

Reminders, Refugees, and Ramadan: Characterizing Missed Immunization

Appointments among Palestinian Refugees in Jordan

by

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Eric Green

Thesis submitted in partial fulfillment of
the requirements for the degree of
Master of Science in the Duke Global Health Institute
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ABSTRACT

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Abstract

There are currently over two million Palestinian refugees residing in Jordan, 370,000 of whom reside in refugee camps. Due to conflict-affiliated disease outbreaks among children in the region, the UN Relief and Works Agency for Palestine Refugees (UNRWA) has identified incomplete vaccination as a critical public health issue and has invested in the development and implementation of a text message reminder service for preventing loss-to-follow-up. Childhood immunization rates in UNRWA catchment regions are generally high, yet little is known about risk factors for missed appointments, which impose a substantial administrative burden due to the need to contact patients for rescheduling. Stronger user characterization is necessary for improved targeting and minimized cost as we develop a more robust SMS system capable of scaling across all health facilities.

This mixed-methods study prospectively recorded 6 months of immunization history among a cohort of children born in June 2014 at Taybeh Health Center in Amman. Demographic information was collected at the time of birth, and caregivers of cohort members were invited to participate in interviews that assessed immunization knowledge, preferences, decision-making, and experience with the SMS reminder system. Patients were more likely to significantly delay appointments during the Ramadan holiday and for doses further from the child date of birth. Future policies that

might bridge these gaps include targeting pre-appointment SMS reminders to high-risk patients, implementing holiday shifts in clinic hours, and regularly updating patient contact information.

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Acknowledgements

At DGHI, I would like to thank Dr. Dennis Clements, Dr. Lavanya Vasudevan, Dr. Eric Green, Dr. Joe Eggers, Sarah Martin, Michael Russell, and Lysa MacKeen for their assistance and guidance. From the field, Dr. Akikiro Seita, director of UNRWA health, was an absolute champion of the original SMS reminder pilot project and was gracious enough to invite me back for a second summer. My colleague Batoul Abuharb conducted a needs assessment at UNRWA clinics in the Gaza Strip that motivated further investigation; her assistance – particularly her service as a stalwart translator the day after escaping a war zone – has been vital throughout the course of this project. I would also like to thank Dr. Majed Habibeh, Dr. Ali Khader, Ghada Ballout, Banan Mughrabi, and Loia Farajallah of UNRWA Health for their assistance and support as well as Seja Abudiab for translating. Rene Bangart and Samantha Buckley provided essential data updates from afar.

1. Introduction

Background, Aims, and Hypotheses

There are currently over two million Palestinian refugees residing in Jordan, 370,000 of whom reside in one of 58 refugee camps. The UN Relief and Works Agency for Palestine Refugees (UNRWA) coordinates multisectoral support for this population and manages camp services such as healthcare. UNRWA has identified incomplete childhood vaccination as a critical public health issue and has invested in the development and implementation of a SMS reminder service for preventing loss-to-followup. This promising system is still in a pilot phase, but the agency would like to take it to scale. Existing mechanisms for maintaining high childhood immunization rates involve substantial time investment on behalf of clinic nurses, who dedicate multiple hours per week to calling patients who have delayed appointments by seven or more days. This proposed study will directly inform scale-up plans by gathering additional information on the drivers of missed appointments and the usability of the reminder system.

Aim 1: Identify the determinants of missed immunization appointments. This research aims identify clinical and demographic factors associated with missed immunization appointments via a prospective cohort study. This study hypothesizes that child gender, maternal education, birth order, and holiday status will be important factors, with greater delays among female children, children of mothers with fewer

years of education, children with older siblings, and children scheduled for vaccination during Ramadan.

Aim 2: Gather information about caregiver immunization knowledge, perception of clinic quality, methods of appointment tracking, and perception of the utility of SMS reminders via in-depth patient interviews. This study hypothesizes that patient perceptions of quality of care will be slightly positively impacted by SMS appointment reminders.

Burden of vaccine-preventable disease: migrating and growing

The World Health Organization has recommended a total of 22 childhood vaccines, including 20 primary doses during the first two years of life – many of which have recommended boosters (Tao, Petzold, & Forsberg, 2013). In Jordan, immunizations may be provided by public clinics, private clinics, or through NGOs. Palestinian refugees in Jordan obtain free primary care, including immunizations, through the UN Refugee and Works Agency for Palestine Refugees in the Near East, abbreviated as UNRWA. UNRWA also provides care for Palestinian-Syrian double-refugees, while other Syrian refugees receive care through UNICEF and UNHCR.

Attitudes to immunizations in the Middle East vary amongst healthcare workers, perhaps signaling larger issues with patient burden and unmet demand: 31.8% of health care workers in three different countries identified “lack of time” as a major reason for not advocating annual influenza immunizations, while 25.4% claimed lack of vaccine

availability and 17.3% of trained health workers expressed concerns about potential side effects (Abu-Gharbieh, Fahmy, Rasool, & Khan, 2010).

