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# Leveraging Humanitarian Technology to Assist Refugees

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## Table of Contents

Introduction.....	3
Literature Review and History of the Issue .....	4
Research Question.....	6
Summary of Findings.....	6
Case Study: Lebanon .....	8
Summary of Challenges Identified .....	9
Case Study: Kakuma Refugee Camp, Kenya.....	11
Summary of Challenges Identified .....	12
Technological Options: Drones .....	13
Monitoring of Refugee Flows Using Drone Technology .....	13
Longitudinal Monitoring of Refugee Camps and Changes in Their Immediate Environments.....	13
Challenges Addressed by Drones.....	14
Technological Options: Smartphones and Online Platforms .....	16
Smart Phone Technology for Logistics and Operational Efficiency.....	16
Challenges Addressed by Smartphones and Online Platforms .....	16
Technological Options: Health Technology .....	20
Challenges Addressed by Health Technology.....	21
Summary of Recommendations .....	24
Conclusion .....	26
Works Cited .....	27

## Introduction

By the end of 2015, conflict, persecution, generalized violence, or human rights violations forcibly displaced 65.3 million individuals around the world.<sup>1</sup> Of those 65.3 million, 21.3 million persons were refugees. More than half (53%) of all refugees worldwide came from just three countries: The Syrian Arab Republic (4.9 million), Afghanistan (2.7 million), and Somalia (1.1 million). Turkey, Pakistan, Lebanon, Iran, Ethiopia, and Jordan are the top hosting countries due to nearby conflicts in Syria, Iraq, Somalia, and other areas. The United Nations High Commissioner for Refugees, (UNHCR), collaborates with the host governments to administer camps that provide shelter and basic services to refugees, and to facilitate urban integration and services.

This project provides recommendations to UNHCR on how emerging technologies such as drones, smartphones, online platforms, and health technologies can be leveraged to alleviate the various challenges refugees face. Notably, smartphones and online platforms are already in prevalent use among refugee communities. UNHCR can take advantage of growing familiarity with technology to complement their efforts. As a whole, these new technologies offer promising opportunities to support and improve humanitarian access.

Since UNHCR is our policy client, our proposed solutions are limited to its scope of work. The agency's legal mandate is based on the Statute of the Office of the United Nations High Commissioner for Refugees, adopted by the General Assembly in 1950, the 1951 Refugee Convention, and the 1967 Protocol Relating to the Status of Refugees.<sup>2</sup> According to the [UNHCR](#), its "primary purpose . . . is to safeguard the rights and well-being of people who have been forced to flee."<sup>3</sup> This encompasses providing shelter, security, health services, and education to refugees as well as returnees, stateless persons, internally displaced people (IDPs), and asylum-seekers.

Although UNHCR is well-known for its administration of refugee camps, its activities also include advocacy, distributing monetary aid, protecting migrants in transit, developing technological solutions, facilitating asylum applications, and maintaining statistics. The agency currently operates in 126 countries and draws from a budget of \$7 billion dollars. Since UNHCR's scope of work provides us with numerous opportunities to make recommendations, we utilize two case studies, Lebanon and Kenya, to identify a range of issues refugees face. We focus on those needs that are best suited to humanitarian technological innovation. Following the case studies, we outline technological options organized in three major areas: **(1) access to information via drones, (2) smartphones and online platforms for organizational efficiency and communication, and (3) health technology.**

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<sup>1</sup> "Figures at a Glance", *UNHCR*, December 2016, <http://www.unhcr.org/en-us/figures-at-a-glance.html>.

<sup>2</sup> "History of UNHCR," *UNHCR*, accessed 27 February 2017, <http://www.unhcr.org/en-us/history-of-unhcr.html>.

<sup>3</sup> "UNHCR Mission Statement," *UNHCR*, accessed 27 February 2017, <http://unhcr.org/ua/en/contact-us/basic-facts/27-basicfact>.

## Literature Review and History of the Issue

The disciplines within cultural studies and migration focus on transnational migrants' use of technologies, such as the internet<sup>4</sup> and mobile phones.<sup>5</sup> However, the literature on the specific importance of technology to refugees who are similarly affected by issues of migration and marginalization is limited. Unlike refugees who are uncertain of the whereabouts of their loved ones because of being displaced, migrants generally have cheap access to information and communication technologies (ICTs) to maintain connection with their families abroad.<sup>6</sup> Scholars have also focused on immigrants when studying the use of social technologies, such as mobile phones and social media, in transforming family networks into transnational ones.<sup>7</sup>

The general role of technologies in promoting feelings of trust and community online have been explored in various studies. Huysman's (2007) studied the use of ICTs to empower culturally diverse communities<sup>8</sup>; Hendersen and Gilding's (2004) studied the stages of trust in creating online friendships<sup>9</sup>; Hauge et al (2009) studied low-income and disadvantaged households' telecommunications choices in the United States, and Metacalf et al (2008) described ways to utilize technology to connect marginalized and disadvantaged young people.<sup>10</sup> These studies, which focus on the use of technology to facilitate individual and community wellbeing, have not particularly been focused on refugees.

Overall, the study of technologies related to communities and communication practices has concentrated on groups other than refugees. Instead, literature on refugees is generally in the areas of provision of basic health and education services to refugees<sup>11</sup> along with treatment of the psychological effects of family displacement and separation.<sup>12</sup>

Moreover, the current literature on refugees and their use of smartphones mainly focuses on case studies that illuminate both the advantages and disadvantages of various types of technology. For example, case studies are often used to discuss the advantages and disadvantages of refugee use of smartphones. Gillespie et al from the Open University produced an extensive research report titled "Mapping Refugee Media Journeys: Smartphones and Social Media Networks" which draws from

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<sup>4</sup> Victoria Bernal, "Diaspora, cyberspace and political imagination: the Eritrean diaspora online," *Global Networks*, 6, no. 2 (2006): 161-79.

<sup>5</sup> Heather A. Horst, "The cell phone: An anthropology of communication," *Social Anthropology*, vol. 18, no. 2 (2006).

<sup>6</sup> Pedro J. Oiarzabal and Ulf-Dietrich Reips, "Migration and Diaspora in the Age of Information and Communication Technologies." *Journal of Ethnic and Migration Studies* 39, no. 9 (2012): 1333-338.

<sup>7</sup> Gonzalo Bacigalupe and Maria Camara, "Transnational Families and Social Technologies: Reassessing Immigration Psychology." *Journal of Ethnic and Migration Studies* 38, no. 9 (2012): 1425-438.

<sup>8</sup> Huysman, Marleen, "The role of information technology in building and sustaining the relational base of communities," *The Information Society*, 21:81-89 (2007).

<sup>9</sup> Henderson, Samantha, "I've never clicked this much with anyone in my life: trust and hyperpersonal communication in online friendships," *New Media & Society*, vol 6, no. 4 (2004): 487-506.

<sup>10</sup> Metcalf, A; Blanchard, M; McCarthy, T; Burns, J. 2008. 'Bridging the Digital Divide: Utilizing technology to promote social connectedness and civic engagement amongst marginalized young people'. *3C Media Journal of Community, Citizen's and Third Sector Media and Communication*.

