# Connecting Communities of Need with Public Health: Can SMS Text-Messaging Improve Outreach Communication?

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## Abstract

*Communities of need face many health crises and often rely on our public health system or their community-based organizations for help in lieu of medical practitioners or clinics. These same communities also turn to affordable cell phones in lieu of landlines for mobility, and cost savings. Public health practitioners and community practitioners who provide local services find ongoing communication with these individuals in communities of need, can be a challenge and raises our research question:. Can SMS text-messaging be used as an affordable means to improve outreach communication and disseminate information between community practitioners? A field study of 50 participants was conducted to collect communication protocol responses through an SMS text-messaging simulation. The web-based training application presented a crisis scenario and plain language training. The findings of this study suggest potential use of SMS text-messaging as a communication medium for exchange between field practitioners. A contribution of this research is the data collection in a community setting for analysis in bridging the digital divide where affordability is a limitation.*

***Keywords:*** *Public health, public health, SMS text-messaging, emergency response, culture, mobile technology, communities of need.*

## 1. Introduction

Community-based organizations are challenged when communicating with underserved populations in between meetings or when needs are specific to an individual. Small grassroots organizations with limited resources face the greatest challenges when using information communication technologies (ICT) to meet outreach objectives. Communication between community practitioners working in the field is needed, in addition to communication between community practitioners and individuals from underserved populations. Mobility and affordable ICT show promise for these communities of need. Affordable information and communication technologies are bridging the connectivity gap at the root of the digital divide [1]. Developing nations show an exponential increase in cell phone usage to that of landlines with Africa at a 2-1 ratio. Kamel [1] cites "the potential of mobile phones to disseminate news, medical information, education, and emergency services to vast numbers of underserved people in poor, rural areas and calls this promise a real revolution" [2]. The World Information Society Report notes "Given that mobile is now the main form of voice communications, mobile tariffs are a key measure of affordability for consumers" [3].

Cell phone technology also benefits low-income populations. Low-income populations often work more than one job and find themselves away from home for longer periods of time. They may only be reachable through a cell phone. A cell phone may be a more permanent means of contacting an individual than a landline or permanent address. This provides an opportunity for practitioners to maintain contact. The flexibility and portability of a cell phone offers benefits, such as text messaging and voice mail. Leveraging low-cost cell phone technology with effective communication strategies presents options for health and well-being initiatives while increasing preparedness for emergency response.

A baseline for communication e-readiness is needed for citizens and community-based practitioners alike who extend from the public health system. To-date limited research has placed emphasis on communication protocols between practitioners or practitioners to citizens (Figure 1). This research begins with communication between community practitioners. The participants in this study have varied cell-phone usage levels. All participants use a

cell phone, but may or may not use SMS text-messaging. Supporting theories of this research revealed SMS text-messaging as a lowest-common denominator for reliable mobile communication [4]. In the Public Health domain, the lack of resources and need for training was also identified [4] [5].

A field study of over 50 participants who respond to community needs was conducted and raises the question "Can SMS text-messaging be used as an affordable means to improve outreach communication and disseminate information between community practitioners?" Communication protocol responses were collected through a web-based application that simulates SMS text-messaging. The role presented to the study participant was that of a community practitioner from a small grassroots volunteer organization. The targeted task was helping communities prepare for an upcoming storm. The study participant was prompted to respond to six events taking place during an upcoming storm notification.

This paper discusses the use of SMS text-messaging as a low-cost communication enabler for community outreach. The emphasis is on the ability to exchange short, clear and concise two-way SMS text-messages and is based on a field study conducted in Spring 2007. Section one of the paper outlines the need and focus within communities of need. Section two provides a literature review of mobile technologies, and the public health sector. Section three discusses an instructional strategy to increase communication between community practitioners as a baseline before extending to the individual within the community of need. Section four discusses study findings. Section five discusses ongoing research and the proposed contribution of this research in communities of need when leveraging mobile information technology.