Despite these concerns, it is clear that routine vaccination is critical in Jordan – a country already in possession of a number of crowded refugee camps and undergoing rapid transformation due to transient conflict-afflicted Syrians. As Coutts (2013) explains in a recent study:

Doctors within the clinics also reported that they expect outbreaks of cholera, typhoid, and hepatitis A, among those refugees living in informal urban and rural settings. The sanitation and living conditions in many of these areas are poor and overcrowded, and most refugee children lack basic vaccinations..., raising the risk for an outbreak of vaccine-preventable diseases. (p. e9)

Despite generally high reported childhood immunization coverage in the Near East, outbreaks have been known to occur unexpectedly. Following a 1995 National Immunization campaign in Egypt, cases of polio in spite of the campaign prompted further investigation (Reichler et al., 1998). While exposure to television and radio campaigns played the largest role in prompting immunization, researchers found that children under one year of age and those over the age of three were more likely to be immunized against polio than children between ages one and three (Reichler et al., 1998). This may imply that parents were more likely to vaccinate their older children after the fact, perhaps rationalizing that there is still time for younger children who are less behind; however, this still leaves children exposed to potential preventable infection longer than recommended.

Some questions remain as to what extent “catch-up vaccinations” are either necessary or cost effective – important considerations for financially-strained international nongovernmental organizations operating in the region, forced to cope with politicized funding sources and monitoring methods subject to porous movement across borders (Hutton & Brandeau, 2013; Shearer & Pickup, 2007). These lessons will become more critical for Jordan as its NGOs struggle to immunize refugees.

Highly transient populations, such as Syrian refugees and Palestinian-Syrian double refugees, have been flowing across the porous border between Jordan and Syria in tremendous numbers since 2011. 2% of these refugees are estimated to have vaccine-preventable infectious diseases, and 47% are estimated to have contagious skin diseases; most are children, and still more are pregnant women whose infants will soon be in need of protection against disease (Coutts, Fouad, & Batniji, 2013; Refaat & Mohanna, 2013). Though Jordan has built formal camps for Syrian refugees, it is expected that these diseases will not remain isolated within this population – Palestinians with families established in Jordan often petition to leave camps with poor conditions, and may do so with a local sponsor.

The UN Relief and Works Agency for Palestine Refugees in the Near East (UNRWA), which provides immunizations for long-term Palestinian refugees within formally established camps, has also been making efforts to absorb twice-displaced Palestinian refugees from Syria (Chen & Cammett, 2012; Coutts et al., 2013). This

population faces an immunization burden of its own, but has become known for similar rates of infectious disease, prompting measles outbreaks (Coutts et al., 2013). Both Palestinian and Syrian refugee families are often large, and younger children are even less likely to have received a full immunization portfolio than those first in birth order (Gavriellov-Yusim, Battat, Neumann, Friger, & Balicer, 2012). UNRWA operates across the Levant, and adheres to childhood vaccination schedules set by each host country for those respective clinics (see **Appendix A** for the Jordanian timetable). Of note, the detection of wild poliovirus type 1 in Syria, as well as in sewage systems in Israel and the Gaza Strip, has led countries in the region to supplement the inactivated poliovirus vaccine (IPV; administered here alongside the three-dose pentavalent vaccine) with the oral polio vaccine (OPV) (Tulchinsky et. al., 2013).

Properly identifying gaps in child immunization in Jordan is more critical now than ever. While infectious disease associated with conflict and refugee surges may be unpredictable, potential immunization delays during Ramadan would constitute an annual event; further understanding and action are needed to ensure the two do not act in tandem to produce increased outbreaks of vaccine-preventable disease throughout Jordan and beyond.

Cultural Factors Impacting Immunization

Muslim patients obtaining healthcare from either sectarian providers or providers with Muslim-majority staff are beset with further barriers to immunization during the holy month of Ramadan. As a religious and cultural phenomenon, Ramadan tends to dominate other standard obligations: work schedules may be shortened, and caregivers may switch to a nocturnal schedule to both prepare meals in a timely manner and to avoid hunger pains during daylight hours (Alwasel et al., 2013).

A study based in England showed that failed clinic appointments were significantly higher among Muslim patients as compared to non-Muslim patients, with the brunt of this disparity created during Ramadan (Gatrad, 1997). As missed appointments cost the British healthcare system over \$3.25 billion USD annually, it is no wonder that a majority-Muslim health system might face significant financial pressure to scale back hours and staff during this month (Gatrad, 1997). Patients with medical obligations not requiring in-person meetings have been found similarly noncompliant, with many not knowing how to coordinate pharmaceutical use with fasting schedules (Panju, 2012).

Most prior studies of patient adherence during Ramadan have focused on those receiving non-time-sensitive treatment for chronic diseases. Because the process of fasting is central to the holy month, initial health studies focused on diabetic compliance (Panju, 2012). In years since, practitioners in niche fields, such as ophthalmology and

dentistry, have also begun assessing compliance and appointment failure during Ramadan (AlBarakati, 2009; Khan, Al-Maskari, & Khan, 2009). Nearly 84% of dental appointments are not attended, while some ophthalmologists have learned to cope with appointment failures by postponing pre-scheduled services until after the holiday (AlBarakati, 2009; Khan et al., 2009). Similarly, a psychological study found that Palestinian mental health patients often forgot to take pharmaceuticals while fasting, prompting a switch to slow-dose drugs (Zaid, 2010).

The potentially time-sensitive nature of immunization in a land full of migrants poses additional constraints. Religious patients and those lacking in health education skeptical of door-to-door campaigns, often preferring to go to a reputable clinic for this service (Sheikh et al., 2013). There is a dearth of information on both cultural and practical impediments to vaccine access during Ramadan and the extent to which vaccination may be delayed beyond the WHO-recommended timeline during this period, and how this change in delay might differ across populations.

2. Methods

This mixed-methods study has two main components: first, a cohort of 100 patients born in June 2014 was followed throughout the course of their first four immunization time points to identify risk factors for missed appointments or delayed immunization (see **Appendix A**). Second, semi-structured interviews were conducted during July and August 2014 with 13 caregivers who had delayed immunization appointments and received SMS reminders to identify barriers to care and to assess the viability and preferred nature of SMS appointment reminders.

