza's total population.

Table 3. Household health and illness

	% yes		% yes
Has anyone in your family been sick in the last 6 months? (n=33)	79	Has anyone in your family been sick in the last 15 days? (n=33)	73

Table 3: Most families surveyed had been sick in the past two weeks as well as the past 6 months. This includes any person within their household that they could recall being sick.

Figure 2: Symptoms of illness in last 6 months (n=33)

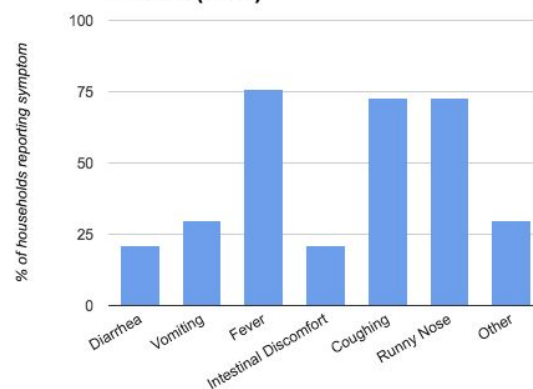


Figure 2: The predominant symptoms that families experienced in the past 6 months were coughing, runny nose, and fever. Incidence of diarrhea and vomiting, which we expect to be more closely associated with waterborne illness, was relatively low.

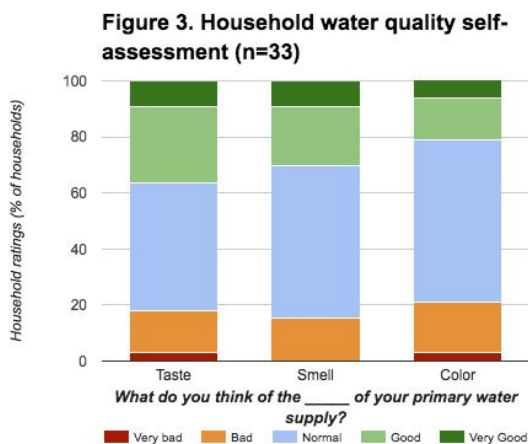


Figure 3: Residents had relatively neutral assessments of their water in all three subcategories of water quality self-assessment. In fact, several residents who rated their tap water negatively said they felt the water smelled too much like “chlor” or chlorine.

Table 4. Disinfection practices

Question	% yes		
Do you ever take measures to clean your water? (i.e. boiling, refrigeration, ceramic filter, adding chlorine) (n=33)	30.3		
Do you clean your water storage vessels? (n=33)	75.8		
	Water only	Soap	Chlorine
If yes, how do you clean your water storage vessels? (n=25)	36%	24%	40%

Table 4: Relatively few of the camp residents surveyed take measures to clean their drinking water, but most clean their water storage tanks. 64% of those who do clean their tanks use either soap or chlorine.

Table 5. Water shortages

How long do you usually go without water from the primary supply during a shortage...	Mean # of days (SD)
In the wet season? (n=15)	7.36 (4.42)
In the dry season? (n=20)	17.43 (7.80)

Table 5: The average family surveyed regularly goes without water for more than a week in the winter and spring and two weeks in the summer.

Residents report water shortages lasting over two weeks in the summer (Table 5), which, for most families, necessitates purchasing water from a secondary source. A majority of respondents (85%) regularly buy drinking water from another source during the summer, and 64% of those respondents buy water from a water truck. This can be expensive — residents reported each cubic meter of water from a water truck costing around 200 NIS, or around USD 52. Even more costly, despite lower initial cost, is bottled water, which is purchased by 53% of families who get supply from a secondary source during water shortages.

The results from our water quality testing and household survey are a snapshot of the water situation during the spring when shortages are less frequent and shorter in duration. As seen from residents' reports of lengthy water shortages, the situation in al Azza is certainly different in the summer, when many residents are consuming water from a secondary source and may be leaving water in their storage tanks for much longer, which leads to evaporation of chlorine and the potential for bacterial proliferation. Therefore, additional tests should be conducted during the dry season.

Previous work in Aida camp has indicated that water availability and even water quality may be related to where people live. In particular, previous WSSS practica surmised that homes at higher elevations in Aida were the last to receive water when it flowed from the primary source. Because of this, these homes experienced longer shortages and possibly worse water quality problems. 76% of those surveyed in al Azza said they believe water availability varies by location of the residence in the camp. Of those, 48% attributed varying availability to elevation differences, 28% attributed it to being on different water lines, and 20% attributed it to differences in water pressure or pump power. Our topography data (Figure 4) shows that there is a slight downward slope across the camp, with the main PWA water source at the highest point. Most homes are thus likely to be at a lower elevation than the water tank, making the pumping of water into household storage tanks possibly faster, which may mean that most or all of the camp is able to fill their tanks each time the primary source is available. In Aida, some residents at high elevations do not get water every time the primary source is available, leading to even longer periods of shortage.

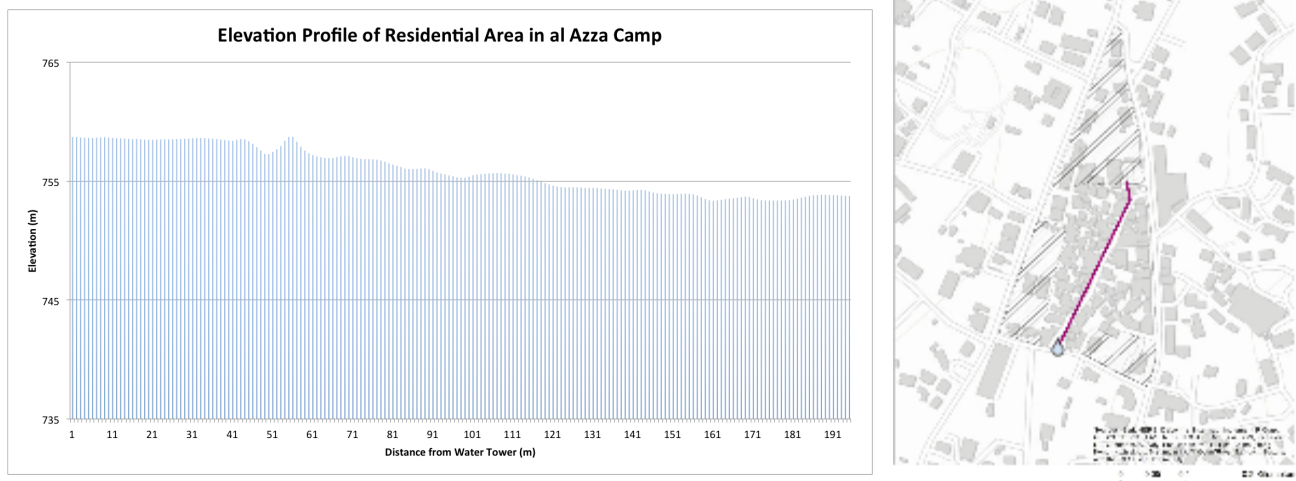


Figure 4: The elevation across the camp down the main road (purple line) has a grade of about -3%.