## 2. Community Response

Mobility and information communication technology (ICT) extend the community of need landscape. Ease-of-use introduced by mobile technology vendors allows the user to readily utilize a mobile device. These plug-and-play devices by default cause the user to bypass training. The use of standards to maximize the efficient device usage is not normally a consideration either. Internet and cell phone use (i.e. mobile wireless technologies) have become as common as a land telephone line with mobile phones, exceeding 100 percent of the population in some countries [3], offering promise as an interoperable communication low-richness device. SMS text-messaging is one low-cost mobile device option that offers an affordable written communication protocol that has witnessed increased use, both as a mass-media broadcast method and for alerts of small inclusion criteria [5][6][7].

SMS text-messaging is a form of written communication that exchanges packets of information between information communication technologies [8]. SMS text-messaging has an exchange limit of 160 characters per message and takes practice to maximize the message content.

Crisis situations can initiate the need for response from hundreds of people, who are from different organizations and who need to freely exchange information, or delegate authority placing emphasis on where people focus and on what resources are expended as a critical problem [24][25]. Crisis situations also remind us how important communication between practitioners can be. Surveillance mechanisms from public health systems are one source that triggers alerts for resources in a community [24]. Interoperability limitations due to low-resources and training protocols impact many community practitioners, namely small grassroots organization volunteers that extend from public health and humanitarian relief agencies. Grassroots organizations in local geographic areas are comprised of local people working together to find solutions in their communities [26]. These practitioners are trained for their organizational position, but often lack ICT specific training due to limited financial resources as mentioned by the Institute of Medicine [21].

Communities of need face more barriers than self-sufficient communities and turn to outreach services associated with the public health system for help. Outreach services may include faith-based organizations, youth councils, and culture-based organizations were resources are limited and the use of technology is compromised. Multicultural populations often speak a primary language other than English and within these languages, different dialects and slang are present. Training these individuals with clear and concise dialogue exchange even in their native language holds promise for both proactive health-related needs and emergency preparedness.

The increased health-related crises of our nation include: daily health and well being crises (i.e. obesity, diabetes, mental health, and injury), disease outbreak (i.e. West Nile and SARS); and bioterrorist induced events (i.e. anthrax and smallpox). Early and reliable detection of health crises and reliable detection for the prevention of injury are essential, not only for the best possible response and treatment, but also for economic reasons [27][28].

## 2.1 Plain Language Use

Clear and concise communication exchange is essential to convey critical information practitioners need to act upon. The use of plain language can assist with clear and concise communication. Plain language for this research is best defined as clear, straightforward expression, using only as many words as are necessary [22]. It is language that avoids obscurity, inflated vocabulary and convoluted sentence construction. The premise of plain language is to improve accuracy, certainty, and precision [22]. Plain language is being adopted for use with governmental grants and procedures, such as National Institute of Health (NIH). These governmental changes introduce a natural fit to parallel initiatives taking place in Public Health and community outreach.

Plain language provides a written language base for effective communication protocols. Plain language is also becoming a standard [23] for interoperable communication in emergency response. For example, FEMA documents [23] state that plain language must be used with interoperable communication systems (enabling fire, police, EMS/medical to collaborate).

Plain language can assist communication between community practitioners for routine use. The use of plain language can also extend from community practitioners to citizens they assist in a community.

## 2.2 Successful One-Way Text-Message Efforts

To-date SMS text-messaging for crisis response has been used primarily as a one-way mass media alert notification. "There is no doubt SMS has the ability to save lives in an emergency [18]." As mentioned in the Strong Angel III press release, in an emergency, messages sent out are very controlled and local media are viewed with some suspicion. The Strong Angel III disaster response training focused on information dissemination recommending practice with the exchange of even a single word of the day across multiple communication mediums..