All surveys and communications with patients were conducted in Arabic with the assistance of a translator. All demographic and appointment record information acquired without the patient caregiver as an intermediary was obtained from an English-language medical records database by an English-speaking UNRWA employee. Study procedures were approved by the ethical review board at Duke University.

2.1 Setting

All participating patients and caregivers were Palestinian refugees receiving free primary care at the Taybeh Health Centre (Taybeh HC) in South Amman, Jordan. Taybeh HC serves a population of 21,366 in its catchment area. This facility has an average monthly volume of 2,100 patient encounters, 960 of which are maternal and child health encounters. Taybeh was identified in consultation with UNRWA because of its large size and dense surrounding population, its recently-renovated facilities

including a robust IT system, and its experience using e-Health, UNRWA's electronic medical records system. All Palestinian refugees obtaining healthcare from Taybeh HC are also Jordanian citizens; however, poverty in the country is most densely concentrated in this refugee population (Khawaja 2003).

Taybeh HC was open from 7 a.m. to 3 p.m. during normal operating hours and from 8 a.m. to 1 p.m. during Ramadan holiday hours. Caregiver interviews were conducted in a closed office on the second floor of the clinic in the presence of the primary researcher and a translator unaffiliated with UNRWA.

2.2 Sample and Eligibility

For assessing risk factors for missed appointments, the target population was limited to infants born in June 2014. Exclusion criteria were infants with major health complications as indicated in the eHealth record and infants registered with UNRWA but who received primary care, including immunizations, at alternate private or public clinics.

For obtaining feedback on immunization access and SMS reminders, the target population was adult caregivers. Eligibility criteria were: caregivers of infants who obtained an immunization at ≥ 7 days after the original appointment, with mobile numbers listed in eHealth who had been sent SMS reminders, and available for an in-person interview. Exclusion criteria were: caregivers of infants who had not yet caught up on the immunization schedule and caregivers with landlines.

2.3 Procedures

2.3.1 Risk Factor Assessment

Recruitment and Assessment

To examine immunization delays among the June birth cohort, patient demographic information was first obtained from UNRWA's eHealth medical records system by UNRWA staff. During collection, information for each patient was stripped of identifying names and phone numbers and assigned an artificially-generated patient identification number. Observed subjects did not proceed through informed consent procedures. Data was collected from UNRWA Health Headquarters in Amman, Jordan using the UNRWA internal network.

Data Management

Immunization logs were updated and stored on an encrypted external hard drive in July and August 2014 by the primary researcher in person; subsequent updates were sent by UNRWA staff in September 2014, October 2014, and March 2015 via a Box account.

2.3.2 Caregiver Interviews

Recruitment

Potential interview subjects were invited to participate in a short interview with outside researchers by staff nurses. Staff nurses obtained verbal consent to pass participant name and contact information to researchers to schedule an interview via a

handwritten list. A list of prospective interview participant phone numbers was given to the primary researcher, and a translator extended a formal invitation and scheduled a meeting via a phone call from a non-clinical number. In most cases, interview times were set to correspond with newly-scheduled catch-up immunization appointments. Prior to the interview, immunization dates for children under participant care were checked to confirm eligibility. No extra flyers, posters, or electronic notices were used to recruit subjects.

Assessment

Upon arrival at Taybeh HC, recruited participants were identified by staff nurses and, after completing any necessary medical priorities, directed to a second-floor office. Those who still had interest in completing the interview provided written informed consent. Participants completed a semi-structured face-to-face interview on their experiences with the clinic, scheduling and managing immunization appointments, and perceptions of SMS reminders.

The full study visit took approximately 20 minutes; time delays due to pre-interview appointments were used to stagger participant flow. Participants did not receive compensation, though a variety of toys were supplied in the study room to keep the children of participants occupied during the procedure.

Data Management

Interview responses were originally recorded using the Smart Voice Recorder Android application; .mp4 file responses were transferred to an encrypted external hard drive, deleted from the original collection source, and then simultaneously translated and transcribed in word document files.

2.4 Measures

2.4.1 Risk Factor Assessment

At birth, a child eHealth profile is established and populated for each patient under UNRWA care. This profile includes both patient and family demographic information, as well as a pre-populated projected immunization schedule based upon the appointments dates in the Maternal-Child Health Handbook issued to the mother at birth.

To assess which patients are at highest risk for immunization delay, basic demographic information was logged along with scheduled and actual immunization dates for each patient (see **Appendix B**). Each patient identification number was associated with the patient's highest achieved maternal education level (illiterate, primary, middle school, high school, or university); number of older siblings (numerical); and gender (binary categorical). These risk factors were selected based upon a combination of historical literature and availability in UNRWA e-Health records. Maternal education, firstborn status, and child gender are well-documented; other

commonly reported determinants, such as antenatal care and rurality, were excluded due to lack of complete patient data and lack of variation among patients, respectively (Obermyer, Deykin, & Potter, 1993; Streatfield, Singarimbun, & Diamond, 1990; Shaffer & Szilagyi, 1995).

Immunization delays were computed by calculating the number of days between the scheduled appointment date and actual appointment date for 4 vaccine time points. These included the BCG vaccine (scheduled for one week after birth) and the first 3 doses of IPV, OPV, DPT, Hep B, and HiB (administered in groups at 2 months, 3 months, and 4 months) of age. Immunization delays were listed both as numerical values (number of days) and as binary categorical values (less than 1 week late; 1 week late or greater). The “scheduled” appointment dates as listed in the eHealth update automatically based upon prior shifts in vaccination schedule due to delays.

