Exploring Whether Wireless Emergency Alerts Can Help Impede the Spread of Covid-19

Hamilton Bean
University of Colorado Denver
1201 Larimer Street, Denver, CO 80217 USA

Nels Grevstad
Metro State University of Denver
890 Auraria Pkwy, Denver, CO 80204 USA

Alex Koutsoukos
University of Colorado Denver
1201 Larimer Street, Denver, CO 80217 USA

Abigail Meyer
University of Colorado Denver
1201 Larimer Street, Denver, CO 80217 USA

Abstract: This study offers a preliminary exploration of whether state-level (N=6) and local-level (N=53) Wireless Emergency Alert (WEA) messages might contribute to impeding the spread of Covid-19 in the United States. The study compares changes in reported rates of infections and deaths between states and localities that issued WEA messages in March and April of 2020 with states that did not. Small sample sizes and differences in the rates of Covid-19 spread prohibit robust statistical analysis and detection of clear effect sizes, but estimated effects are generally in the right direction.

Keywords — Covid-19, mHealth, mobile technology, risk communication, Wireless Emergency Alerts,

SUGGESTED CITATION: Bean, H., Grevstad, N., Koutsoukos, A., & Meyer, A. (2021). Exploring whether wireless emergency alerts can help impede the spread of Covid-19. *Proceedings of the International Crisis and Risk Communication Conference, Volume 4* (pp. 33-36). Orlando FL: Nicholson School of Communication and Media. <https://doi.org/10.30658/icrcc.2021.08>

INTRODUCTION

Evidence supporting the efficacy of mobile alerting for Covid-19 is now beginning to emerge. While no nationwide mobile alert was issued in the United States, this study explores preliminary evidence that state-level (N=6) and locality-level (territory/county/municipal) (N=53) Wireless Emergency Alert (WEA) messages might contribute to impeding the spread of Covid-19. States included Colorado, Maryland, Michigan, New Mexico, South Carolina, and Florida. Localities ranged from locations such as “Cook County, IL,” to “Areas of Manatee County, FL,” to “Areas of City of Malibu, CA.” to “Areas of UT, AZ, and NM” (Navajo Nation). Although the U.S. WEA system is used primarily for issuing severe weather warnings (i.e., for tornado, flood, snow squall, etc.), messages are also issued that can help protect lives and property for various types of hazards (fire, industrial accident, drinking water contamination, etc.). As of 2020, “pandemic” has been added to the list of hazards for which WEA messages are issued. Research concerning the use of WEA messages to warn at-risk publics typically focuses on correlations between message attributes (i.e., source, hazard, guidance, timeframe, location, style, and map and URL inclusion) and recipients’ interpretations (i.e., comprehension, belief, and personalization) and behavioral intentions and actions (i.e., protective action decision-making and response) [1], [2], [3], [4], [5], [6], [8]. By contrast, this study explores a novel set of correlations: changes in reported rates of Covid-19 infections and deaths between states and localities that issued WEA messages in March and April of 2020 with states that did not. We situate our exploratory study in the context of public warning and mobile health communication

ISSN: 2576-9111

© 2021 Copyright is held by the owner/author(s).

Publication rights are licensed to ICRCC.

<https://doi.org/10.30658/icrcc.2021.08>

(“mHealth”) research and describe the purpose and operation of the WEA system. Following a discussion of our research questions and methods, we summarize statistical model comparisons between states and localities that issued WEA messages in March and April of 2020 and states that did not. We conclude with several ideas for “next steps” stemming from our analysis.

LITERATURE REVIEW

A research arena associated with mobile public warning research is mHealth (mobile health communication), defined as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices” [7]. mHealth technology allows for “place-shift” so that people can receive health messages when they are not able to easily access mass media (e.g., radio, television, or the internet). mHealth messages can also reach publics when they are most amenable to behavior change, such as when they need to take an immediate protective action to keep themselves and their loved ones safe from harm. mHealth messages delivered via the WEA system also have the benefit of extensive reach: Most members of the public own mobile devices and typically have them turned on and nearby. The WEA system was not explicitly designed with a pandemic in mind [8]. Although it is still unclear exactly what type of instructional communication within a WEA message is needed to maximize protective action among diverse audiences during a pandemic, mHealth has demonstrated its effectiveness in other contexts. It is important to note, however, that mHealth campaigns typically involve personalized, repetitive, and “opt in” SMS messages, whereas officials typically view cell broadcast WEA messages as an impersonal “bell ringer” designed to alert people located in a large geographic area [8]. Adaptively tailoring WEA messages for smaller communities and frequently issuing them is possible, however, and a few U.S. communities used the WEA system in this way during the onset of the Covid-19 crisis. To our knowledge, this study is the first to explore the efficacy of mHealth-type messages issued via the WEA system during the 2020 Covid-19 pandemic.