<sup>11</sup> Mares, S; Jureidini, J. 2003. 'Children and families referred from a remote Immigration Detention Centre'.

<sup>12</sup> Nickerson, A. 2008. 'Mental health and postmigration adjustment in the Mandaean refugees in Sydney, Australia: A longitudinal study'; Johnson, P; Stoll, K. 2008. 'Remittance patterns of southern Sudanese refugee men: Enacting the global breadwinner role'. *Family Relations*; Luster, T; Qin, D; Bates, L; Johnson, D; Rana, M. 2009. 'The lost boys of Sudan: Ambiguous loss, search for family, and reestablishing relationships with family members'. *Family Relations*.

two case studies—Crisis Info Hub and Welcome 2 Europe—to highlight best practices and generate key findings and recommendations.<sup>13</sup> Additionally, they conducted a comprehensive two-part analysis: the first comprising a series of interviews with refugees to understand their usage of phones to access information and needs unfulfilled by such technology, and second, social media research focusing on Facebook groups and Twitter to supplement the qualitative data obtained from the former. Ultimately, the researchers concluded that while refugees utilized Facebook groups to connect with family and friends and to access news information, fear of surveillance has compelled them to communicate via channels such as Telegram and Whatsapp that provide secure and encrypted messaging options, making refugees (especially those in transit) difficult to monitor. Thus, studies of refugee use of technology include those whose access to and literacies in those technologies is unproblematic and does not affect communication practices.

Due to this lack of focus on the use of technologies for refugees, our policy project recommends a comprehensive approach to integrating emerging technologies into assistance for unique refugee situations. The goal of this project is to provide UNHCR with a set of suggested technology tools along with examples of their applications to enhance the provision of aid to refugees.

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<sup>13</sup> Gillespie et al. “Mapping refugee media journeys: smartphones and social media networks,” *The Open University/France Medias Monde*, (2016), [http://www.open.ac.uk/ccig/sites/www.open.ac.uk/ccig/files/Mapping%20Refugee%20Media%20Journeys%2016%20May%20FIN%20MG\\_0.pdf](http://www.open.ac.uk/ccig/sites/www.open.ac.uk/ccig/files/Mapping%20Refugee%20Media%20Journeys%2016%20May%20FIN%20MG_0.pdf)

## Research Question

UNHCR’s mandate and the scope of the refugee crisis present myriad avenues for humanitarian technological aid. This policy project focuses on opportunities to employ drones, smartphones, online platforms, and health technology to assist in resolving problems faced by UNHCR in both refugee camps and urban integration. To identify these problems, we analyze two case studies, Lebanon and Kenya, that represent a range of refugee experiences. Following the case studies, we discuss each category of technology and provide recommendations to address the problems identified with humanitarian technology solutions. The report will serve as a guide to how technology might address a variety of issues faced by UNHCR. We conclude with a summary of our recommendations and a discussion of best practices for adopting them.

## Summary of Findings

Tech Option	Problem	Recommendation
<b>Drones</b>	UNHCR and other aid providers face initial challenges of developing camps into sustainable living environments.	Use drone technology to map camps as living environments.
	Refugee flows are difficult to track.	Employ drone technology to map and monitor refugee flows.
	Environmental concerns complicate refugee camp management.	Depending on local environmental concerns (e.g. desertification, water contamination, or others), choose appropriate drone technology to monitor the environs visually.
<b>Smartphones and Online Platforms</b>	Refugees struggle to receive adequate education.	Employ smartphone apps and online platforms to aid teachers and students in improving access to quality education.
	There are often tensions between refugees and the citizens of host countries, which sometimes result in violence.	Leverage social media as a platform for communication between refugee and host country communities.
	Physical camp security is a key worry for refugees who live in camps.	Develop camp-specific online maps compatible with existing web apps to enhance refugees’ camp experience by consolidating information about potentially dangerous areas.

	Refugees often face limited employment opportunities, both inside and outside of camps.	Adapt technological platforms for entrepreneurship and job-seeking to the refugee context.
	The provision of aid is sometimes hindered by corruption and a lack of transparency and accountability.	Utilize online platforms, social media, and websites to monitor the integrity of social services and make financial information more transparent.
	Upon arrival in a host country, refugees need access to reliable information about temporary shelters and longer-term accommodation.	Leverage Google’s expertise in designing Crisis Info Hub to create a comprehensive online platform for consolidation of critical information pertaining to camps, temporary shelters, and other forms of accommodation that spans the Middle East and African regions.
	Language barriers are one of the main obstacles refugees face as they attempt to settle in a new region.	Publicize options for translation technology and improve refugee access.
<b>Health Technology</b>	Refugees require reliable access to food and proper nutrition but often lack information as to how to obtain it.	Reassess guidelines for listing the provision of food assistance on current online platforms to ensure quality control.
	The refugee experience can contribute to the development of mental illness and exacerbate existing issues.	Utilize telemedicine, teletherapy, and social media networks to assist the treatment and prevention of mental illnesses.
	Refugee women and girls face specific health issues, including gender-based violence and gynecological problems.	Develop anonymous and remote reporting systems for gender-based violence and feedback on health services. Employ telemedicine for women’s health issues. Create social media campaigns for sexual education and gender-based violence awareness.
	Refugee camps are prone to the spread of communicable diseases.	Promote online diagnostic platforms among healthcare providers to standardize pharmacy services, prescription standards, and treatment regimes.

## Case Study: Lebanon

According to the European Commission for Humanitarian Aid and Civil Protection, Lebanon has the highest per capita refugee population in the world.<sup>14</sup> With over 1.5 million refugees and an overall population of around 4.5 million people, more than one in four people in Lebanon is a refugee.<sup>15</sup> This poses serious logistical problems for Lebanon, whose government already faces issues of deep religious division and dysfunction. For example, until October of last year the country had gone two and half years without a president due to party disagreements in the religiously-based political system.<sup>16</sup> Compounded with a struggling economy and high unemployment rate, the refugee situation in Lebanon is dire.

Lebanon has experienced multiple waves of refugees entering the country over the course of the last century. The first major wave occurred during World War I when thousands of Armenians fled genocide in the former Ottoman Empire. Most of these refugees went to either Syria or Lebanon, where they eventually became integrated into society. Armenians in Lebanon received citizenship in the 1920s and have formal representation in parliament.<sup>17</sup> The areas that began as informal settlements, such as Borj Hammoud, are now thriving neighborhoods in Beirut.

Unlike the Armenians, the Palestinian refugees who entered Lebanon following the 1948 and 1967 wars have not been as fortunate. According to the United Nations Relief and Works Agency, (UNRWA), there are around 500,000 registered Palestinian refugees in Lebanon today.<sup>18</sup> Over half of this population lives in the twelve recognized refugee camps scattered across the country, which all suffer from lack of infrastructure and basic services such as proper housing, healthcare, and education. Palestinian refugees in Lebanon are not formal citizens and thus do not have voting rights or representation in parliament. Additionally, they are limited in the types of employment they can obtain and cannot own property outside of the camps. Palestinians living in these camps have been particularly vulnerable to the instability and violence that has occurred in Lebanon, most notably the massacres in the Sabra and Shatila refugee camps in which over 800 Palestinians were murdered by Christian militiamen.<sup>19</sup> As conflicts continue to arise within and surrounding Lebanon, conditions for Palestinian refugees continue to be inadequate.