2.4.2. Caregiver Interviews

All study interviews were conducted in the local Arabic dialect. See **Appendix C** for an English-language set of questions.

Demographics

Participants reported how many years they attended school, number of children, and were asked how often they attended the health center to establish rapport and assess familiarity with clinic personnel and procedures.

Appointment Management and Scheduling

Participants were asked when the health center was busiest and least busy. For analysis, responses were sub-coded for content based upon type of appointment and wait time.

As all interviews were conducted during the Ramadan holiday, several open-ended questions were asked to illuminate the reasons behind any potential significant quantitative differences in Ramadan and non-Ramadan immunization delays.

Participants were asked: “What is your normal schedule like during Ramadan?”; about the nature of differences from typical daily routines; and follow-up probes regarding stress, fatigue, time availability, and fasting in an open-ended exchange.

Attitudes to Immunization and Perceptions of Care

To gain insight into participant views of vaccination, participants were asked whether they or anyone they know had ever acquired a vaccine-preventable disease.

Participants were also asked how they think most people in their communities feel about vaccines, with follow-up probes if appropriate. To gain an understanding of how these responses might be impacted by the particular health center-patient or physician-patient relationships, participants were asked how the clinic could do a better job of addressing the needs of their families.

SMS Recollection and Response

All eligible interview participants were at least one week late for a vaccination and had been issued a reminder SMS to the mobile number listed in their eHealth profile. Participants were asked open-ended questions about the reason for the delay and how they remember appointments.

Participants were asked whether they knew which mobile phone in their family was registered in the Taybeh Health center records, and whether they or someone in the family remembered receiving a SMS reminder about the late appointment. Participants were also asked about who in the family schedules health appointments for the children, and whether they were the family typically tasked with health-related childcare.

2.5 Data Analysis

2.5.1 Risk Factor Assessment

Quantitative data were entered manually by typing values listed in eHealth records into a Microsoft Excel spreadsheet. There were no missing values for patient demographic information. Missing values for missed immunizations were typically supplemented with a note in eHealth explaining that the patient had moved or switched to an alternate clinic. In such instances, values for cohort members prior to leaving the Taybeh catchment area were considered; those after the switch were removed from consideration (i.e. if 2 patients moved away at 3 weeks of age, 100 immunization observations would be considered for the BCG vaccine but only 98 for the first set of join

vaccines). Single-group risk ratio comparisons were calculated using T-tests; comparisons among multiple groups were conducted using ANOVA. STATA SE version 13 was used to calculate descriptive statistics; resultant data was prepared for display using Microsoft Excel and PowerPoint.

A delay of one week or more, while not necessarily clinically relevant, was used as a binary designation for delay to account for the administrative burden that emerges after a delay of that period. This deadline was used in contrast to the four week buffer period typically used in existing literature because UNRWA clinics mandate rescheduled appointments after a one week delay, but allow walk-in appointments for delays under a week.

To assess the impact of Ramadan on appointment delays, BCG appointments scheduled during Ramadan were compared to BCG appointment scheduled prior to Ramadan to avoid potential confounding by comparison to a later immunization appointment. To assess the impact of appointment time from birth on appointment delays, doses 1, 2, and 3 – administered 2, 3, and 4 months after birth, respectively – were compared to one another.

To avoid compounding delays for patients who were over one week late to an appointment, future scheduled dates for subsequent vaccinations were projected forward based upon the actual appointment. For example, if a patient slated for DPT doses on August 20, September 20, and October 20 was 10 days late to the first

appointment, the scheduled date for the second and third appointments would be pushed forward to September 30 and October 30, respectively (as they would be in practice). Subsequent delays would then be calculated from these newly scheduled dates.

2.5.2. Caregiver Interviews

Audio recordings of patient interviews were translated from Arabic into English as they were transcribed. The transcripts were uploaded directly into the NVivo 10 analysis software and coded for information related to SMS appointment reminders, Ramadan and scheduling, perceptions of clinic quality, and attitudes toward immunization, as well as emergent sub-themes related to wait time, gender issues, and different factors impacting Ramadan scheduling. The transcripts were coded and analyzed for themes by one researcher. Quotations representative of interview responses were selected to support emergent themes.

3. Results

3.1 Description of Sample

As outlined in Table 1, the June birth cohort included 46 male infants and 54 female infants. A majority of mothers obtained at least a secondary-level education, though a plurality stopped at primary school. Number of children per family ranged from 0 to 9.

Table 1 Cohort sample characteristics (n = 100)

Gender	Male		Female		
	46		54		
Maternal Education	None	Primary	Secondary	High School	University
	9	34	11	33	13
# Older Siblings	0	1	2	3	4+
	25	20	18	19	18

Of the 13 caregiver interview participants, 12 were female and 1 was male; all were parents of the child late for the appointment, and all were married.

3.2 Characterizing Risk of Immunization Delay

Compared to patients with appointments due during non-holiday times, patients with BCG immunization appointments slated during the Ramadan holiday were significantly more likely to be > 1 week late (risk ratio = 1.44, $p < 0.01$). Delays during Ramadan were also longer, with patients who missed appointments averaging 12.3 days

late versus 6.2 days late for appointments scheduled prior to Ramadan ($p < 0.01$). A distribution of delay extent for BCG vaccination under holiday versus non-holiday conditions is presented in Figure 1.