The WEA system is a partnership between FEMA, the Federal Communications Commission (FCC), and the nation’s wireless service providers. Launched in 2012, the WEA system is designed to enhance public safety by allowing authorized federal, state, and local officials to send 90-character (recently 360-character), geotargeted, text-like messages to the public’s mobile devices during an emergency. According to the FCC [9], the WEA system is an essential part of U.S. emergency preparedness and been used more than 56,000 times to warn the public about dangerous weather, missing children, and other critical situations. The WEA system is designed to enable officials to send “imminent threat” alerts, as well as AMBER alerts for missing and abducted children. A third type of alert, “public safety message,” became available for alert originators in July 2019 (related messages include recommendations for saving lives and property). A fourth type of alert, a “presidential alert,” allows the President of the United States to send a message to the entire nation (or a portion of it) in the event of a catastrophic disaster, such as a nuclear attack. All four alert types involve a text-like message that appears on the screen of the recipient’s mobile device, accompanied by an audible attention signal and vibration. WEA messages can be issued in English and Spanish, and they may also include an “embedded reference” hyperlink for additional information. The first three types of WEA messages (imminent threat, AMBER, and public safety) can also be “opted out” of, that is, turned off or blocked on one’s mobile device. As of May 20, 2020, scores of emergency management and public safety organizations in each state have earned FEMA’s authorization to issue WEA messages, although some states only have a relative handful of authorized alerting authorities.

The U.S. government has funded the lion’s share of WEA-related research via the Department of Homeland Security (DHS) Science and Technology Directorate’s First Responders Group. There are more than 25 WEA-related research publications listed on the DHS website. The 2018 National Academies report, “Emergency Alert and Warning Systems: Current Knowledge and Future Research,” provided summaries of many of these studies, which range from broad reviews of prior research to narrow measurements of research participants’ heart rates, skin conductance (sweaty palms), and other physiological responses when receiving experimental WEA messages. A synthesis of the research contained in the National Academies [10] report is outside the scope of this study, but it is important to note that its authors concluded that fairly little is known about how to maximize the effectiveness of short alert messages in an information-rich environment. It is important to note that the public warning, mHealth, and the WEA system literature does not anticipate correlating WEA message issuance with disease case rates and death rates, as we do herein. Our study focused mainly on these correlations, but we also explored message completeness and social media response. Space does not permit us to elaborate the latter two analyses herein (please contact the corresponding author for more information).

Because some states issued state-wide Orders, but not statewide WEA messages, we compared states that issued statewide WEA messages with states that did not issue WEA messages but did issue statewide Orders. Also, because some states issued neither state-wide Orders nor WEA messages, we compared the states that issued statewide WEA messages with states that issued neither Orders nor WEA messages. A handful of U.S. localities issued WEA messages (sometimes multiple messages) in March and April 2020. Issuance occurred in states that both did and did not issue statewide Orders or WEA messages. We compared county-level per capita increases in rates of Covid-19 cases and deaths 30 days and 60 days after the first WEA message issuance with states that issued no WEA messages. We recognize that we are comparing counties with states, but we do not have a rationale for picking non-WEA message-issuing counties for comparison. We wanted to see whether Covid-19 case and death rates were lower, per capita, in counties that issued WEA messages

compared with per capita cases and deaths in states that did not.

Group 1: States

Q1: Did the 6 states that issued statewide WEA messages during March or April 2020 see lower per capita increases in rates of Covid-19 cases and deaths 30 days and 60 days after message issuance than the 44 states that did not issue WEA messages?

Q2: Did the 6 states that issued statewide WEA messages during March or April 2020 see lower per capita increases in rates of Covid-19 cases and deaths 30 days and 60 days after message issuance than the 36 states that issued statewide Orders but did not issue WEA messages?

Q3: Did the 6 states that issued statewide WEA messages during March or April 2020 see lower per capita increases in rates of Covid-19 cases and deaths 30 days and 60 days after message issuance than the 8 states that issued no Orders nor WEA messages?

Group 2: Localities

Q4: Did the 53 localities that issued WEA messages during March or April 2020 see lower per capita increases in rates of Covid-19 cases and deaths 30 days and 60 days after message issuance than the 24 states that issued no statewide WEA messages, nor issued any county- or municipal-level WEA messages?