The influx of Syrian refugees over the past several years marks the third major wave of refugees to enter Lebanon in the last century. As of March 2017, there are over a million registered Syrian refugees in the country, with estimates putting the overall Syrian refugee population at over 1.5 million. The Lebanese government has adopted a ‘no camp’ policy, making the construction of new

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<sup>14</sup> “Lebanon: Syria Crisis,” *European Commission for Humanitarian Aid and Civil Protection*, March 2017, [https://ec.europa.eu/echo/files/aid/countries/factsheets/lebanon\\_syrian\\_crisis\\_en.pdf](https://ec.europa.eu/echo/files/aid/countries/factsheets/lebanon_syrian_crisis_en.pdf).

<sup>15</sup> Tina Rosenberg, “For Refugees, Cash Instead of Camps,” *The New York Times*, 13 September 2016, <https://www.nytimes.com/2016/09/13/opinion/for-refugees-in-lebanon-cash-instead-of-camps.html>.

<sup>16</sup> Kareem Chehayeb, “What will a new president mean for Lebanon?” *Al Jazeera*, 30 October 2016, <http://www.aljazeera.com/news/2016/10/president-lebanon-161030082900603.html>.

<sup>17</sup> Jenny Gustafsson, “To Beirut with hope: how the city shaped by refugees makes room for new arrivals,” *The Guardian*, 4 February 2016, <https://www.theguardian.com/cities/2016/feb/04/beirut-lebanon-city-shaped-by-refugees-syria-migration-new-arrivals>.

<sup>18</sup> “Where We Work,” *United Nations Relief and Works Agency for Palestine Refugees in the Near East*, 1 July 2014, <https://www.unrwa.org/where-we-work/lebanon>.

<sup>19</sup> “Flashback: Sabra and Shatila massacres,” *BBC News*, 24 January 2002, [http://news.bbc.co.uk/2/hi/middle\\_east/1779713.stm](http://news.bbc.co.uk/2/hi/middle_east/1779713.stm).



refugee camps illegal. Thus, Syrian refugees live in informal settlements across the country, a majority of which are in urban areas. The Lebanese government has also instituted other policies in order to regulate the entrance of Syrian refugees, such as tightening border control and requiring all refugees to purchase legal residence permits. Many of these people cannot afford the permits. As a result, a significant number of refugees have become undocumented, further limiting their access to work and movement and increasing their risk of exploitation.<sup>20</sup> With the war in Syria pressing on, Syrian refugees' needs will require more comprehensive and long-term solutions.

Multiple actors are involved in the humanitarian response to the refugee situation in Lebanon. These include the Lebanese government, the United Nations and related agencies, multinational organization such as the European Union, foreign governments, and other non-governmental organizations. These actors work together to fund aid programs that provide housing, clean food and water, education, healthcare, and other services for refugee populations. For Palestinians, UNRWA has lead the response in creating schools, vocational training centers, health centers, and other services in the recognized camps. While UNRWA has set up and maintains services in these camps, administering and policing is the responsibility of the Lebanese government. Due to the new 'no camp' policy, providing services for Syrian refugees has been more challenging as the refugee population is more scattered across the country. Additionally, more refugees are beginning to move to cities and are not concentrated in easily identifiable places. Traditionally, aid has been provided in the form of material goods, such as sacks of grain, stacks of blankets, and building materials. However, the Lebanese government and other organizations, such as the International Rescue Committee, are beginning to implement programs that give cash to refugees instead of hard goods.<sup>21</sup> Provision of hard cash has been implemented, but programs are increasingly switching to electronic payments to decrease the risk of mismanagement and corruption.

Technology has emerged as an increasingly effective tool in providing services for refugee populations across the world, including Lebanon. Smartphones and mobile apps have been used by refugees to navigate their way in the country, connect with communities to find shelter, and locate necessary services. As electronic payments are becoming more popular among aid programs, mobile banking has become an increasingly important tool in receiving and managing money as well. Additionally, research has been conducted on how mobile technology can be used in other areas. The American University of Beirut conducted a study on the use of digital technology and antenatal care among Syrian refugees in Lebanon. Results show a high use of mobile technology, such as WhatsApp, among female Syrian refugees and a desire to use this technology to increase access to antenatal care.<sup>22</sup> The women surveyed in the study supported the idea of using mobile technology to streamline creating appointments, communicate with doctors, and provide health information. These examples show that while technology is not an all-encompassing solution, it can be an extremely valuable tool in providing for the needs of refugee populations in Lebanon.

## Summary of Challenges Identified

### 1. Refugee flows are difficult to track.

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<sup>20</sup> Rami Ruhayem, "Syrian refugee living in fear as Lebanon tightens its laws," *BBC News*, 12 September 2016, <http://www.bbc.com/news/world-middle-east-37260994>.

<sup>21</sup> Tina Rosenberg, "For Refugees, Cash Instead of Camps," *The New York Times*, 13 September 2016, <https://www.nytimes.com/2016/09/13/opinion/for-refugees-in-lebanon-cash-instead-of-camps.html>.

<sup>22</sup> Talhouk et al, "Syrian Refugees and Digital Health in Lebanon: Opportunities for Improving Antenatal Health," *CHI* 2016, <http://dx.doi.org/10.1145/2858036.2858331>.

2. There are often tensions between refugees and the citizens of host countries, which sometimes result in violence.
3. Refugees often face limited employment opportunities, both inside and outside of camps.
4. The provision of aid is sometimes hindered by corruption and a lack of transparency and accountability.
5. Upon arrival in a host country, refugees need access to reliable information about temporary shelters and longer-term accommodation.
6. Language barriers are one of the main obstacles refugees face as they attempt to settle in a new region.
7. The refugee experience can contribute to the development of mental illness and exacerbate existing issues.
8. Refugee women and girls face specific health issues, including gender-based violence and gynecological problems.

## Case Study: Kakuma Refugee Camp, Kenya

The Kakuma refugee camp was established in 1991 to serve Sudanese refugees, the “Lost Boys of Sudan.” The Lost Boys of Sudan describes the groups of over 20,000 boys of the Nuer and Dinka ethnic groups who were displaced and/or orphaned during the Second Sudanese Civil War. During the same year, large groups of Ethiopian refugees fled their country after the fall of the Ethiopian government, which resulted in a significant inflow of refugees from Kenya’s northern neighbor. Somalia had also experienced high insecurity and civil strife, causing people to flee. Since it was established, the camp has expanded to serve refugees from the Democratic Republic of Congo, Eritrea, Uganda, and Rwanda. The camp population has risen rapidly from an estimated 165,168 in 2017,<sup>23</sup> with most families spending an average of ten years as camp residents and more than half of the camp are children.<sup>24</sup>

Kenya’s non- integration policy severely restricts movement of Kakuma refugees and their integration with the local community.<sup>25</sup> In addition to being located in one of the poorest and most remote region of Kenya, the historical tension between the refugees and their host local Kenyan community – predominantly of the Turkana ethno-cultural community – that has resulted in violence only exacerbates the challenges faced by Kakuma residents. In response, the UNHCR and implementing partners have allocated funds to support the host community and promote peaceful coexistence between the Kenyan locals and the refugees. Although refugees come to the camp seeking safety, Kakuma is not without its own security risks. The proliferation of armed robberies in the region and the proximity to Sudan, Uganda and Ethiopia threaten camp security.