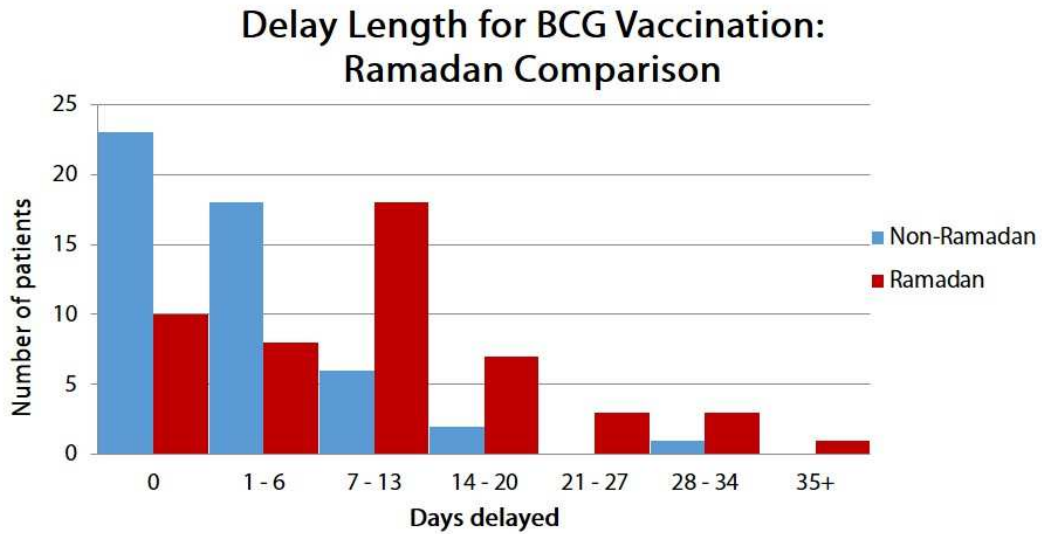


Figure 1 A comparison of BCG vaccination delays between patients scheduled prior to and during Ramadan (n = 50 for each category).

A two-way ANOVA of dose number for the combination vaccine and delays >1 week yielded statistically significant results. Mean delays, percentage of delays greater than one week, and risk ratios for delay relative to Dose 1 for each of three doses of the IPV/OPV/DPT/Hep B/HiB-a immunization suite are listed in Table 2. A distribution of delay extent for each of the combination vaccine doses is presented in Figure 2.

Table 2 Immunization Delays by Dose Number

Dose	N	Mean delay (days)	Percent >1week late	Risk Ratio (ref: D1)	95% Confidence Interval
1	98	2.2	10.2	---	---
2	98	7.0	26.5	2.10	[1.02 , 4.32]
3	98	11.7	79.6	7.80	[4.48 , 12.28]

Delay Length for Combination Vaccination: Dose Comparison

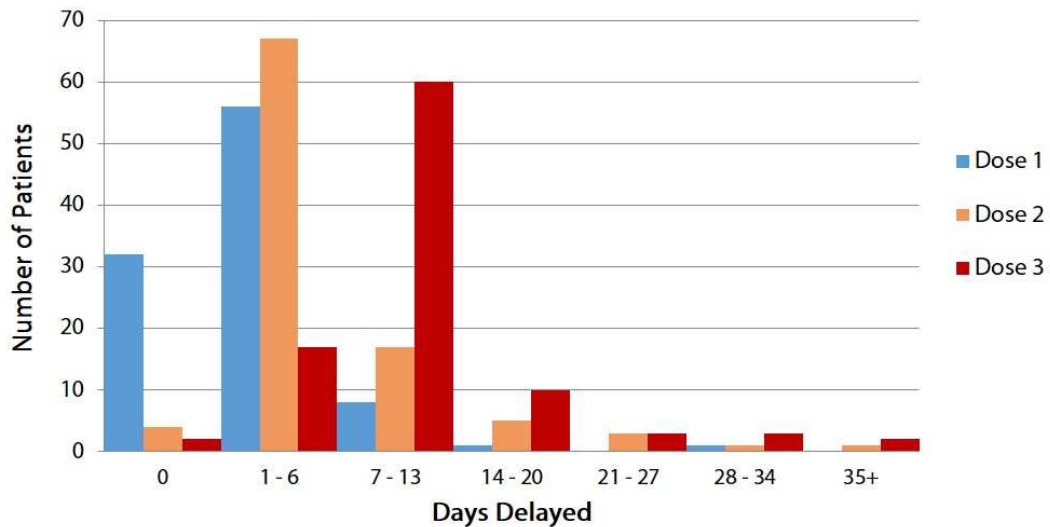


Figure 2 A comparison of appointment delays between patients for each of the subsequent combination vaccine doses (n =98 for each category).

58.0% of all appointments delayed more than one week were for female children; this difference, as compared to male children, was not statistically significant ($p = 0.24$). When stratified by appointment date, however, the girls were significantly more likely to be over one week late ($p = 0.09$) and to have longer delays ($p = 0.07$) for combination dose 1; other doses had low but insignificant p -values. Similarly, firstborns were slightly more likely than children with older siblings to receive vaccinations within a week of schedule, though the difference was not statistically significant ($p = 0.25$). Differences in maternal education level were also not significant.