Considerations for future expansion

There are notable differences between the refugee camps in which the Lajee Center hopes to expand its Environment Unit. These differences indicate that detailed needs assessments will be important as new camps are added to the program. As the Lajee Center embarks on expansion, it should consider

- What is their vision for inclusion of new camps in the program?
- How should expansion look?
- How should diverse needs be assessed?
- How can expansion be funded to promote sustainability?

What does success look like?

The vision of success molds to the shifting needs of the Palestinian communities 1for3 serves, according to its leaders. Currently, the primary goals are to improve water quality through industry-accepted methods of monitoring and treatment and to replicate the Lajee Center's Environment Unit at 11 other locations (Al-Azraq 2016; Kurban 2016).

The organization currently has no formal community-feedback mechanism, but community participation has been an informal way of measuring the relevance of the Lajee Center's programs (Kurban 2016; Al-Azraq 2016). The organization aims to reach all segments of society — women, children, men, seniors, and others — and adjusts programs based on whether the community deems them important.

Another measure of success is the community's active response to programs. For example, the Lajee Center and the residents of Aida camp challenged information from local water officials after the Environment Unit's water quality testing workshops equipped the community with their own data that showed potential water contamination that has gone unaddressed (Al-Azraq 2016). In this case, the community was equipped with the tools to handle the situation. By contrast, 1for3 ceased rooftop tank cleaning operations when it discovered residents were becoming reliant on the service instead of cleaning their own tanks (Al-Azraq 2016).

For the Lajee Center and 1for3, positive community engagement is perhaps the most important goal. Staff of both organizations are proud of the sustainability of their programs, particularly in light of the failure of an UNRWA-led greenhouse project similar to

Lajee's rooftop garden initiative (Kurban 2016). Staff attribute much of this success to community engagement and ownership of projects.

For this reason, the Lajee Center has worked to establish and maintain longstanding relationships with community-based organizations throughout the West Bank, a process that has been underway for nearly 10 years. The Lajee Center hopes to work in close partnership with these organizations to expand the Environmental Unit. This model implies the Lajee Center will not take on the full cost and administrative burden of expansion, but rather will collaborate with and support partner organizations.



A rooftop garden in Aida

How should expansion be performed ?

Leaders at 1for3 hope to have units similar to the Lajee Center's Environment Unit at 12 different locations — 10 officially-recognized refugee camps and 2 villages with many refugee residents — in two to three years (Al-Azraq 2016; Kurban 2016). This goal depends heavily on funding. Currently, 1for3's expressed primary goal is to expand geographically and through replication of existing programs rather than to expand the types of programs offered by the Environment Unit. There are tentative plans to expand the programming into public health, but the details of this plan are beyond the scope of this report.

Currently, the Lajee Center is first expanding the water testing portion of the Environment Unit, having begun training potential staff members at al Azza camp, al Walaja village, and al Arroub camp. The motivation for this is in part because water is such an integral part of every other program — e.g., without a dependable water supply, rooftop gardens would not be reliable (Kurban 2016) — and partly because testing for *E.coli* and total coliform bacteria in water is relatively simple and inexpensive to replicate. Once water quality monitoring programs are established, the Lajee Center can assess what other programs are needed in each camp.

The 11 additional communities earmarked for expansion — including al Azza, al Arroub, and al Walaja — were selected because they have existing centers affiliated with the Lajee Center (Al-Azraq 2016). The Lajee Center has longstanding relationships with all of these centers and the goal is to share resources from the Environment Unit's programs with these other centers.

Much of the literature on nonprofit expansion speaks about the importance of setting goals early on for the relationship between headquarters and affiliates (Morgenbesser 2004; Grossman and Rangan 2001). This relationship likely has already been established by these other centers affiliated with the Lajee Center. The Lajee Center will need to establish a unified vision between all the different branches of the Environment Unit. Leaders at 1for3 have expressed a desire to encourage the other camps considerable autonomy in executing their own programs (Al-Azraq 2016).

Finally, scholars also note the importance of standardizing procedures in successful nonprofit expansion (Bradach 2003). Because 2016 is the first year of expansion, much of the Lajee Center's operating procedures have not yet been standardized and documented (Kurban 2016). Leaders at the Lajee Center should carefully consider which practices to standardize and which to leave open for field offices to decide on during this early period of expansion.

In scaling up the water quality program, water testing protocol should be written in Arabic to promote uniformity. Harmonization of the methodology across camps to match UNRWA protocols would be beneficial because results could be compared, particularly when used for advocacy. While UNRWA has no written protocol for water quality testing at refugee camps, a visit to UNRWA offices in Dheisheh gave the team a clear understanding of its methodology that can be easily documented for future volunteers or staff members engaged in water quality testing (Salah 2016). Of particular importance are the use of positive and negative controls, the use of a flame to sterilize the tap before collecting a sample, and running the water for about a minute before collecting the sample. It may be useful to collect two samples at each location to provide a backup for instances of user error or equipment failure, such as leakages from broken vacuum filtration apparatus.

In the future, there may be cause to consider other contaminants in addition to *E.coli* and total coliform bacteria, based on the literature or the suspected presence of other disease-causing organisms. For example, recent research indicates that nitrate contamination of groundwater resources is increasingly a problem in the West Bank

(Anayah and Almasri 2009). Testing for additional contaminants increases the cost of materials as well as the time needed for testing and analysis, and should be done where there is strong evidence to believe the contamination is a cause for concern.

How should diverse needs be assessed?

The Lajee Center spent one and a half years researching the situation in Aida before it began its programs there. Similar care should be taken with the other 11 camps, although the process may be somewhat streamlined by borrowing from the Aida program and from longstanding relationships. The March 2016 Tufts project was one of the first steps in expanding to al Azza, but more study is required before establishing a program at this camp. Nidal Al-Azraq, the Executive Director of 1for3, will spend a month visiting all 12 communities during the summer of 2016 to obtain a more accurate assessment of the situation on the ground and information on how these centers can partner with the Lajee Center (Al-Azraq 2016).