In addition, the camp is located in a semi-arid desert environment with environmental issues such as extreme high temperatures, dust storms, cholera, and outbreaks of malaria.<sup>26</sup> The non-integration policy and general atmosphere, comprised of regular conflicts between refugees and the local Turkana people, prevents refugees from keeping animals. This further complicates the provision of adequate nutrition and makes agriculture very challenging.

The Kenyan government’s encampment policies also prevents refugees in this 26-year old camp from engaging with the rest of the world. This has negatively impacted the quality of education as resources to students and teacher development are limited.<sup>27</sup> The number of children is constantly on the rise, class sizes have grown rapidly, and facilities struggle to keep pace. As a result, high quality and enriching lessons are difficult to provide for students.

In addition to educational limitations, tensions with local community and government-induced restrictions on employment opportunities, refugees have difficulty supporting themselves with income-generating experiences. Although some work with NGOs, that represents only a fraction of the population. As Arafat Jamal concludes from his evaluation of Kakuma camp, “Anyone confined

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<sup>23</sup> UNHCR, “Population statistics by country of origin, sex and age group.” UNHCR Kakuma, accessed 14 March 2017, [http://reliefweb.int/sites/reliefweb.int/files/resources/KakumaCampPopulation\\_Statistics20170305.pdf](http://reliefweb.int/sites/reliefweb.int/files/resources/KakumaCampPopulation_Statistics20170305.pdf)

<sup>24</sup> <http://assets.wusc.ca/Website/Resources/StudentRefugeeProgram/kakumacamp.pdf>

<sup>25</sup> Jaji, R. “Social Technology and Refugee Encampment in Kenya.” *Journal of Refugee Studies* 25, no. 2 (2011): 221-38.

<sup>26</sup> Ibid.

<sup>27</sup> UNHCR, “Skype in the classroom.” UNHCR Innovation, accessed 16 March 2017, [http://www.unhcr.org/innovation/labs\\_post/skype-in-the-classroom/](http://www.unhcr.org/innovation/labs_post/skype-in-the-classroom/)

to a place like Kakuma is rendered automatically dependent on some form of hand-out.”<sup>28</sup>

## Summary of Challenges Identified

1. UNHCR and other aid providers face initial challenges of developing camps into sustainable living environments.
2. Environmental concerns complicate refugee camp management.
3. Refugees struggle to receive inadequate education.
4. There are often tensions between refugees and the citizens of host countries, which sometimes result in violence.
5. Physical camp security is a key worry for refugees who live in camps.
6. Refugees often face limited employment opportunities, both inside and outside of camps.
7. The provision of aid is sometimes hindered by corruption and a lack of transparency and accountability.
8. Language barriers are one of the main obstacles refugees face as they attempt to settle in a new region.
9. Refugees require reliable access to food and proper nutrition but often lack information as to how to obtain it.
10. The refugee experience can contribute to the development of mental illness and exacerbate existing issues.
11. Refugee women and girls face specific health issues, including gender-based violence and gynecological problems.
12. Refugee camps are prone to the spread of communicable diseases.

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<sup>28</sup>Jamal, Arafat. “Minimum standards and essential needs in a protracted refugee situation: a review of the UNHCR programme in Kakuma, Kenya,” <http://www.unhcr.org/3ae6bd4c0.pdf> .

## Technological Options: Drones

To secure and sustain humanitarian access, it is critical to obtain current and accurate information for both humanitarians and those in need. Organizations with the most accurate and current information related to humanitarian assistance will be better able to organize a timely and relevant response. Drone technologies have the potential to provide a high volume of information to support practitioners.

### *Monitoring of Refugee Flows Using Drone Technology*

While drones typically evoke images of new cutting-edge military strategy, their applications are broad. Whereas some businesses (for example Amazon) are developing drones for package delivery or marketing, others are applying them to petroleum detection and homeland security. Herein we review the overarching literature on applying drone technology to refugee-based contexts.

Given their adaptability, drones present an area of opportunity for the UNHCR. One possibility is tracking refugee populations before they arrive in camps. Often local authorities struggle to predict and ultimately assemble required logistical resources for refugee settlements because they have little information beforehand. Tracking refugee groups with drones in the air might provide authorities with the information they need to make better logistical decisions. This might include rescue services for refugees at sea, especially on the Mediterranean Sea.<sup>29</sup>

### *Longitudinal Monitoring of Refugee Camps and Changes in Their Immediate Environments*

Other examples of drone applications might include monitoring road and drainage construction within camps, assessing environmental impact, and monitoring physical changes in refugee settlements over time. These applications span from initial planning for a refugee camp to transitioning of said camp from temporary to sustainable living environments.

Accordingly, an important application of drones concerns camp conception. Some of drone technology's data outputs in this domain include topographical analysis with contour lines and slope/elevation analysis. Provided these are sufficiently high-resolution data, camp designers can produce the following: a map with general services and facilities, drainage planning, WASH (water/sanitation/hygiene) and irrigation systems, tracking of physical changes to campsites over time, appropriate road infrastructure, and improved scientific rigor of household surveys. Potential obstacles include legal barriers (obtaining a host country's permission to fly drones in their airspace is often difficult) and ensuring high image resolution. In 2016, a collaborative effort between CartONG and Swiss Foundation for Demining (FSD) trialed this technology over a 1.8km<sup>2</sup> area with an eBee Sensefly drone equipped with an RGB camera. The total time needed was seventy minutes (thirty for flying, forty to convert data into orthomosaic and contour lines), and the cost was \$20,000 (deemed more financially viable than the alternative – satellite imagery, which costs \$500 per image).<sup>30</sup>

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<sup>29</sup> "Using Drones in Refugee Search and Rescue Efforts." *Al Jazeera*, 19 March 2017, <http://www.aljazeera.com/indepth/features/2016/04/drones-refugee-search-rescue-efforts-160428093459978.html>; "Autonomous Drones for Assisting Rescue Services within the Context of Natural Disasters." *General Assembly and Scientific Symposium (URSI GASS) 2014 XXXIth URSI*, 4 March 2017.

<sup>30</sup> "How Drones Can Help Improve Refugee Camps." *FSD*, 19 March 2017, <http://drones.fsd.ch/en/testing-mapping->

Other case studies point to similar applications. These include projects in Haiti (where UAV imagery provided figures on seven camps in Port-au-Prince for persons displaced by the 2010 earthquake) and Ecuador (where drones provided sufficient information to construct maps and assess building damage in Northwest Ecuador following a magnitude-7.8 earthquake in 2016).<sup>31</sup>

### Challenges Addressed by Drones

1. UNHCR and other aid providers face initial challenges of developing camps into sustainable living environments.
2. Refugee flows are difficult to track.
3. Environmental concerns complicate refugee camp management.