Two examples demonstrating the one-way exchange of optimal information include: the Lebanon 2006 evacuations and the China 2006 typhoon warnings [29]. In Lebanon, Swedish citizens who were registered with the Swedish mobile network were contacted with five distinct text-messages over four days beginning with a message that evacuations were taking place, followed by additional text-messages with instructions for meeting locations leading to the actual evaluation [5]. Pre-registration with the Swedish mobile network enabled the evacuation process. Similarly, over 18 million messages were sent for the five 2006 typhoon warnings in the Fujian province and coastal city. Such content contained essential information that was a match for the task-technology fit yet served as a vehicle for preparedness. SMS text-messaging for early warning notifications was leveraged due to China's mobile phone penetration, and as the world's biggest population of mobile phone users [28]. The 426 million mobile phone users have surpassed the country's 365 million fixed-line phones, and increased mobile phone use spans beyond the urban consumer to the blue collar workers and farmers in the poor countryside where many villages have no fixed telephone lines but dozens of mobile customers.

These successful initiatives with targeted populations are indicators that SMS text-messaging can be used to convey essential information citizens can act upon. At present, the use of the ICT for community practitioners offers limited research.

## 3. Reaching Communities of Need with Plain Language

Reaching communities of need with health alerts is a challenge when coupled with practitioners working at a distance or from their homes. Mobile technologies can compensate for the communication gap and need for information exchange. Training and practice can assist the communication gap.

Plain language training and ongoing use with SMS text-messaging is one option that can improve communication for community practitioners working in the field. Collaboration between community practitioners who work in the field can assist individuals requiring public health assistance is also an ongoing need. Protocols (procedures) that relate to public health objectives can be established to assist community practitioners, increasing e-readiness. Once protocols are in place between community practitioners, protocols can be established between community practitioners and the citizens they assist.

At present the literature does not reflect any domain specific applications related to mobile communication exchange practices either between organizations or within organizations (Figure 1) in public health or grassroots (community) organizations. However, the increased initiatives related to Homeland Security now extend into public health and community outreach.

This research introduces protocols and basic communication tactics hypothesized to improve preventative care (preparedness). A crisis scenario was selected due to the "commanding nature"

initiated in a crisis response effort. The setting presented supported a response action that was realistic to the community practitioner role. Direct application with response tactics and the type of role the community practitioner can play in a crisis that extends beyond 911 or 112 emergencies and until external specialty teams or disaster relief agencies arrive is known to occur. However, the challenge of finding ways to increase usage through everyday needs in local communities remains. Establishing practice and routine protocols for reminders and health alerts benefit communities of need, and can also increase preparedness for emergency response.


**Figure 1. Interaction between practitioners to address citizen needs.**

Practice to increase use of mobile technologies including SMS text-messaging can assist community practitioners working in the field. Establishing a baseline and protocols for practitioners before training is provided to citizens is proposed to increase e-readiness overall. Public Health in the 21st Century and initiatives, such as Healthy People 2010, depend on multiple technologies for information delivery and communication [19][21]. On-going research identified in the Public Health Sector [21] notes:

- Supporting the critical role of preparing public health professionals to function effectively improving population health.
- Increasing Internet and email access and usage by state and local agencies.
- Teaching employees how to apply the use of information and data to public health practice.

At the time of this study, no baseline data was available for two-way mobile communication exchange. Therefore, a phased approach was introduced. The first step was to develop a training application to introduce a crisis scenario relevant to community practitioners. The second step introduced three pre-training tasks. The third step introduced three post-training tasks. The tasks were introduced as the crisis scenario progressed, capturing a communication response for each task prompt. Before each post-training task, a short audio/video training module was introduced on plain language before asking for a task response. The training modules provided plain language recommendations intended to improve the task response message.

A phased approach provides a baseline for communication exchange responses and writing assessment. The findings can be reviewed with community practitioners to establish best practices among themselves before trying to communicate with citizens in a community. Device usage and availability for use and practice for these practitioners is essential.

## 4.0 A Web-Based Application

A web-based training application that introduces plain language communication protocols was developed for this study and was also pilot-tested. An SMS text-message cell-phone simulation and communication protocol exchange within a crisis scenario are the context for the training application. The web-based training application follows usability protocols and applies a procedural writing discourse. To achieve a two-way message exchange, task prompts were provided using “personas”. A persona assumed the role of a command and control coordinator and mitigated the task responses for the study participant. The simulated “command and control coordinator” exchanged communication with the study participant to achieve a sender/receiver communication exchange dialogue.