3.3 Caregiver Feedback

3.3.1 Immunization Remains a Clear Priority for Most, Despite Outliers

Interview participants, in spite of missing appointments themselves, universally heralded the protective value of vaccines, the logic behind prompt vaccination, and the proficiency of the immunization team and ease of the immunization queue system at Taybeh. Nonetheless, several participants indicated firsthand knowledge of Palestinian refugees who felt otherwise. One woman provided a particularly vivid example:

“I live with my husband’s family. They are [tribe name]. I feel like they are very neglectful of their children, I don’t know why. They ignore appointments, they ignore, even neglect the kid himself...they have no order, I don’t know how to tell you...my father-in-law’s wife, he had a daughter and he didn’t want to take her to the immunizations, didn’t want to take her to the doctor, because she is a girl.”

Others provided explanations for extreme delays that hinged upon relatively stable and abundant access, contrasting attitudes in Jordan with those of relatives in other states. “Even if they’re late, they’re late because they know they can be. Even if they’re late, they know they can still get it.” Several participants also alluded to increasing community concern regarding vaccine-preventable disease: “These days all the diseases are spreading”

3.3.2 Few Barriers Impede Access, But Priorities Shift during Holiday Season

Among participating caregivers, missed appointments were almost universally attributed to fatigue, stress, and time constraints associated with the obligations of the

Ramadan holiday. “The thing is that my schedule doesn’t change that much in Ramadan,” explained one woman, “just that the things that happen in the morning get moved to the afternoon. The things that we do daily, we can still do during Ramadan.” A majority of participants concurred, referencing their own later shifts in sleeping hours to cope with the pangs of daily fasts. Many women in particular spoke of the overwhelming demands of managing extra cooking in addition to standard tasks while keeping up with young children who are not required to fast:

“We stay up in Ramadan. So when we stay up, [my newborn daughter] stays up with us. She starts to sleep, my God, she starts to sleep. Her sleep schedule changed. She sleeps when I’m awake and is awake when I’m asleep. I don’t sleep. And with that, I still give her all my time.”

One dissenter, however, favored Ramadan visits to the clinic despite the reduction in hours: “It is very, very slow and quiet [at the health center] during Ramadan,” she said. “My father-in-law was here last ...and was actually seen on time.”

While wait times were common complaints for other procedures at Taybeh, few complained about wait times for immunizations. Unlike prenatal appointments, in which a patient must arrive at a specific time, caregivers seeking immunization simply pick a day and arrive at their leisure. Most caregivers lived within walking distance, though some mentioned requiring their husbands to stay home to watch the children during appointments as 5 to 6 were too many to take to the generally crowded health center.

Two women also offered simple forgetfulness as a reason for forgetting to immunize their children – especially as vaccinations become more temporally disparate as children grow older. “When [my son] was younger, there wasn’t very much time between his immunization appointments so it was easier to keep up with them. As he gets older, the space between the appointments starts to vary so it is hard to keep track.”

3.3.3. SMS Reminders are a Favorable Prompt

At present, all health centers and hospitals within UNRWA’s multi-national health care network utilize Maternal-Child Health Handbooks to remind parents of immunization appointments. SMS reminders for caregivers who miss appointments have been piloted on a smaller scale at two different health centers. Despite praise of the Maternal-Child Health Handbook, utilization is irregular in practice:

“My daughter is pregnant now and she asked me a question about her baby because she couldn’t feel him moving. I asked her if she had read the handbook. She said no. So I yelled at her because it has so much good information about pregnancy, when to see the doctor, what you should worry about.”

While other participants were not quite as vehement, several did mention referencing the handbook when they needed it – but a few admitted that they missed immunization appointments despite knowing they were listed inside, simply because they forgot. This gap in attention, bridged by the SMS reminders piloted at Taybeh, were praised by every interview participant who recalled receiving them. “We had a lot going on and it was Ramadan and people forget,” one woman explained. “If you hadn’t...sent us a message we would have never showed up.” Another echoed the sentiment: “The

text message really motivated me a lot to come in as soon as possible. It is a huge motivator.”

Another woman reported that the more technical addition improved her opinion of health center quality:

“I loved it! I felt like Taybeh was such an advanced, high-tech clinic. My husband was like ‘Here you go, someone is on the phone for you,’ when you girls called [with the interview request]. And then he checked his messages and told me that there was a text for me from the clinic. I was very impressed by it all.”

3.3.4. Gendered Technology Practices Impede Effectiveness of SMS Reminders in Practice

Despite enthusiasm on behalf of the interviewees, most female participants were not the original recipients of the reminder. Of the 11 caregivers who recalled an SMS reminder, 7 remembered being told by their husbands, whose phones were registered with the health center. Two participants indicated that widespread female cell phone ownership is a recent arrival in Taybeh’s catchment area. “When we registered this number, I didn’t have a cell phone because women didn’t really carry a cell phone back then,” one explained. “Only recently did women start to carry cell phones so my number never got registered with the clinic.”

3.3.5 Time-Delay Response to SMS Reminders

As per historical policy at Taybeh health center, SMS reminders were issued on a weekly basis to all patients who were at least a week late for a particular immunization. Of 106 total reminders issued between June 1 and August 6 2014, 85 were functional (15 numbers were out of service, and at least six numbers were incorrectly entered into the e-Health system). Patients with functional phone numbers who did not return to care within one week were issued subsequent weekly reminders until they met the appointment. Prior to August 6, 66 of these 85 patients returned to care; a paired comparison of delays prior to the first SMS reminder and days after the first SMS reminder prior to return to care is portrayed in Figure 3.