Results from al Azza, along with visits to al Arroub and al Walaja, point to the importance of mapping in the initial assessment process. Mapping of a camp is an important first step that allows for better understanding of hydrology, water infrastructure, and population distribution in a camp. For example, an understanding of the water delivery infrastructure and the location of public water sources can be used to determine which households will likely have the greatest water quantity issues. In the case of al Azza, surveys demonstrated that certain water lines, for example those linked to Caritas Hospital, provided more reliable water supply than other lines. Future researchers should consider obtaining Institutional Review Board (IRB) approvals to collect geographic identifiers with the water samples. Groups can then determine whether there are patterns in the survey responses and water quality testing results that correspond with topography, distance from a water source, and the like. Accurate mapping is also imperative for obtaining a random sample of households for survey and water sample collection.

Conducting household surveys is another key component of the assessment process. Appropriate survey design can help Lajee capture the most accurate and relevant information while minimizing data collection costs. A random sample covering roughly 10 percent of a given camp's population is recommended. The random sample should incorporate variations of which level in a multi-story building a family lives on, because that often affects the reliability of water supply. In larger camps, like Dheisheh, it may be more reasonable to use a complex survey design that incorporates clustering.

Response rates should be reported and considered to determine if the sample was truly representative of the camp as a whole. A response rate of <40% would be cause for concern that a certain demographic was excluded from the survey, or that unobservable factors were influencing people's inclusion in the survey. For example, sampling mid-day could systematically exclude people who work outside the home during the weekday.

Furthermore, survey questions should be reconsidered. Designing a survey specifically for use across all refugee camps would streamline data collection and analysis. Developing one survey that incorporates demographic information, public health questions, and food security and water quality dimensions could also lower costs and time spent conducting surveys related to the rooftop gardens and water quality monitoring projects. If the organization finds indicators that specific issues need to be tested for in any of the subject camps, it can create a supplemental survey or conduct additional testing to investigate those issues. Field-testing the survey with the target population is also recommended to ensure the questions are intuitive, culturally appropriate, and elicit the responses they are meant to address. For example, the WSSS team had difficulty with questions regarding willingness to pay, and people's perceptions of water quality on a subjective, qualitative scale.

It should also be noted that a clearer understanding of household water consumption would be beneficial. Respondents were often unfamiliar with the actual volume of their various tanks, particularly those households that used a mix of plastic and metal tanks. Checking reported tank sizes can provide a more accurate depiction of household water use. Because a dearth of reliable data currently exists for this region, it is vital for 1for3 and the Lajee Center to do additional ground truthing and verification, despite the extra time and cost. Part of this process may involve comparison with statistics produced by organizations like the Applied Research Institute - Jerusalem, the Bethlehem Water Authority, and the UNRWA. Relationships with trusted officials from these organizations may facilitate collaboration and data sharing that benefits 1for3, or exposes differences in methodology that warrant further investigation.

It is imperative to convey to any university students or staff members involved in the research that all aspects of study — including water sampling, water testing, conducting of surveys, and research design — should be rigorous and replicable to produce data that the organizations can have confidence in. Random sampling of households and use of positive and negative controls for water testing are of particular importance.

In order to ensure that all those participating in the research effort are on the same page, it would be beneficial to hold a training workshop for members of all of Lajee's partner organizations, as well as interested students or community members. Clear demonstration of water testing procedures combined with hands-on experience would ensure proper sampling methodology. It was noted by our group that even small inconsistencies in our understanding and recording of survey question responses made analysis significantly more difficult. These issues can be avoided through training and establishing detailed, yet easily understood, protocols.

It may also be beneficial to include questions about the quantity and horsepower of pumps families use to transport water to rooftop tanks. This can help Lajee determine willingness to pay for water access through revealed preferences such as how many pumps people buy and the amount of horsepower they choose. These pumps also represent a source of vulnerability, as was evident in al Arroub, where intermittent electricity and frequent power outages interrupt pump function.

Another consideration to either reduce costs of survey collection, or to capture a wider range of qualitative information beyond the random sample, would be to conduct focus groups. These would have to be carefully formulated to ensure representativeness. Research suggests that conducting separate focus groups for men and women can help ensure that gender does not influence who speaks and what is said.

Ongoing data collection to understand trends over time is also important for long-term success. This is being done in Aida, and should be done in all camps, as it is unclear from our results in al Azza whether water quality issues would exist in the hotter, drier summer months when water delivery is less frequent, and rates of chlorine evaporation from the tanks are higher.

The immense amount of data collection needed for the expansion to 11 new locations over two to three years means thinking innovatively about how this can be done efficiently. Given high unemployment in Bethlehem and a highly educated young population, involving university students in Palestine in data collection and surveying activities could be more cost effective than partnering with institutions in the United States (Al-Azraq 2016). Nonetheless, identifying ways that international student groups like the WSSS program at Tufts can contribute to these efforts, with or without traveling to Palestine, remains an important collaboration and key to 1for3's outreach efforts in the United States.

Talking to other organizations that have developed different research models or working relationships with universities might be of interest. For example, the Andean Alliance for Sustainable Development, a nonprofit community development organization in Peru, has developed an Immersive Education Model in collaboration with students at the Middlebury Institute of International Studies that puts significant emphasis on individual students taking full ownership and responsibility of the planning and implementation of that project (AASD, n.d.). Their approach is similar to that of participatory action research (PAR), which is by definition “a methodology enabling researchers to work in partnership with communities in a manner that leads to action for change.” PAR’s emphasis is on “a reflective process ... influenced by understanding of history, culture, and local context and embedded in social relationships” (Baum 2006). There is a large literature on the benefits and unique strengths of this approach, as well as the ethical considerations for its implementation.

Finally, as evidenced in the literature, there is a need for consistent monitoring and evaluation of programming to ensure it is responding to the needs of camp residents (Mansuri and Rao 2004). Feedback mechanisms that allow people to formally and anonymously provide criticism or requests to Lajee Center should be put into place. At the moment, feedback is given primarily through informal conversations with camp residents. While an undoubtedly invaluable form of feedback, space should be made for those who wish to provide anonymous feedback to do so. Periodic community meetings or fora to raise issues or propose solutions may also help sustain interest in programming and increase community acceptance.