### **1. UNHCR and other aid providers face initial challenges of developing camps into sustainable living environments.**

Drones may help transition camps sites from temporary crisis response to sustainable living environments. A relevant case study has taken place in Lima, Peru, where residents collaborate with the Barlett Center for Advanced Spatial Analysis and Swiss NGO Drone Adventures to produce 3D maps. These maps – produced with drones and 3D printers – help residents identify areas where fast urbanization and land trafficking lead to eviction threats and resource/land bottlenecks.<sup>32</sup> This approach puts emphasis on participation – making residents agents of their own community building. While not yet explored in refugee-based contexts, a similar approach may help organizations like the UNHCR improve sustainability and living conditions in refugee camps.

### **Recommendation: Use drone technology to map camps as living environments.**

### **2. Refugee flows are difficult to track.**

Some countries have developed useful models for tracking refugee flows – namely, Niger, Burkina Faso, and Uganda. The three have used drones to “map huge populations of displaced people, assess their needs and figure out how best to get assistance.”<sup>33</sup> For its part, Niger has seen an uptick of refugees and internally displaced people (IDPs) following Boko Haram-linked instability in the region. Faced with 250,000 refugees and IDPs, many of whom seeking housing, Niger turned to an airplane-shaped drone – the T-800 M – to capture video of a Belgium-sized area and take bird’s eye images of two camps and their environs – Sayam Forage and Kabelawa. Burkina Faso, similarly, has employed a four-propeller drone to film shelters, a primary school, market, health center, and roads leading to and from Goudobo – a camp meant to house some of approximately 32,000 Malian camp mapping can help reshape our ability to respond to short-term and long-term needs. For instance, we could track the evolution of the locations of the shelters and the movements within the camps, but also document the evolution of the environmental context and the available natural

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drones-as-a-planning-tool-for-refugee-camp-sites-with-unhcr/.

<sup>31</sup> “Case Study No. 14: Using Drones to Create Maps and Assess Building Damage in Ecuador.” *FSD*, 17 March 2017, <http://drones.fsd.ch/en/case-study-no-14-using-drones-to-create-maps-and-assess-building-damage-in-ecuador/>; “Case Study No. 8: High Resolution UAV Imagery for Camp Management in Haiti.” *FSD*, 17 March 2017, <http://drones.fsd.ch/en/case-study-no-8-high-resolution-uav-imagery-for-camp-management-in-haiti/>.

<sup>32</sup> “Promoting Participatory Community Building in Refugee Camps with Mapping Technology.” *Proceedings of the Seventh International Conference on Information and Communication Technologies and Development*, 19 March 2017; “ReMap Lima.” *ReMap Lima*, 19 March 2017, <http://remaplima.blogspot.co.uk/>.

<sup>33</sup> “UNHCR Uses Drones to Help Displaced Populations in Africa.” *UNHCR*, 5 March 2017, <http://www.unhcr.org/afr/news/latest/2016/11/582dc6d24/unhcr-uses-drones-help-displaced-populations-africa.html>

resources in and around the camps. This would also help better prevent and mitigate the risks of natural disasters.”<sup>34</sup>

**Recommendation: Employ drone technology to map and monitor refugee flows.**

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### **3. Environmental concerns complicate refugee camp management.**

Many refugee camps face significant environmental challenges in their immediate environs, ranging from dust storms to seasonal outbreaks of malaria, deforestation to water contamination. Rapid population growth in some refugee camps, increased settlement construction, and human activities like agriculture compound these challenges. For example, intense competition among locals at the Kakuma refugee camp for cattle, climate change, and gradual deforestation have contributed to long-term desertification in the region. Equipped with bird’s-eye camera technology and other mapping instruments, drones constitute an important tool to monitor these environmental changes. For these applications, private firms have applied drones in diverse contexts - erosion monitoring, river mapping, flood risk assessment, biomass estimation, vegetation health analysis, and ecosystem management.<sup>35</sup> Another important application monitoring water sources near refugee camps. The literature suggests tracking surface water and reservoir levels, turbidity, and chlorophyll-a (indicative of algal blooms) of water sources is not only possible, but more affordable than satellite-based alternatives.<sup>36</sup>

**Recommendation: Depending on local environmental concerns (e.g. desertification, water contamination, or others), choose appropriate drone technology to monitor the environs visually.**

Our recommendations suggest drones have potential to alleviate refugee suffering, from increasing sustainability of refugee camps to tracking environmental changes in their environs. Nevertheless, use of drones carries stigma in certain contexts and deserves cautious consideration. Moreover, many countries lack the legal framework to regulate drones, so the UNHCR should beware administrative red tape. We recommend the UNHCR clear its potential use of drones with host countries to ensure all actors are on the same page.

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<sup>34</sup> Ibid.

<sup>35</sup> “Drones for Environmental Protection and Management.” *senseFly*, 5 April 2017, <https://www.sensefly.com/applications/environmental-protection.html>

<sup>36</sup> “Field Test: Can We Use Drones to Monitor Water Quality?” *The Nature Conservancy*, 7 April 2017, <http://blog.nature.org/science/2015/11/05/drones-in-the-field/>

## Technological Options: Smartphones and Online Platforms

Smartphones and social media already play an incredibly important role in the refugee experience. With the proliferation of smartphones and associated technologies (e.g. apps) over the past few years, they have become incredibly effective tools for those fleeing war-torn countries. As stated by Bassam Sebti of the World Bank, the current refugee crisis is the “first of its kind in a fully digital age.”<sup>37</sup> Not only are smartphones being used for practical purposes, such as navigation, but they also allow refugees to tell their stories to the world.

Smartphones and online platforms have been providing solutions to the numerous obstacles that refugees face. These include, but are not limited to, navigation and GPS, translation, communication, finding shelter, and managing money. Apps like Google Maps, Facebook, WhatsApp, Bitcoin, and others serve to provide refugees with the tools necessary to find a better life outside of their home countries. Techfugees, a social enterprise helping to coordinate the tech community’s response to the refugee crisis, identifies five areas where smartphones can help refugees: infrastructure, education, identity, health, and inclusion.<sup>38</sup> Although smartphones and apps continue to provide new tools for refugees, problems still exist in terms of access. The price of the technology itself has decreased substantially but is still not affordable for many refugees. Additionally, smartphones require an Internet connection, which is often lacking in camps and throughout the refugee journey. While the tech sector continues to find innovative solutions for the refugee crisis, the UNHCR could advance this effort by increasing access to smartphones and the internet.

### *Smart Phone Technology for Logistics and Operational Efficiency*

Smartphones provide a convenient means of accessing digital information pertaining to the availability of shelter, food, water, humanitarian aid, and other various social services. As it stands, there are a wide range of smartphone friendly web-based applications that aggregate information about the availability and provision of such services. For example in 2015, Google worked with the International Rescue Committee and Mercy Corps to develop an open-source platform called Crisis Info Hub which serves as a repository of information for refugees arriving via the Eastern Mediterranean route.<sup>39</sup> However, the technology faces numerous challenges such as maintaining up-to-date, accurate information and providing information in the five languages of the app. The information is only valuable to refugees when it accurately reflects the situation on the ground. Given the proliferation of such web-based applications, UNHCR has the potential to centralize online resources and foster a culture in which humanitarian service and other aid providers regularly update information on the location and provision of services.