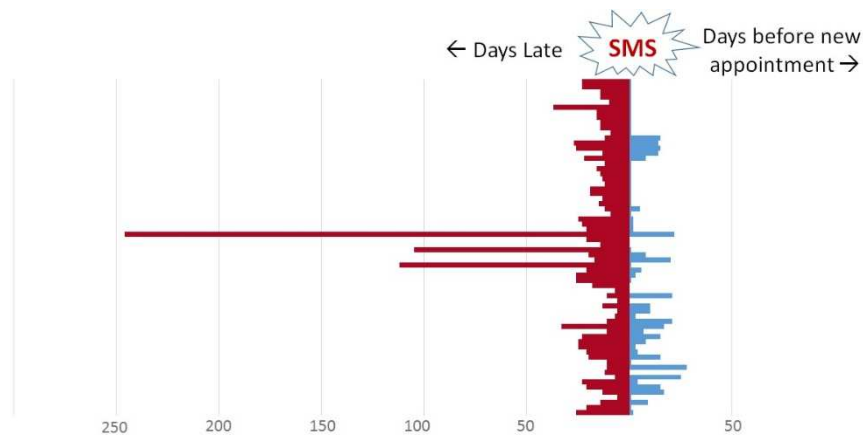


Figure 3 A paired comparison of patient immunization delays prior to the first SMS reminder and days after the SMS reminder prior to return to care.

The 77% of patients who returned to care were a median of 16 days late prior to the SMS reminder and were vaccinated a median of 1.5 days after the reminder was issued. These reminders included all children scheduled for vaccination during the field

study period and were not limited to those receiving the BCG and combination vaccines.

In this data set, reminder response time is not linked to dose number.

4. Discussion

While prior work has examined the impact of Ramadan on particular costs and particular appointments, none have addressed the possible impact on a broad scope of basic preventative public health services such as vaccinations. While short-term delays may not necessarily be clinically relevant, the administrative complications that arise from swarms of patients before and after the holiday, and the underutilized clinical resources throughout, indicate a form of allocative inefficiency.

Data obtained largely in support of the original hypotheses regarding Ramadan and dose date and align with the published literature. Furthermore, information from the interviews reinforces the quantitative data, especially regarding increased risk of missed appointments during Ramadan, a potential gender-based risk factor, and the complications of tracking more distant appointments as children age.

4.1 Implications for policy and practice

One of the most practicable and easy to implement recommendations identified by this study is the need to update patient phone numbers regularly. Phone numbers on record at the clinics were overwhelmingly owned by husbands, whereas wives were overwhelmingly responsible for managing clinic childcare. Aligning these nodes is necessary to maximize the practical efficiency of any expansion of SMS reminders. This could be conducted by having health center clerks ask for contact numbers at initial

check-in and updating the records immediately in eHealth much as is done in most American doctors' offices.

A second UNRWA-wide policy that might be considered is adjusting system-wide clinic hours during the month of Ramadan in the opposite direction of which they are currently adjusted. While staff absenteeism was not assessed in this study, it is possible that staff attendance and timeliness were also impeded. Working around widespread cultural schedules – and being available for services when patients are awake – may improve immunization rates during this period as well as reduce unnecessary costs.

Finally, patient responses to simple outreach through SMS reminders seemed to drastically improve patient impressions of occasionally frustrating clinical services. Enthusiasm for a seemingly personal touch – even if automated – may do well to improve patient and broader population perceptions of the agency in challenging times.

4.2 Implications for further research

Further research on risk factors for missed appointments might move beyond single-factor comparisons to create a predictive model by which to assess the probability a particular patient will be late for an appointment given a set of relevant demographic factors. The consistent difference in immunization delays by child gender in particular, especially when combined with information from interviews, suggests that this difference may be significant with a larger sample size or may be emergent as

appointments are spaced further from birth. Though only two patients mentioned patient tribal affiliation as a relevant factor, this might also reflect underlying disparities in health access (though it is not tracked in e-Health system), which may prompt UNRWA to alter outreach practices. A more thorough investigation of patient gender, tribal affiliation, and immunization noncompliance at UNRWA clinics may be an interesting topic for future research.

Further research on the utility of SMS-based reminders for this particular population might include a cost-benefit analysis of issuing SMS reminders before appointments, rather than only to late patients after-the-fact. This might be done by selecting patients who meet certain risk factor thresholds and pinpointing the criteria at which the costs of delays outweigh the costs of sending messages.

It would also be useful to see whether the same risk factors hold in other UNRWA-managed clinics - particularly in different countries and occupied territories – prior to expanding any SMS reminder thresholds based on those criteria beyond Jordan. Clinical practices, including mechanisms of contacting patients after missed appointments, may vary in ways that might render an automated appointment reminder mechanism more or less useful.

4.3 Study strengths and limitations

One unique strength of this study relative to other studies of the UNRWA patient population is the integration of database-level patient information from

headquarters with frank patient interviews. Other projects witnessed by the researcher tended to use male agency higher-ups from headquarters as translators, with no informed consent procedures. Conducting a study using translators unaffiliated with the agency, particularly women closer in age to the subjects, may have produced perspectives more reflective of reality. Furthermore, tracking a cohort over time provides for internal consistency and more reliable comparisons.

First among the limitations of this study is that the interviews were coded by just one researcher. Two translators were utilized across the 13 interviews, with very different interview styles and slightly different verbal patterns. One translator was audibly detectable as a resident of a geographic location undergoing extreme conflict during the course of the study, and wide public knowledge of an infectious disease outbreak in that location may have biased responses on the importance of immunization, as might have the simple fact that the interview was conducted in a health center.