How can the expansion be funded sustainably?

Given that this is the final year the Lajee Center will receive funding from the Pontifical Mission in Jerusalem, new donors and funding streams are needed. Leaders at the Lajee Center have expressed uncertainty about future funding sources outside of assistance from 1for3, which currently helps the Center with matching funds. For the Lajee Center and 1for3 to maintain the same level of services as the past three years, the organizations will have to identify another funding source that can provide about USD 27,500 over two years.

Lajee Center Budget, December 2014 (USD)			
Budget items from approved budget	Pontifical Mission contribution	Lajee Center match	Total cost
Program director (28 months*\$500)	8,600	5,400	14,000
Extracurricular education trainer (90hrs*\$10)	900		900
Water quality testing (270 hrs*6)	1,280	340	1,620
Local field trips (6*\$450)	2,700		2,700
Water tank cleaning crew and materials (45*\$120)		5,400	5,400
Environment festival (2*\$800)	1,600		1,600
Outreach activities (12*\$300)	3,600		3,600
Rooftop gardens (100m ² *\$50)	3,500	1,500	5,000
Seedlings	600		600
Plastic/nylon for greenhouse	1,400		1,400
Tools and equipment (20*\$12)	240		240
Admin costs (28-months*\$40)	1,120		1,120
Telecommunication	840		840
Stationery	560		560
Hospitality	560		560
TOTAL	27,500	12,640	40,140

Expansion of services will require additional funding. In particular, expansion will require additional staff, and likely increased transportation costs between the various camps and villages. In April 2016, the Environment Unit director began a two-month training workshop for potential program coordinators in al Walaja and al Arroub. Once the training is complete, the Lajee Center hopes to employ the program coordinators part-time (Al-Azzeh 2016).

The literature points out that “rapid scaling up results in hiring facilitators who are particularly inexperienced and poorly trained. Given the pivotal role that facilitators play in the [community based development] process, this could...doom the effort from the start” (Mansuri and Rao 2004, 36). Rather, organizations should pay careful attention to the training and development of a core group of facilitators to lead community-based interventions. “This, again, cannot be done in haste, and is part of the learning-by-doing process. Inexperienced facilitators should be given a chance to learn and grow, under the supervision and leadership of more experienced individuals” (Mansuri and Rao 2004, 39). This highlights the importance of the Lajee Center’s close collaboration with partner organizations. It also implies that new staff may benefit from working closely with Lajee Center staff, particularly the director of the Environment Unit, at the outset of expansion.

Some staff at the Lajee Center also expressed interest in having additional space set aside for the Environment Unit. Given the many activities that the Lajee sponsors and the number of events and children constantly in the Lajee Center, finding a clean and designated laboratory space for water quality testing and storage of materials may become more important as the number of samples taken increases.

Purchasing additional water quality testing materials, particularly expensive items like the incubator (\$1000), will be necessary for expansion. Initially, depending on the rollout of data collection and water sampling, it may be possible to share equipment between centers. Nonetheless, if these programs are to be sustained, each location should have their own materials, as the geographic distribution of the refugee camps in the West Bank makes it inefficient to transport equipment back and forth. As this equipment is purchased, its proper storage and care should be ensured, such as refrigeration of the growth media. A tentative list of materials needed for water quality testing, along with their costs and where they can be purchased in the United States, is listed in Appendix 1. Adapting this for Palestinian partner organizations would be useful.

To gain a preliminary understanding of potential costs involved in replicating the water testing program one can use existing costs for testing materials, listed in Appendix 1, combined with other operational costs. The materials listed in Appendix 1 will accommodate initial capital costs and about 600 water samples for a total of USD 2,821. Removing the initial capital expenses — such as the incubator, the refrigerator, the vacuum filtration set up, the goggles, and the lab coats — leaves a budget of USD 1,000 for recurring expenses to cover about 600 water samples, or about USD 1.67 per water sample.

To illustrate the cost of replicating the water testing program in other camps, it is possible to use this per-sample cost and apply it to the presumed protocol of testing 10 percent of households at each camp per month. Since the population and number of housing units varies considerably between camps, the costs associated with maintaining the water quality testing programs in each camp would vary accordingly. For instance, in 2007 the Palestinian Central Bureau of Statistics (PCBS) estimated that al Azza camp included approximately 275 housing units and al Arroub camp included approximately 1,420 housing units (Applied Research Institute – Jerusalem 2009, 2010). So testing 10 percent of housing units per month at al Arroub camp would cost about USD 237 before labor costs, whereas testing a similar proportion of housing units in al Azza camp would cost about USD 46 before labor costs. Therefore, a budget of USD 1,000 would be sufficient to maintain the water quality testing program at al Arroub camp for approximately four months or the program at al Azza camp for approximately 20 months without accounting for salaries.

These numbers could increase or decrease depending on other factors such as scale, rental of a laboratory space, salary, utility bills, and other related expenses. The Lajee Center and 1for3 will also have to factor in compensation for staff members collecting these samples. Currently, the full-time program director at the Lajee Center’s Environment Unit receives a salary of about USD 500 per month. In some instances, one staff member could handle water testing at multiple communities depending on proximity and resources, but it is beyond the scope of this project to assess this.

While time scale is not of the utmost importance in this process, saving time can equate to saving money, and thus should be prioritized wherever possible. In this vein, standardization of certain processes can help facilitate efficient adoption of programs by Lajee’s partners. Standardization will be helpful only when it does not mask important idiosyncrasies between households or camps. For example, clear documentation of where to purchase water quality testing materials, a standardized procedure for water quality testing, and a scalable system of recording results can facilitate faster adoption of this program in other refugee camps. Similarly, the standardized and comprehensive survey mentioned previously may incorporate questions that are not relevant in all camps, as was the case with a question about sewer connections in al Azza, a fact that is tolerable given the considerable time saved from adapting surveys to each camp. It may also lead to surprising results, particularly about camp residents’ perspectives. For example, one household in al Azza responded that they were not connected to a sewerage system, despite information from outside sources that the entire camp is connected. These types of

responses can help Lajee and 1for3 determine whether education and dissemination of accurate information is a major need within a given camp.