### Challenges Addressed by Smartphones and Online Platforms

1. Refugees struggle to receive adequate education.
2. There are often tensions between refugees and the citizens of host countries, which

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<sup>37</sup> Bassam Sebti, “4 smartphone tools Syrian refugees use to arrive in Europe safely,” *The World Bank*, 5 March 2017, <http://blogs.worldbank.org/voices/4-smartphone-tools-Syrian-refugees-use-to-arrive-in-Europe-safely>.

<sup>38</sup> “About Techfugees,” *Techfugees*, 5 March 2017, <https://techfugees.com/about/>.

<sup>39</sup> “Google launches 'Crisis Info Hub' to help refugees,” *Al Jazeera*, 17 March 2017, <http://www.aljazeera.com/news/2015/10/google-crisis-info-hub-refugees-151024061606185.html>.



sometimes result in violence.

3. Physical camp security is a key worry for refugees who live in camps.
4. Refugees often face limited employment opportunities, both inside and outside of camps.
5. The provision of aid is sometimes hindered by corruption and a lack of transparency and accountability.
6. Upon arrival in a host country, refugees need access to reliable information about temporary shelters and longer-term accommodation.
7. Language barriers are one of the main obstacles refugees face as they attempt to settle in a new region.

### **1. Refugees struggle to receive adequate education.**

UNHCR's report finds that refugees are five times more likely to be out of school than the global average. Only 50% of refugee children have access to primary education, compared with a global average of more than 90%. This gap widens as these children become older, with only 22% of refugee adolescents attending secondary school compared to the global average of 84%.<sup>40</sup> In the Kakuma camp, there are between 150 and 300 students per teacher and less than one textbook per 10 students.<sup>41</sup> Teachers are often refugees themselves with deficits in education or training. However, support comes in a cutting-edge form – their phones. Students seek feedback and translation in Facebook groups, teachers google answers to questions, and bounce ideas off one another through group chats like WhatsApp.

**Recommendation: Employ smartphone apps and online platforms to aid teachers and students in improving access to quality education.**

### **2. There are often tensions between refugees and the citizens of host countries, which sometimes result in violence.**

In both Kenya and Lebanon, various factors contribute to sociocultural tensions between refugee communities and the populations of the host countries. Causes include distorted perceptions of aid given to refugees and discrepancies in social practices, such as differing ages of marriage. Smartphone and social media technology could help bridge the gap between these groups. Particularly in situations like the Kakuma camp, where security concerns may limit physical contact between refugees and the outside world, digital networks would play a powerful role. UNHCR could use existing social media platforms to publicize camp life to the surrounding community and establish a forum for communication across camp boundaries. Similarly, social media could be used to connect refugees who are dispersed in urban and rural areas outside of camps in order to facilitate community-building.

**Recommendation: Leverage social media as a platform for communication between refugee and host country communities.**

### **3. Physical camp security is a key worry for refugees who live in camps.**

The proliferation of armed robberies near Kakuma and its proximity to the regions of Sudan, Uganda and Ethiopia threaten camp security. Given the existence of various map-based online applications offering information about social services, there lies potential for the development of

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<sup>40</sup> UNHCR, "UNHCR reports crisis in refugee education," UNHCR, 3 April 2017,

<http://www.unhcr.org/afr/news/press/2016/9/57d7d6f34/unhcr-reports-crisis-refugee-education.html>.

<sup>41</sup> Dryden-Peterson et al, "How teachers use mobile phones as educational tools in refugee camps," *The Brookings Institute*, Accessed 25 March 2017, <https://www.brookings.edu/blog/education-plus-development/2017/03/14/how-teachers-use-mobile-phones-as-education-tools-in-refugee-camps/>

crime maps and concomitant safe zones with the option of requesting for “walking escorts” (i.e. volunteers) for refugee camps.

**Recommendation: Develop camp-specific online maps compatible with existing web apps to enhance refugees’ camp experience by consolidating information about potentially dangerous areas.**

#### **4. Refugees often face limited employment opportunities, both inside and outside of camps.**

In both Kenya and Lebanon, refugees face legal and practical restrictions on employment opportunities. There are numerous technological platforms both for entrepreneurship and job-seeking that could be adapted to the refugee context. Some refugees establish small business ventures inside camps, such as bakeries, laundry services, and craftsmanship. Microfinance platforms, like Kiva.org, could support these entrepreneurs. UNHCR might also consider developing a smartphone application or online platform for job postings, including short-term and handiwork jobs within the refugee community.

**Recommendation: Adapt technological platforms for entrepreneurship and job-seeking to the refugee context.**

#### **5. The provision of aid is sometimes hindered by corruption and a lack of transparency and accountability.**

Information and communications technology can be important tools to promote transparency and accountability as well as to identify and reduce corruption. New technologies, in the form of websites, mobile phones, applications etc. have been used to facilitate the reporting of corruption and the access to official information, to monitor the efficiency and integrity of social services and to make financial information more transparent. In Kenya, only 5.5% of Kenyans have reported complaints.<sup>42</sup> Many institutions do not have a proper complaints handling system, relying on manual systems which result in complaints not handled effectively. Websites like ipaidabribe.com in India and the use of Twitter and Facebook allow citizens to report cases of corruption.<sup>43</sup>

**Recommendation: Utilize online platforms, social media, and websites to monitor the integrity of social services and make financial information more transparent.**

#### **6. Upon arrival in a host country, refugees need access to reliable information about temporary shelters and longer-term accommodation.**

Given that different countries possess varied policies on refugee camps and other forms of shelter, it is critical that a central database exists to amalgamate such information so as to facilitate refugees’ process of settling in and accessing other services such as medical treatment and provision of food and water. Crisis Info Hub, an open-source five-language online repository of information powered by Google, contains vital information regarding short-term shelters (such as Eleonas, an Athens entry camp) for refugees arriving in Greece and in general those traveling the Eastern Mediterranean route. However, this existing platform is limited in geographical scope—it only covers certain regions such as along sea Greek-Turkish border and the Greek-Macedonian border. There is great potential for such a project to be replicated for other host countries, especially since there is a wealth of information that refugees with relevant experience could share with others who are arriving in the same host country.

**Recommendation: Leverage Google’s expertise in designing Crisis Info Hub to create a**

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<sup>42</sup> Brankamp, Hanno, “Community policing in Kakuma camp,” *FM Review*, Accessed 3 April 2017, <http://www.fmreview.org/sites/fmr/files/FMRdownloads/en/community-protection/brankamp.pdf>

<sup>43</sup> Ibid.

comprehensive online platform for consolidation of critical information pertaining to camps, temporary shelters, and other forms of accommodation that spans the Middle East and African regions.

**7. Language barriers are one of the main obstacles refugees face as they attempt to settle in a new region.**

Various smartphone and online platforms exist for translation technology. An example of a technological innovation is Nowall. Nowall makes it easier for refugees to complete paperwork in unfamiliar languages, by offering translation via mobile phone. Refugees send a text message to Nowall and users will either receive a written response via text, a phone call, or a face to face meeting with a volunteer interpreter.<sup>44</sup>

**Recommendation: Publicize options for translation technology and improve refugee access.**

A variety of smartphone and online platform options exist for improving the refugee experience. They could address a wide range of issues, from camp security to employment and community integration in urban settings. The key challenge for implementing this type of technology is the decentralization inherent in smartphone apps, social media initiatives, and web-based platforms. UNHCR can play an important role in this regard by centralizing the resources available in guidance given to refugees. Aid providers must also take steps to improve access by expanding the availability of Wi-Fi and technological support.