Quantitative data was derived from electronic medical records rather than from first-hand observation. While generally accurate with regard to appointment dates and child gender, information in e-Health on maternal education and sibling number has historically been prone to error. While the ultimate quantitative sample size included over 300 time-point observations for vaccination, a power trade-off with the number of terms variables used to explain these observations limits the number of potentially

useful terms. This study also did not track caregiver age, which may be a relevant factor in appointment compliance, especially as the catchment population includes a number of young mothers.

Importantly, positive responses in the interviews regarding the utility of SMS reminders are likely influenced by the fact that interviewed patients were limited to those who returned to care in response to the SMS reminders. The sample size for interviews was much smaller and therefore vulnerable to capturing or inflating the perspectives of people with stronger opinions or more free time. Conducting interviews during Ramadan may have further limited sample size due to individual physiological constraints. Furthermore, a broader swath of interviews – perhaps conducted at a time other than a lengthy cultural holiday – might provide more diverse and more energetic perspectives on clinic performance and unmet need identification.

Finally, all conclusions are of limited generalizability. Patient consensus regarding clinic operating efficiency, for instance, varied significantly throughout health centers in Amman. This was obvious from the responses of some patients in interviews, one of whom for instance considered a standard 2-hour wait as outlandish relative to his old clinic and another who considered it far preferable to the one she had moved from.

5. Conclusion

In spite of perceived superiority relative to Jordanian public clinics, UNRWA-managed health centers experience long wait times exacerbated by missed patient appointments. Furthermore, an influx of new refugees with lower population vaccination rates has increased the importance of timely routine vaccination for maintaining herd immunity among Palestinian refugees in Jordan, who may be more likely than native Jordanians to encounter unvaccinated individuals due to similar socioeconomic status.

Combined with single-agency clinical control, the demonstrated significantly increased risk of childhood immunization delays during Ramadan and for doses further from child date of birth provides ample opportunity for small policy shifts to improve childhood immunization rates among Palestinian refugees in Jordan. Shifting clinic hours during Ramadan, improving patient phone records, and strategically issuing mobile reminders for high-risk patients in advance of appointments emerge as low-risk nodes for improvement.

Appendix A: Childhood Vaccination Schedule, Jordan

Vaccination Type	Scheduled for...after birth
BCG	1 week
IPV, OPV, DPT, Hep B, HiB Dose 1	2 month
"" Dose 2	3 months
"" Dose 3	4 months
Measles	9 months
DPT, OPV, MMR	15 months

Appendix B: Risk Factor Variable Set

Variable	Description
Patient ID	Patient ID assigned by URNWA IT system
Maternal Education	Categorical; illiterate, primary, middle school, high school, or university
Older Siblings	Numerical; number of older siblings
Gender	Categorical; male or female
Ramadan	Binary; was Ramadan in session during the scheduled BCG vaccine?
BCG Scheduled Date	Date of scheduled BCG immunization
BCG Actual Date	Date of actual BCG immunization
BCG Delay	Numerical; delay between scheduled and actual BCG immunization, in days
Group Dose 1 - Scheduled Date	Date of scheduled immunization for dose 1 of the IPV, OPV, Hepatitis B, and HiB vaccines
Group Dose 1 - Actual Date	Date of actual immunization for dose 1 of the IPV, OPV, Hepatitis B, and HiB vaccines
Group Dose 1 Delay	Numerical; delay between scheduled and actual Dose 1 immunization, in days
Group Dose 2 - Scheduled Date	Date of scheduled immunization for dose 2 of the IPV, OPV, Hepatitis B, and HiB vaccines
Group Dose 2 - Actual Date	Date of actual immunization for dose 2 of the IPV, OPV, Hepatitis B, and HiB vaccines
Group Dose 2 Delay	Numerical; delay between scheduled and actual Dose 2 immunization, in days
Group Dose 3 - Scheduled Date	Date of scheduled immunization for dose 3 of the IPV, OPV, Hepatitis B, and HiB vaccines
Group Dose 3 - Actual Date	Date of actual immunization for dose 3 of the IPV, OPV, Hepatitis B, and HiB vaccines
Group Dose 3 Delay	Numerical; delay between scheduled and actual Dose 3 immunization, in days

Appendix C: Caregiver Interview Guide

This survey instrument was used to assess patient perception of barriers to immunization access and will be provided to mothers who missed their child's appointment by at least 1 week.

(If administered during Ramadan, ask questions 1 & 2. If not, skip to question 3)

1. What is your typical schedule like during Ramadan?
 - Is this different from your normal schedule?
 - If so, how?
 - Do you feel more or less stressed than usual? Why?
 - Have you been feeling tired lately? (To indirectly assess fasting)
2. How do you go about standard chores, such as doing laundry or shopping, during the holiday? Is it easier or harder to find time?
3. How many times per year do people in your family come to the clinic?
4. When during the year is the clinic busiest? When is it least busy?
5. You were a few days late for [child's name]'s vaccine. Was there any reason for this?
 - [Probes here should vary significantly depending on the answer. For example, a response of "I forgot" should be met with probes on how the mother keeps track of her schedule, kid's activities, etc.]
6. How many children do you have? Does [child who missed appointment] have any older siblings?
7. Do you remember receiving a text message reminding you about your appointment after the original day passed? If not, do you know if a different phone owner in your family received a text?
 - Compare to reminder status in records to assess whether a number registered with the patient was sent a reminder message
8. Do you know anyone who has had measles or mumps?
9. How do you think most people you know feel about vaccines?
10. How could the clinic do a better job of addressing your family's needs?
11. How many years did you attend school?

12. Who in your family has the cell phone registered with the clinic?

13. Who in your family schedules health appointments for your children?

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