The Lajee Center can also document and share the Environment Unit curriculum and the rooftop garden designs with partner organizations, but these projects may require context-specific alterations. For example, the Environment Unit curriculum should be tailored to student interests, and rooftop garden plans may need to be adapted based on space and infrastructure limitations. Similarly, rooftop gardens and compost piles are vulnerable to contamination from tear gas, so areas where tear gas is frequently deployed by Israel Defense Forces must protect crops and compost. Of course, using contaminated or scarce water resources on crops also has health risks and implications for equity, so the initial water analyses should be completed before greenhouses and compost piles are constructed. Depending on where soil for raised beds is obtained, the Lajee Center should consider testing the soil for contaminants before using it in the raised beds. There have been several incidents of dumping of hazardous and toxic waste in the West Bank in the past, and areas exposed to untreated wastewater may contain contaminants as well (UNCTAD 2015; Durán-Álvarez and Jiménez-Cisneros 2014).

Applying for new grants as the Pontifical Mission funding comes to end is an important step to seeking new funding, but obtaining these funds may be increasingly difficult in light of the larger refugee crisis in Europe that is receiving large amounts of humanitarian aid and international development funding (Al-Azraq 2016). Nonetheless, there has been some reassurance, as from the European Commission, that money will not be diverted from other countries in need around the world (Rankin 2016). In recent years, the humanitarian aid and development communities have been putting an increased emphasis on Islamic financing institutions to fill gaps in funding. “There has been tremendous growth of the Islamic finance industry... and non-traditional donor countries such as the [United Arab Emirates] and Saudi Arabia are making a greater contribution than some long-established aid donors. This means it’s a good time to bring Islamic finance toward the center of the global development agenda” (Igoe 2015). Identifying new donors would be a major benefit, as the staff of both the Lajee Center and 1for3 have limited time to spend on fundraising efforts.

The quantity and variety of funding resources available to students in Boston-area schools can provide support for individuals or teams of students to assist with data collection; however, facilitating the international and in-country travel, accommodations, and work of international groups, and in particular individuals, places an immense time burden on the

Lajee Center and 1for3. These students are also unlikely to speak fluent Arabic, and need translators, which increases both compensation and transportation costs. While there are many intangible benefits that accrue from international cooperation and partnerships, these need to be weighed carefully against the opportunity cost of the time spent preparing for trips, ensuring visitors' safety, and the like. Employing Palestinian university students is certainly the most cost-effective way to gather this information. Furthermore, there is always cause for concern that international students will be thwarted by institutional security concerns, perhaps with little notice. This year was the first year Tufts required WSSS practicum students to obtain ISOS clearance before traveling to the region, and denial of this permit would have delayed or derailed this project.

Finally, the fact that 1for3 is based in Boston means that low-cost student internships or collaborations are a possibility. This year, 1for3 is working with three interns. Graduate students or undergraduates with experience in survey research and design could help develop the surveys, with some limited assistance and guidance from professors with expertise. It is best to identify specific classes where outputs chosen by students can be of benefit to 1for3 (i.e., Geographic Information Systems, Survey Research, or a student-designed Directed Study). Those with prior grant-writing experience may also be able to assist with grant applications. Other tasks that require lower levels of expertise, such as compiling lesson plans into a curriculum and event-planning, could be done by undergraduates. Getting in touch with administrators and posting internship or volunteer opportunities on school portals may stimulate interest. Again, the benefit of having interns should be weighed against the necessity of providing them with some sort of structured environment and feedback, as well as complying with occasional paperwork and administrative requirements interns must fulfill. If interns have a poor experience, this will diminish the likelihood of additional students from that program or school becoming involved in the future.

Conclusions

The expansion of the Lajee Center's Environment Unit to other West Bank refugee camps should be carried out with an emphasis on prior research and community engagement that made the program in Aida camp such a success. Given the diversity among the locations where the Lajee Center hopes to expand, understanding the intricacies and needs of each community is imperative for continued success. Standardizing protocols for data collection and needs assessments will be important given budget and staff constraints. Similarly, improved surveys will result in data that is easier to analyze and more comprehensive in scope. Better baseline information and improved evaluation of these projects over time, including a more strategic gathering of community feedback, will allow the Lajee Center to determine which programs are easiest to standardize and expand. This information, when well-documented, can also serve as a crucial input for future grant applications. The Lajee Center can then decide which projects can be centralized, and which projects require significant autonomy on the part of each camp and partner organization. Finding cost-effective ways to collect the immense amount of data while maintaining its quality will be a significant difficulty in the expansion of the water quality testing program and the Environment Unit.

Recommendations

- Conduct comprehensive needs assessments before determining which of the Environment Unit's programs should be adapted for each new camp. Needs assessments should use mapping, surveys, water samples, and potentially focus groups to capture the most relevant information.
 - Ensure consistency and continuity by standardizing and recording protocols for surveying, collecting water samples, building rooftop gardens, and other practices that will be replicated.
 - Improve the survey to incorporate a broader range of questions related to health, water quality, and food security. Field test the survey to ensure questions obtain the desired results before initiating survey collection more widely.
 - Monitor programs and evaluate regularly to ensure they are meeting the needs of camp residents. Incorporate an anonymous and user-friendly feedback mechanism.
 - Use results of monitoring and evaluation efforts to articulate accomplishments of the Environment Unit to potential donors.
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- Find innovative, cost-effective ways to use both Palestinian and American university students to collect data and help in the scaling up process without overburdening Lajee and 1for3 staff with administrative tasks and oversight.
 - In working with partner organizations, clearly and formally articulate and document the roles of partner organizations and the Lajee Center, setting specific financial and administrative responsibilities, while remaining open to changes if partners express a need for more or less autonomy.
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Appendix I: Water quality testing materials budget

Water Sampling Material	Quantity	Price (USD)	Company/website
125 mL sample bottles, narrow mouthed, polyethylene	72 bottles/case	99.75	Nalgene, product: 2002-0004
Colored labeling tape	2 in x 14 yards	9.33	Fisher science, Fishersci.com
Permanent marker	1 pack	3.00	Sharpie
Deionized Water	--	--	Boiled RO water
Isopropyl alcohol 70%	1 bottle	2.75	
Waterproof notebook	1	8.00	Sokkia field notebooks, ascscientific.com
Cooler	3	90.00	Igloo.com
Incubator	1	974.00	Hach, product number 2569900
Battery eliminator - incubator accessory	1	291.00	Hach, product number 2580400
Bleach - to sterilize cultured bacteria - 1-2 mL, 15 minutes contact time	1 bottle	3.00	Chlorox
Refrigerator (mini fridge)	4.9 cubic feet	180.00	Sears
Gloves latex powder-free	100/box	51.00	fishersci.com
Goggles	5	35.00	fishersci.com
Lab coat	5	150.00	fishersci.com
Petri dishes with absorbent pad, one per sample	600/pack	200.00	millipore, catalog number PD20047S5