Each study participant performed six tasks for one continuous crisis scenario. For training purposes, the study participant assumes the role of a community practitioner (Action Team Volunteer), who is communicating with a command and control coordinator (Action Team Coordinator). The practitioner is a person who is taking action in a local community, based on an alert notification. The premise is to provide a context rich enough to capture the complex written transactions in the context of SMS text-message training for crisis response. The context allows for observation and analysis of crisis scenario tasks when introduced through multimedia training.

To assess communication exchange and the potential for communication protocol improvement, the six tasks introduced to each study participant were

divided into pre-training and post-training measures. The first three tasks were used to assess pre-training communication responses. The final three tasks introduced a short plain language training module before each task. The training materials were created based on the plain language initiative [23]. The training modules were designed by leveraging plain language [23] training which is now being introduced for interoperability in crisis management.

## 4.1 Study Findings for Discussion

A field study of 50 participants (Table 1) was conducted to collect communication protocol responses through an SMS text-messaging simulation. Participation was voluntary and initial emails were distributed to solicit participation from community volunteers and also to solicit participation from emergency response practitioners.

Participation in this study was accomplished through an Internet browser from the participants own machine. Because the application was accessible through the Internet, this study was able to reach participants from six states and two countries allowing for a broader sample distribution that contributed to an initial baseline.

The web-based training application presented a crisis scenario and plain language training. The study participant assumes the role of a community practitioner from a small grassroots volunteer organization for the training application. The scenario unfolds with a series of six tasks that help communities prepare for an upcoming storm.

## 4.2 Study Participants

Emergency response practitioners were included in the 50 participant total of the study to establish a baseline for field communication in crisis situations. As noted in Table 1, there was equal participation by gender. Participant age participation resembles the current age range for community practitioners in the crisis management domain with 70% of the participants between 35-64 years of age.

**Table 1. Study Participants (N=50)**

| Question | Categories | Total N | Percentage |
|---|---|---|---|
| **Gender** | Female | 25 | 50.0% |
| | Male | 25 | 50.0% |
| **Age** | 18-34 | 11 | 22.0% |
| | 35-49 | 18 | 36.0% |
| | 50-64 | 17 | 34.0% |
| | Over 65 | 4 | 8.0% |
| **Role relating to crisis response** | Community Volunteer | 15 | 30.0% |
| | Practitioner with Crisis Response Responsibilities | 16 | 32.0% |
| | Academic Researcher | 2 | 4.0% |
| | Student | 4 | 8.0% |
| | None | 10 | 20.0% |
| | Other (please specify) | 3 | 6.0% |

In comparing the six categories of participant roles: 1) community volunteer; 2) practitioner with crisis responsibilities; 3) academic researcher; 4) student; 5) none; 6) other to the recruitment predictions; it can be noted that the role for community volunteers remains in need of identification for self-categorization.

For this study, a comparison of cell phone use for job related activities is compared to personal cell phone use (Table 2). The most noticeable frequency of cell phone use was “several times a day” for both

work and personal use with a total of nineteen study participants. In comparing the cell phone for personal use "several times a day" to "a few times a week" for job related activities, there were a total of eight study participants combined. Participants using a cell phone "several times a day" for personal use and "less than once a month" for job related activities were a total of five. In most cases, cell phone use is greater for personal use than job related activities indicating that use for community practitioners working in the field could be increased. What remains an open issue and was outside the scope of this study was the reason why a cell is not used more frequently for job related activities. Is an alignment of job activity and the technology needed or is cost for the use of the cell phone a factor.

**Table 2. Personal Cell-Phone Use comparison to Job Related Cell-Phone Use**

| Frequency of Use (cross tabulation) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Personal Cell-Phone Use | Job Related Cell-Phone Use | | | | | | Total |
| | About once a day | Several times a day | A few times a week | Less than once a month | Once a month | A few times a month | |
| About once a day | 3 | 2 | 1 | 3 | 0 | 1 | 10 |
| Several times a day | 2 | 19 | 8 | 5 | 0 | 1 | 35 |
| A few times a week | 0 | 1 | 2 | 0 | 0 | 0 | 3 |
| Less than once a month | 1 | 0 | 0 | 1 | 0 | 0 | 2 |
| Once a month | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| A few times a month | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 6 | 22 | 11 | 9 | 0 | 2 | 50 |

Overall 46% (23 participants) of the study participants currently use SMS text-messaging. Job related cell phone users (Table 3) whose use is high (several times a day) constitute about 44% (22 participants) of the study participants. However, only 20% (10 participants) of the study participants use SMS text-messaging for job related activities.