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<sup>44</sup> Techfugees, "Translation through text: How Nowall can help refugees overcome the language barrier, 12 September 2016.

## Technological Options: Health Technology

Healthcare is a cornerstone of state responses to refugee influx. Medical providers must address an array of unique challenges – from the spread of communicable diseases to nutrition, mental health to sexual assault. Moreover, language barriers between provider and patient can complicate diagnosis, treatment, and preventative care. The needs of refugees vary by gender and age group. For the most part, the refugee situation exacerbates existing health conditions and makes it more difficult to access quality treatment. However, the experience of war and displacement also contributes to the development of new problems such as psychological trauma and physical injuries. Other issues are specific to the experience of refugees living in host countries, including the spread of communicable and infectious diseases.

We identify four target areas for policy: infectious disease, mental health, reproductive health, and language barriers. With their high population densities and atypical living conditions, refugee camps can be settings conducive to the spread of communicable diseases – especially infectious diseases, like tuberculosis, HIV/AIDS, malaria, and cholera. Some illnesses spread through contaminated water or food supplies, while others spread through mosquitos, blood, or respiratory droplets. In both cases, lack of preventative measures – such as mosquito nets or contraception – can exacerbate the situation. Likewise, lack of comprehensive pharmacy services and prescription standards can promote the development of MDR disease strains. Researchers found that the 2011 war in Syria led to the spread of measles, hepatitis A, leishmaniasis, poliomyelitis, meningitis, and scabies throughout the displaced population in Syria and refugees in neighboring countries.<sup>45</sup>

The refugee experience can contribute to the development of mental illness and exacerbate existing issues. Refugees undergo significant trauma by witnessing violence in their home countries, fleeing to unfamiliar situations, and monitoring events at home from afar. Separation from family and friends, poor living situations in camps, and financial strain cause additional distress. These experiences aggravate existing conditions and lead to the development of Post-Traumatic Stress Disorder (PTSD), depression, and anxiety, among other illnesses. Interviews with female Syrian refugees in Irbid and Ramtha, Jordan, found “common feelings of isolation and sadness among a great many of the women.”<sup>46</sup> The researchers additionally found that interventions led by NGOs and UNHCR were not always successful because women were reluctant to socialize while grieving and monitoring the war from afar.

Some studies have focused on the health needs of female refugees specifically. These include gender-based violence and gynecological health problems. A 2015 evaluation of reproductive health services in camps for Syrian refugees in Jordan found that there was only one fully functional rape center and refugees held negative opinions of the quality of the services at women’s health centers.<sup>47</sup> Another NGO survey of women living in camps in Jordan concluded that “23% of women were unaware about reproductive health services, 28% had experienced unplanned pregnancies and 17%

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<sup>45</sup> Sima L.Sharara and Souha S. Kanj, "War and infectious diseases: challenges of the Syrian civil war," *PLoS pathogens* 10, no. 11 (2014): e1004438.

<sup>46</sup> Karen Boswall and Ruba Al Akash, “Personal perspectives of protracted displacement: an ethnographic insight into the isolation and coping mechanisms of Syrian women and girls living as urban refugees in northern Jordan,” *Intervention* 13, no. 3 (November 2015): 207.

<sup>47</sup> Sandra Krause et al, "Reproductive health services for Syrian refugees in Zaatri Camp and Irbid City, Hashemite Kingdom of Jordan: an evaluation of the Minimum Initial Services Package," *Conflict and health* 9, no. 1 (2015): 1.

did not access antenatal care for pregnancy.”<sup>48</sup>

Finally, language barriers between refugees and their providers are worthy of consideration. In high-resource settings, healthcare institutions often staff their facilities with trained translators or integrated phone-based interpretation systems. [Bellevue](#), one of New York City’s flagship hospitals, recorded nearly 11 million minutes of interpretation phone services in 2015. Given the high linguistic diversity of many refugee camps, camp administrators often lack the resources to mimic this approach.

New health technologies and approaches show promise in meeting said challenges. Of particular interest are telemedicine, smartphone apps, and “big data.” Increasingly, social entrepreneurs (start-ups) and large technology firms (for example Google) alike are looking to apply new software solutions to healthcare problems. Apps especially germane to refugee health might support patients diagnosed with PTSD, establish “big data”-enabled medical and pharmacy record systems, and facilitate prenatal monitoring during pregnancy. New advances in “smart” translation technology and telemedicine services that enable long-distance service also merit policy attention.

One frontier that shows promise is mobile health technology. Several programs exist to remotely diagnose health conditions and provide medical advice. For example, the mobile health application CelloPhone uses imaging to analyze bodily fluids and assess the spread of infectious disease.<sup>49</sup> In one instance, UNHCR health providers in a camp for refugees from Bhutan in Nepal used telemedicine to connect refugees and specialists in other regions of the country.<sup>50</sup> Translation devices and phone applications may also be useful to overcome language barriers between refugee patients and doctors in host countries.

#### Challenges Addressed by Health Technology

1. Refugees require reliable access to food and proper nutrition but often lack information as to how to obtain it.
2. The refugee experience can contribute to the development of mental illness and exacerbate existing issues.
3. Refugee women and girls face specific health issues, including gender-based violence and gynecological problems.
4. Refugee camps are prone to the spread of communicable diseases.

#### **1. Refugees require reliable access to food and proper nutrition but often lack information as to how to obtain it.**

[Services Advisor](#), a bilingual English-Arabic app created by Canadian non-profit PeaceGeeks in partnership with UNHCR, provides information about various services including provision of food aid by humanitarian organizations in Jordan and Syria. However, food rations and assistance might be considered degrading, especially if they are of poor nutritional quality such as those that have been distributed in Kakuma camp.

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<sup>48</sup> Goleen Samari, "The Response to Syrian Refugee Women’s Health Needs in Lebanon, Turkey and Jordan and Recommendations for Improved Practice," *Knowledge & Action*, Humanity in Action (2015).

<sup>49</sup> Caitlin Turner, “Refugee Health: The Potential of Mobile Health Technology,” *TechChange*, 1 November 2010. <https://www.techchange.org/2010/11/01/refugee-health-the-potential-of-mobile-health-technology/>.

<sup>50</sup> UNHCR, “Using telecommunications to improve clinical healthcare in refugee camps,” UNHCR Innovation, accessed 10 March 2017, <http://www.unhcr.org/innovation/using-telecomms-to-improve-clinical-healthcare-in-refugee-camps/>.