Membrane filters, sterile, white, grid-marked, 0.45 µm pore size	600/pack	255.00	hach, product number 2916800
m-FC Broth w/rosolic acid liquid ampoule 2mL	50/pack	67.00	millipore, catalog number MHA000P2F
hand pump	1	75.45	hach, product number 1428300
Membrane filtration units (filter base and funnel)	12/case	100.00	Nalgene MF75, 150 mL capacity
Filter forceps/ tweezers	1	4.00	millipore, catalog number XX6200006
95% ethanol	2 X 250 mL	42.61	fishersci.com, catalog number ES6710
Hand tally counter	1	180.00	miniscience.com
Distilled water	--	--	Boiled RO water
Total		2821	

Appendix II: Institutional Review Board documents and survey



OFFICE OF THE VICE PROVOST FOR RESEARCH

Social, Behavioral, and Educational Research
Institutional Review Board
FWA00002063

March 15 2016 Notice of Action

IRB Study # 1602018 | Status: ACTIVE

ATTENTION! : BEFORE CONDUCTING ANY RESEARCH, PLEASE READ THE ENTIRETY OF THIS NOTICE AS IT CONTAINS IMPORTANT INFORMATION ABOUT PROPER STUDY PROCEDURES.

Title: WSSS Palestine Practicum

PI: John Durant

Study Coordinator: Christine Van Fossen

Co-Investigator(s): Monique Ching, Rachel Gilbert, Jessica Norriss, Elisabeth Spratt

The PI is responsible for all information contained in both this notice of action and on the following **Investigator Responsibilities Sheet**.

Only copies of approved stamped consent forms and other study materials may be utilized when conducting your study.

This research protocol now meets the requirements set forth by the Office for Human Research Protections in 45 CFR 46 under Expedited Category 7

Reviewed 3/9/2016 Expires 3/8/2017

- Approved for 60 participants for the duration of the study.

Protocol Management:

- All translated study documents must be submitted for review, approval, and stamping prior to use.
- For all changes to the protocol, submit: *Request for Protocol Modification* form
- All Adverse Events and Unanticipated Problems must be reported to the Office of the IRB promptly (no later than 7 calendar days after first awareness of the problem) using the appropriate forms.
- Six weeks prior to the expiration of the protocol on 3/8/2017, investigators must submit either a *Request for Continuing Review* or a *Request for Study Closure*
- All forms can be found at: <http://www.tufts.edu/central/research/IRB/Forms.htm>

IRB Administrative Representative Initials: *cl.*

IN THE KNOW

BULLETIN OF THE TUFTS SBER IRB MEDFORD CAMPUS

UPDATES TO IRB FORMS

All IRB forms have been updated to expedite the approval process.

The revisions include the addition of information on the following:

- Applicability and receipt of local IRB approval for international research protocols
- Tufts University's Participant Payment Policy
- Tufts University's Human Record Retention Policy

The updated forms can be found on our website:

<http://www.tufts.edu/central/research/IRB/Forms.htm>.

*** AS OF NOVEMBER 5, 2012, ONLY REVISED FORMS WILL BE ACCEPTED ***

Avoid using previously saved templates of outdated forms. Please go to the forms webpage every time you submit. This will ensure that only the latest version of the form is being used. These forms are identified as version 11/2012.

All revisions to the forms are intended to ensure that researchers are well-informed of all applicable university and federal policies. If you have any questions regarding these policies, please contact the SBER IRB Office at 617-627-3417.

Feedback and suggestions are also always welcome. To do so, please email sber@tufts.edu.

On behalf of the SBER IRB Office, thank you.

Tufts University Office of the Vice Provost for Research
Social, Behavioral, and Educational Research Institutional Review Board (SBER IRB)
Program for the Protection of Human Participants in Research

Investigator Responsibilities

Research involving human participants involves a myriad of responsibilities.

General Responsibilities:

- To comply with the Code of Federal Regulations regarding the protection of human subjects <http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.htm>
- To protect the rights and welfare of all human subjects and to conduct all research according to the IRB approved protocol.
- To retain all data and signed consent documents for at least 3 years beyond the completion of the research.

Consent Responsibilities:

- To ensure that each potential participant understands the nature of the research.
- To ensure that the correct procedures are followed to gain *informed* consent from each person prior to participation.
- To provide each participant with a copy of the IRB approved consent document unless waived by the IRB.

Education Responsibilities:

- To ensure that all researchers, research assistants and faculty advisors have completed the required CITI training and that the certification is current. Certification is valid for a period of 5 years.

Procedural Responsibilities:

- When submitting to the SBER IRB, be sure to only use the most updated version of the required forms. They will always be posted on the website under 'forms'.
- To not initiate any changes to the protocol without IRB review and approval, unless it is necessary to eliminate an immediate hazard. Submit the *Request for Protocol Modification* form.
- To submit to the IRB for continuing review (*Request for Continuing Review* form) at least 6 weeks prior to the expiration date of the protocol if the research is going to continue past the expiration date.
- To promptly report any unanticipated problems to the IRB. Submit *Unanticipated Problem Report* form.
- To promptly report any adverse events to the IRB. Submit the *Adverse Event Report* form.
- To officially close the study once completed. Submit the *Request for Study Closure* form.

Please refer to the website for additional information:
<http://www.tufts.edu/central/research/IRB/main.htm>

Feel free to contact us at SBER@tufts.edu or 617-627-3417 for any assistance.

Revised January 2013

Tufts University Office of the Vice Provost for Research
Social, Behavioral, and Educational Research Institutional Review Board (SBER IRB)
Program for the Protection of Human Participants in Research

Faculty Advisor Responsibilities

All faculty advisors who oversee undergraduate and graduate student research have the following responsibilities:

- To complete the required CITI training.
 - To ensure that the principal investigator and additional research staff abide by the *Investigator Responsibilities*.
 - To meet with the principal investigator to monitor study progress and ensure that the procedures outlined in the IRB protocol are followed.
 - To be available to the principal investigator to supervise and address problems should they arise.
 - To arrange for an alternate faculty advisor to assume these duties when unavailable (vacation or sabbatical).
 - To oversee the prompt reporting of any adverse events or unanticipated problems to the IRB.
-

Verbal Consent Script

Background and Purpose: You are being asked to participate in a research project organized by a group of Tufts University students and professors in the Water: Systems, Science and Society (WSSS) program. Tufts is a research university located near Boston in the United States. The purpose of the project is to investigate potential water quality issues in al-Azza Camp and a possible connection between water quality and health problems. As a member of the community, you are in a position to provide insight into water quality at the camp. I would appreciate it if I could ask you some questions, in the form of a survey, about these issues. Also, if you are willing, I would like to collect a small water sample from your household water source to test for the presence of contaminants.