**Table 3. Job Related Cell-Phone Use comparison to Text-Messaging Use**

| Frequency of Use (cross tabulation) | | | |
|---|---|---|---|
| Job Related Cell-Phone Use | Text-Messaging Use | | Total |
| | Yes | No | |
| About once a day | 4 | 2 | 6 |
| Several times a day | 10 | 12 | 22 |
| A few times a week | 6 | 5 | 11 |
| Less than once a month | 3 | 6 | 9 |
| Once a month | 0 | 0 | 0 |
| A few times a month | 0 | 2 | 2 |
| Total | 23 | 27 | 50 |

Table 4 provides findings on personal cell phone use in comparison to text-message use. Personal cell phone users whose usage is high (several times a day) constitute about 70% (35 participants) of the study participants. However, only 34% (17 participants) of the frequent cell phone users, also use SMS text-messaging. Personal use of SMS text-messaging is 14% higher than job related use of SMS text-messaging. Frequency of use overall and text-messaging based on the study findings reflects that the majority of text-messaging users are also frequent cell phone users and is an indicator that increasing overall cell-phone use for community practitioners may increase e-readiness prompting a closer analysis of task response evaluation.

**Table 4. Personal Cell-Phone Use comparison to Text-Messaging Use**

| Frequency of Use (cross tabulation) | | | |
|---|---|---|---|
| Personal Cell-Phone Use | Text-Messaging Use | | Total |
| | Yes | No | |
| About once a day | 5 | 5 | 10 |
| Several times a day | 17 | 18 | 35 |
| A few times a week | 1 | 2 | 3 |
| Less than once a month | 0 | 2 | 2 |
| Once a month | 0 | 0 | 0 |
| A few times a month | 0 | 0 | 0 |
| Total | 23 | 27 | 50 |

## 4.3 Task Response Evaluation

In this study, each task response for each study participant was coded (Table 5). A total of 300 responses were collected (N=50 x 6 task responses). The coding scheme used for the results represented in Table 5. The codes were assigned by the researcher of this study and leverage writing assessment coding. About 20% of the results were externally reviewed by two field experts working in emergency management with training and preparedness exercises.

**Table 5. Initial Response Codes Assigned**

| Response Code | Response Level | Criteria Used |
|---|---|---|
| 1 | Low | Participant response did not answer both prompts for the task. |
| 2 | Low-medium | Participant response did not convey situational information. Participation response included ambiguity or uncertainty. |
| 3 | Medium-high | Participant response answered both prompts with some situational information or mixed verb tenses or content causing confusion. |
| 4 | High | Participant response answered both prompts with essential situational information. |

The communication episodes consisted of parallel pre-training and post-training tasks (Table 6). Task complexity was also determined. The communication episodes were also paired between pre-training and post-training tasks as noted in the communication episode column of Table 6.

**Table 6. Communication Episodes**

| Communication Episodes and Tasks | |
|---|---|
| **Communication Episode** | **Task Complexity** |
| 1 and 3 | Medium |
| 2 and 4 | High |
| 2b and 5 | Low |

A total of six tasks (Table 7) were performed by each study participant. Three tasks were pre-training (tasks 1, 2, 2b) and three tasks were post-training (tasks 3, 4, 5). Task response code (Table 5) is a 4 level code assigned for writing assessment that looks at the content of the task response [4].