**Recommendation: Reassess guidelines for listing the provision of food assistance on current online platforms to ensure quality control.**

## **2. The refugee experience can contribute to the development of mental illness and exacerbate existing issues.**

Refugees undergo significant trauma by witnessing violence in their home countries, fleeing to unfamiliar situations, and monitoring events at home from afar. Separation from family and friends, poor living situations in camps, and financial strain cause additional distress. These experiences aggravate existing conditions and lead to the development of Post-Traumatic Stress Disorder (PTSD), depression, and anxiety, among other illnesses. Technology often worsens rather than improves mental illnesses, as individuals monitor violent and tragic events via smartphones, or further isolate themselves from physical contact with others. Telemedicine and teletherapy technology show promise in aiding the refugee population. With a smartphone app, refugees could communicate with doctors and therapists anywhere in the world. Other types of technology, such as social media networks, could also facilitate community building and communication for in-person support.

**Recommendation: Utilize telemedicine, teletherapy, and social media networks to assist the treatment and prevention of mental illnesses.**

## **3. Refugee women and girls face specific health issues, including gender-based violence and gynecological problems.**

Technology has the potential to address the sensitivities surrounding women's health issues. Women suffering from sexual health issues or gender-based violence may be reluctant or unable to visit a health provider in-person. UNHCR could develop anonymous and remote reporting systems for gender-based violence. Telemedicine could also aid in this area, as women could obtain diagnoses for sensitive issues without leaving the home. Social media and online platforms could also be used to raise awareness and educate the population on sexual issues and gender-based violence, as well as resources for assistance. Finally, some of the studies reviewed reported that refugees held negative opinions of the quality of services at women's health centers. UNHCR might consider developing an anonymous survey system to allow refugees to provide feedback on services confidentially.

**Recommendation: Develop anonymous and remote reporting systems for gender-based violence and feedback on health services. Employ telemedicine for women's health issues. Create social media campaigns for sexual education and gender-based violence awareness.**

## **4. Refugee camps are prone to the spread of communicable diseases.**

Refugees are vulnerable to communicable diseases - including MDR communicable diseases - for a number of reasons. An important reason relates to antimicrobial treatment plans prescribed for affected patients. Low-resource settings often lack the antiretroviral therapies or antibiotics necessary for comprehensive treatment of a given disease. It is possible that a given drug will fail to kill all microorganisms responsible for disease. Those microorganisms that remain can develop resistance - thereby presenting renewed threat to the patient. Development of MDR diseases can happen via this mechanism when a healthcare provider prescribes only one drug as opposed to multiple drugs. Online platforms with standardized pharmacy recommendations, prescription standards, and treatment regimes for effective treatment of known communicable diseases can help mitigate this risk. Healthcare providers should then encourage patient adherence to their prescribed treatment plans.<sup>51</sup>

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<sup>51</sup> Tracy Kidder, *Mountains Beyond Mountains*, 31 August 2004.

**Recommendation: Promote online diagnostic platforms among healthcare providers to standardize pharmacy services, prescription standards, and treatment regimes.**

A variety of innovative health technologies demonstrate potential to improve UNHCR services. Aid providers should also note that health technologies intersect with other types of technology, particularly smartphones and mobile platforms. Apps and social media initiatives to alleviate mental illness, for example, might be integrated with projects to reduce tensions between refugees and host country nationals or facilitate community-building for refugees in urban settings. Health technologies also introduce a number of limitations, from privacy concerns to potentially high costs. We recommend that UNHCR leverage existing platforms, like mental wellness apps, and NGO partners, such as Doctors Without Borders, to reduce overhead.

## Summary of Recommendations

Tech Option	Problem	Recommendation
<b>Drones</b>	UNHCR and other aid providers face initial challenges of developing camps into sustainable living environments.	Use drone technology to map camps as living environments.
	Refugee flows are difficult to track.	Employ drone technology to map and monitor refugee flows.
	Environmental concerns complicate refugee camp management.	Depending on local environmental concerns (e.g. desertification, water contamination, or others), choose appropriate drone technology to monitor the environs visually.
<b>Smartphones and Online Platforms</b>	Refugees struggle to receive adequate education.	Employ smartphone apps and online platforms to aid teachers and students in improving access to quality education.
	There are often tensions between refugees and the citizens of host countries, which sometimes result in violence.	Leverage social media as a platform for communication between refugee and host country communities.
	Physical camp security is a key worry for refugees who live in camps.	Develop camp-specific online maps compatible with existing web apps to enhance refugees' camp experience by consolidating information about potentially dangerous areas.
	Refugees often face limited employment opportunities, both inside and outside of camps.	Adapt technological platforms for entrepreneurship and job-seeking to the refugee context.
	The provision of aid is sometimes hindered by corruption and a lack of transparency and accountability.	Utilize online platforms, social media, and websites to monitor the integrity of social services and make financial information more transparent.



	Upon arrival in a host country, refugees need access to reliable information about temporary shelters and longer-term accommodation.	Leverage Google’s expertise in designing Crisis Info Hub to create a comprehensive online platform for consolidation of critical information pertaining to camps, temporary shelters, and other forms of accommodation that spans the Middle East and African regions.
	Language barriers are one of the main obstacles refugees face as they attempt to settle in a new region.	Publicize options for translation technology and improve refugee access.
<b>Health Technology</b>	Refugees require reliable access to food and proper nutrition but often lack information as to how to obtain it.	Reassess guidelines for listing the provision of food assistance on current online platforms to ensure quality control.
	The refugee experience can contribute to the development of mental illness and exacerbate existing issues.	Utilize telemedicine, teletherapy, and social media networks to assist the treatment and prevention of mental illnesses.
	Refugee women and girls face specific health issues, including gender-based violence and gynecological problems.	Develop anonymous and remote reporting systems for gender-based violence and feedback on health services. Employ telemedicine for women’s health issues. Create social media campaigns for sexual education and gender-based violence awareness.
	Refugee camps are prone to the spread of communicable diseases.	Promote online diagnostic platforms among healthcare providers to standardize pharmacy services, prescription standards, and treatment regimes.

## Conclusion

We urge aid providers, particularly UNHCR, to consider our recommendations for leveraging humanitarian technology to improve the provision of services to refugees. As we attempted to provide a broad survey of technological options, several limitations were inherent in this project's scope. We focused on two case studies to identify several examples of challenges that refugees may face both in refugee camps and in urban integration. Of course, these are neither comprehensive nor representative of the full range of refugee experiences, but we hope that the example problems discussed can lead to solutions that are applicable in a variety of contexts. In addition, we focused on three broad categories of technology: drones, smartphones and online platforms, and health technology. Each field brings nuances and its own limitations for use in the refugee context. In particular, we are concerned by legal limitations, potentially high costs, and possible stigma or negative attitudes held by refugees toward some technologies. Further researchers should undertake more in-depth study of each area and its associated advantages and disadvantages.

Our research suggests a few best practices in implementing these recommendations. First, aid providers should centralize the resources offered by a range of online platforms and smartphone applications so that refugees can access the most effective solutions. Second, aid providers should coordinate efforts with existing partners and platforms as much as possible to mitigate overhead costs. Finally, UNHCR must collaborate with host country governments to encourage refugees and host communities to use new technologies. We expect that the innovation and proliferation of these technologies will greatly increase in the coming years, as conflicts around the world continue to exacerbate the refugee crisis. Ultimately, aid providers must take advantage of the available technological solutions to improve the lives of the people they serve.

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