Procedures: If you agree to participate, one of our group members will ask you some questions directly or through a translator. Our survey should take about 30 minutes. One of my colleagues will take notes. Afterward, we will collect the sample of your water, if permitted.

Risk and Confidentiality: There are no physical risks arising from your participation in this project. We will not record your name, and have designed the questions to avoid obtaining information that can be used to identify you. Please be aware that, although your responses will be maintained in complete confidentiality, there is a chance that someone may discover that you participated in this study.

We believe that the risk of harm to you and your family by participation in this survey and water quality testing is minimal. However, you should consider whether you want to be associated with this study prior to providing your consent.

Voluntary Participation: Participation in this project is strictly voluntary - there are no consequences if you do not wish to be surveyed or to provide a sample of your water for testing. Furthermore, if you decide at any time during the survey that you no longer wish to participate, you may withdraw your consent without consequence and we will not incorporate any of your responses into our research.

Benefits: There are no direct benefits to you for participation in the project. However, your participation will help to determine whether or not there may be a link between health issues and water quality in al-Azza Camp and the testing of a water sample from your household source for contaminants may help us to determine what water quality issues currently exist in the camp. This information may assist future efforts to improve water quality in the camp, and may provide a framework for future projects conducted by other students and faculty from Tufts University.

Request for More Information: If you have any questions or concerns about the project or your participation in it, please do not hesitate to contact Study Coordinator Christine Van Fossen at christine.van_fossen@tufts.edu or, until March 25, 2016, via the Lajee Center. We will provide you with an information sheet with this contact information to keep after we leave.

Permissions: Now that I've explained the purpose of the survey, would you be willing to participate?

Yes No

Would you be willing to allow the research team to collect a sample of your water for testing?

Yes No

Would you consent to allowing us to anonymously provide general results about the survey and water quality testing results at a public meeting in your community? (Please note that we will not provide specific information about your individual survey or water quality testing results, only general results about the camp as a whole or a large section of the camp, in order to protect your privacy.)

Yes No

Signature: I confirm that the purpose of the research, the study procedures, the possible risks and discomforts as well as benefits have been explained to the participant. All questions have been answered. The participant has agreed to participate in the study.

Signature of Person Obtaining Consent

Tufts University
Medford, MA 02144
USA

Participant Information Sheet

2016 Water: Systems, Science and Society Palestine Practicum

Purpose of the study

The purpose of the study is to investigate potential water quality issues in al-Azza Camp a possible connection between water quality and health problems.

Contact information

If you have any questions or would like to receive a report of this study (or a summary of the findings) when it is completed, please contact us.

Study Coordinator: Christine Van Fossen
Email: christine.van_fossen@tufts.edu

Faculty Advisor: John Durant
Email: john.durant@tufts.edu
Telephone (in the USA): +1 617 5489

If you have questions or concerns to be directed to the research team while they are in Palestine from March 20-25, 2016, please contact the Lajee Center and your message will be forwarded.

Lajee Center
Telephone (in Palestine): +970 0789

If you have concerns about this study or your rights as a participant, you are encouraged to contact the relevant Tufts University Institutional Review Board (IRB).

IRB Administrator: Lara Sloboda
Telephone (in the USA): +1 617 3417

Public Health and Water Quality, Usage and Storage Survey

Section I Public Health

How many people live in this household?

How many are children under the age of 5?

a) Adults over the age of 65?

Has anyone in your family been sick in the last 15 days? Yes / No / I don't know

a) In the last 6 months? Yes / No / I don't know

b) Who (no names—categorize by age)?

c) What was the nature of the illness? Check all symptoms associated with illness (even if symptoms occur singly):

- Diarrhea
- Vomiting
- Fever
- Intestinal discomfort
- Coughing
- Runny nose
- Other: _____

4) How frequently does an illness occur like this in your household?

- Less than once a year
- 1-2 times a year
- More than twice a year
- Once a month

5) Are there types of illnesses that occur at specific times of year in the camp? Yes / No / I don't know

a) If so, what are they and when do they occur?

b) What caused the sickness described above?

Section 2 Water Usage and Storage

How do you store your water?

- Tank (Plastic / Metal) Quantity:
- Cistern Quantity:
- Dubba Quantity:
- Other: _____ Quantity:

7) Do you ever take measures to clean your water? Yes / No / I don't know

a) If so, what are they? Check all that apply:

- Boil
- Filter
- Refrigerate
- Other: _____

b) How did you learn about these measures?

8) If you don't take measures to clean your water, would you be willing to do so in the future?

a) Which interventions would you be more likely to use?

-
- Adding chlorine to water
 - Using a filtration system (ceramic filters?)
 - Using flocculant/disinfectant powders (PUR Purifier of Water)
 - Placing water bottles in the sun for 6 hours (solar disinfection)
 - Boiling water
- 9) Do you clean your water storage vessels? Yes / No / I don't know
- a) If so, how?
 - b) If not, why not?
- 10) Would you request tank cleaning services if they were available? Yes / No / I don't know
- a) If so, how much would you be willing to pay for these services?
- 11) How much water did your family use in the last week?
- a) Do you know your monthly water usage?
- 12) How does usage vary between the dry season and the wet season?
- 13) How often does your primary water supply run out in the wet season?
- a) In the dry season?
- 14) When water supplies are low, what are your priority uses? (Please rank.)
- Drinking water
 - Cooking/food preparation
 - Bathing/personal hygiene
 - Gardening
 - Livestock/animal care
 - Other: _____
- 15) Do you ever buy water? Yes / No / I don't know
- a) If so, how much does it cost?
 - b) Where do you get it?
 - Water truck
 - Water bottles or other water-based drinks
 - Other: _____
- 16) How long does it take to fill one tank when water is running from the public supply? (Please indicate tank size.)
- 17) Does the availability/distribution of water vary between certain areas of the camp? Yes / No / I don't know
- a) If yes, do you know why?