**Table 7. Communication Protocol Improvement** (Pre-training/Post-training Comparison)

| | Independent Sample T-Test | | | | | |
|---|---|---|---|---|---|---|
| **Task Response Level** | **Mean** | | **Standard Deviation** | | | |
| | **PreTrain** | **PostTrain** | **PreTrain** | **PostTrain** | **t** | **p** |
| Paired Tasks 1 & 3 | 3.02 | 2.94 | .87 | .91 | .65 | .522 |
| Paired Tasks 2 & 4 | 3.06 | 3.56 | .94 | .13 | -3.63 | .001** |
| Paired Tasks 2b & 5 | 2.36 | 3.32 | 2.36 | 3.32 | -4.45 | .000*** |

* p< .05
** p< .01

The mean between pre-training and post-training paired tasks reflects significant improvement with the exception of the first paired task (1 &3). This may have occurred because task 1 begins the event and simulation was through email instead of text-messaging.

The data analysis indicates the lowest level task was the one showing the greatest significance at (.000, p<.001). The task with the highest task complexity also showed significance at (.001, p<.01). The task of medium complexity did not show significant change.

The reason the improvement may be less is that task 1 that began the scenario was a task using email. All remaining tasks for the training application use a cell phone simulation that is not as

familiar to most. Changing from email for task 1 to the task 3 (paired task) cell phone task with one module of training may account for the lower significance. Email is recognized for fluency rather than syntactic language. It should also be noted that when reviewing a sample of responses with the field experts for validation, the field experts found it was difficult to rank (assign a response code level) to task 5, noting that there is really no difference for the majority of responses because the essential information contained in the task response.

Overall, the findings based on task response level are indicators that with some training, study participants do improve the content of their communication exchange. It should also be noted that for this study, training was only introduced with a plain language objective. The study findings and also expert reviewers input reflected that training for "context" in crisis response could also improve communication exchange.

## 5. Conclusions and Future Research

The goal of this research was to identify and assess scenarios that strengthen the communication exchange between the community (public health) practitioners and the individuals in our communities of need. Low-cost mobile solutions are our focus due to the financial limitations of both community organizations and individuals of these communities of need. In addition, mobile devices and the use of SMS text-messaging complement the transient lifestyle between long hours of work to frequent changes of residence.

This research proposes to extend the use of information technology into communities of need by showing where affordability of information technology can serve as an enabler for these communities to begin collaboration. The use of low-cost technologies as a lowest-common denominator and as a vehicle to establish e-readiness offers an initial step in bridging the digital divide for these communities. Moreover, this research seeks to develop a communication protocol to aid the dialogue and two-way information exchange between two practitioners within a community. A contribution of this research is the study participants in a community setting that assists in bridging the digital divide where affordability is a limitation.

The data collection from the study contributes to the need for an initial baseline for ICT e-readiness aimed to help communication protocols of small grassroots practitioners. Two additional contributions of this research include a means to: 1) identify if SMS text-messaging content can improve through training as a basis for e-readiness; and 2) advance the role of mobile ICT for community practitioners in crisis management contexts. The ultimate goal of this research is to develop a model for communication training and practice protocols, as new mobile technologies are introduced to increase mobile communication readiness, which is needed for communication exchange between community practitioners.

Participant profile was a focus of the pre-training survey, with emphasis on cell-phone and SMS text-message usage. Increasing work hours and aggregating a second job have people away from the home for longer periods of time. Leveraging cell phones for follow-up reminders, health-related alerts, and for workshop offerings promotes not only a sense of community, but offers a stronger connection across our communities of need.

As part of the web-based training application, a pre-training survey placed emphasis on current usage patterns of these communities, identifying frequency of cell phone use and how often the cell phone is carried with them in their daily life. However, one limitation of this study is that affordability of the device (calling plan) was not determined and therefore we cannot conclude that lack of use for job related activities or increased personal use are related to cost. Moreover, we do not know if cost were not a limitation, would the percentage of frequent users be the same.

The next steps for this research are to repeat the study with minor adjustments, but focusing on one group of community practitioners with some regular ICT usage experience and routine job related needs to increase practice. Obtaining additional information on affordability for job related use should be part of the next study. Providing training and thereafter extending the training to practice in the everyday life of a practitioner would be a subsequent step after training. Like groups of community practitioners are beneficial for a future research study. A feedback loop process should also be included when measuring practice and content.

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