Section Water Quality

- 18) What do you think of the quality of water delivered (taste, smell, color) from your primary and secondary water supplies?
- Primary supply (Where you generally get your water)
- a) Taste
 - Very bad
 - Bad
 - Normal
 - Good
 - Very good
 - b) Smell

- Very bad
 - Bad
 - Normal
 - Good
 - Very good
- c) Color
- Very bad
 - Bad
 - Normal
 - Good
 - Very good

Secondary supply (Where you get water when your primary supply is not available)

- a) Taste
- Very bad
 - Bad
 - Normal
 - Good
 - Very good
- b) Smell
- Very bad
 - Bad
 - Normal
 - Good
 - Very good
- c) Color
- Very bad
 - Bad
 - Normal
 - Good
 - Very good

9) Have you had your water tested recently?

- a) If yes, when?
- b) How did you learn about the water quality testing service?
- c) If you didn't have your water tested, are you aware these services are available?
Yes / No

20) If your water was tested recently, did it contain coliform bacteria? Yes / No / I don't know

- a) If so, did you take any measures to treat your water if it was contaminated? Yes / No / I don't know
- b) What were those measures and how did you find out about them?
- c) If you didn't take any measures, why not?

21) Do you monitor the quality of the water you use in your home? Yes / No / I don't know

- a) If yes, who in your home is responsible for this task?

22) Is your household connected to a sewer? Yes / No / don't know

23) If a water quality issue were identified:

- a) Who would you go to with your complaint?

UNRWA

PWA

Mekorot

Other: _____

- b) Who would you expect to deal with it?
- UNRWA
 - PWA
 - Mekorot
 - Other: _____
- c) Does this organization generally deal with complaints effectively? Yes / No
- 24) How do you think the Lajee Center could encourage the implementation of clean water practices in households throughout the camp?
- 25) What do you think might be some solutions to the water issues in the camp?
- 26) Would you be willing to serve as a volunteer checking water quality in the camp? Yes / No / I don't know
- 27) Would you be willing to pay \$3/month for clean water? Yes / No / I don't know
- a) \$5/month? Yes / No / don't know
 - b) \$10/month? Yes / No / I don't know

Survey/Interview and Water Sample Collection Procedures

1. Interview Planning

Select the team – preparation and planning

Conducting the interview requires a trained interviewer and trained translator. A second person may serve as a note-taker but is not necessary. The interviewer, with the assistance of the translator, will: conduct informed consent, complete interview survey, write up the interview summary following the interview, request and, if permitted, collect water sample to test for the presence of contaminants.

Decide on the time and location

Interviews are expected to last approximately 30 minutes. The team will randomly select homes within the camp for in-person surveys and collection of water samples for testing. The time of day during which the surveys/water sample collection will be conducted will be varied so as to avoid selection bias. In the instance that no one is present at the randomly selected residence, the surveyor will approach the residence immediately adjacent. This process will continue until a residence with an eligible and consenting individual is found, and the survey will be completed at that location and, if possible, a water sample will be collected, thereby starting the random selection process over again. The location of the home will not be recorded in any way that could connect the survey to any specific home. An Arabic-speaking translator will be present at all times. Surveying and water sample collection should be conducted at the most comfortable setting possible for the individual (i.e., in the home, in front of the home, etc.).

Eligibility Criteria

- *Inclusion criteria:* Participants of interviews and/or water sample collection will be long-term residents of al-Azza Camp (defined as having lived in the camp for greater than 12 contiguous months), aged 18 years or more, and who provide informed consent to participate in the process.
- *Exclusion criteria:* Individuals will be excluded from participating in the interviews and/or water sample collection if they do not provide verbal consent to participate, are less than 18 years of age, or if the study team and/or other implementing partners determine that participation may cause harm to the participant.

2. Informed Consent

Consent scripts will be developed to provide information on project objectives and activities, risks and benefits associated with participation and study contact information. Before data collection begins, the appropriate consent script should be read aloud to each participant by the interviewer and communicated to the potential participant by the interviewer and/or trained translator. The potential participant should be asked if he/she has any questions or concerns about participation. They may be reminded that they can choose not to answer any questions they do not wish to answer, and that they can end their involvement in the interview or water sample collection at any time. Their decision to participate or decline participation in the interview/water quality testing will not influence services they receive from any affiliated programs in any way. If there are no further questions, the participant will be asked if he/she gives verbal consent to

participate in the survey and/or water quality testing. **No signature, name, or identifying information should be provided on the consent script.**

All participants will receive a unique participant identification number (participant ID) at enrollment when consent is provided. This number will be generated sequentially and agreed between team members conducting simultaneous interviews. These numbers will be used (with the date) on all study documents.

This study uses oral consent scripts—this method ensures the confidentiality of the participant because no participant is required to sign their name for consent but must provide verbal agreement. **It is important to note that although signed consent is waived, the consent process is still required and the interviewer/translator is responsible for documenting that consent was obtained.** Consent will be documented by entering the following information: participant ID, date, and whether informed consent was provided by the participant.

3. Conducting the interview/water sample collection

Roles and responsibilities of interviewers, sample collectors, and notetakers

- Bring all materials needed (e.g., surveys, notebooks, pens, interview guide, consent scripts, water sample collection materials).
- Keep all participants focused, engaged, attentive, and interested.
- Monitor time and use limited time effectively.
- Use prompts and probes to stimulate discussion.
- Be prepared to explain or restate questions—a list of key phrases or local/commonly used terms may be useful.
- Ensure confidentiality.
- Collect water sample efficiently.

Leading the discussion

Establish rapport: Often participants do not know what to expect from survey questions and interview discussion. To set the participants at ease, the interviewer should describe the purpose and format of the discussion at the beginning of the session. Participants should be told that the survey questions are standardized, and that discussion is informal. Participants are not required to provide personal experiences. Participants should be reminded that they are sharing their expertise and opinions, so there are no right or wrong answers

Protecting participants during interviews/discussions and water sample collection

It is important that project staff remember the communities in which participants reside are small, people often know each other, and unintentional disclosure of participation or experience can place a participant at social or physical risk. The interviewer/coordinator should develop a contingency plan to prevent unintentional disclosure of the individual's participation. The contingency plan should include: 1) a topic to which the interview should change to if someone else enters the room during the interview and 2) fake name(s) and/or titles(s) of the interviewer/translator. It is the responsibility of the project team to continuously assess the environment and stop project activities to avoid placing the participant and/or project team at risk.

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