Q5: Did the 4 local communities that issued “complete” WEA messages see lower per capita increases in rates of Covid-19 cases and deaths 30 days and 60 days after message issuance than the 24 states that did not issue statewide WEA messages, nor issued any county- or municipal-level WEA messages?

METHODS

To obtain data for this study, the first author contacted FEMA on April 26, 2020 about its Covid-19 response efforts and was provided with a spreadsheet summary of Covid-19 related WEA messages to date (produced for internal tracking purposes). The FEMA spreadsheet included the WEA issuance data used in this study (available from the corresponding author upon request). The FEMA spreadsheet includes: (a) states and localities that issued WEA messages; (b) issuance date; and (c) the text of the messages sent. To repeat, states included Colorado, Maryland, Michigan, New Mexico, South Carolina, and Florida. Localities specified in the FEMA spreadsheet ranged from locations such as “Cook County, IL,” to “Areas of Manatee County, FL,” to “Areas of City of Malibu, CA.” to “Areas of UT, AZ, and NM” (Navajo Nation). To supplement FEMA’s spreadsheet, the authors integrated data from the Johns Hopkins University & Medicine website and Washington Post coronavirus tracking website including: (a) population figures for states and localities that issued Covid-19 WEAs (and states that did not); (b) date of statewide Covid-19 Order (if applicable); (c) reported Covid-19 cases and deaths on date of WEA issuance; (d) reported Covid-19 cases and deaths 30 days after date of WEA issuance; and (e) reported Covid-19 cases and deaths 60 days after date of WEA issuance. Space does not provide for a description of the statistical tests completed (please contact the corresponding author).

RESULTS

For all five research questions, there is some evidence that WEA messages are effective in lowering Covid-19 transmission rates and growth rates in cumulative deaths, but the observed effects are not statistically significant except in conjunction with the effect of an Order (Q3). The non-significance of statistical test results may be explained by relatively small sample sizes, especially for Q5. The 6 states that issued statewide WEA messages during March or April 2020 saw markedly lower Covid-19 transmission rates and, to a lesser extent, slower growth rates in deaths after message issuance than the 44 states that did not issue WEA messages (Q1). Those observed effects diminish, however, when the non-Order-issuing states are removed from the comparison group. In this case, the 6 states that issued WEA messages (and Orders) saw only slightly lower transmission rates and only slightly slower growth rates in deaths than the 36 states that issued statewide Orders but not WEA messages (Q2). On the other hand, the observed effects of WEAs increase substantially, and become statistically significant, when the Order-issuing states are removed from the comparison group. In this case, the 6 states that issued WEA messages (and Orders) saw dramatically lower transmission rates than the 8 states that issued neither statewide Orders nor WEAs, and they also saw dramatically slower growth rates in deaths (Q3). The 53 counties that issued WEA messages during March or April 2020 saw lower Covid-19 transmission rates and, to a greater extent, slower growth rates in deaths after message issuance than the 24 states that issued neither statewide nor non-statewide WEA messages (Q4). The effects of “complete” countywide WEA messages were even more pronounced. The 4 counties that issued “complete” WEA messages during March or April 2020 saw considerably lower transmission rates and somewhat slower growth rates in deaths after message issuance than the 24 states that issued no WEA messages (Q5).

CONCLUSION

WEA messages do not exist in a vacuum, and it is impossible for us to know what other kinds of messages the members of the communities represented in this study received. Nevertheless, our findings suggest that states and communities should issue Covid-19-related WEA messages in efforts to thwart the spread of the disease. In absence of a widely

available vaccine, communities will need to remain vigilant—and well informed. WEA messages can communicate vital health information and protective action guidance, potentially inoculating recipients from dubious advice proffered via mass media channels and interpersonal networks. Covid-19-related WEA messages should strive for completeness by consistently including the content categories of source, guidance, location, hazard, and timeframe. A reference link should be included to provide additional information that specific community groups may need (i.e., parents with joint custody of children, definitions of “essential,” Order enforcement mechanisms, etc.). Studies of WEA message efficacy are exceedingly rare. As the use of the WEA system expands, health and safety outcome comparisons among groups of people who did and did not receive WEA messages should be conducted. Demonstrating the efficacy of WEA messages across hazards is an important evolution in understanding how to maximize the benefits of mobile technology [8]. However, to repeat, WEA messages do not exist in a vacuum, so parsing out their unique influence within a given communication ecology will be extremely difficult. Finally, there are other factors not explored in this study that may help account for its findings. This study was limited by small sample sizes. The difficulty of determining effect sizes within different geographical areas experiencing different rates of spread, case reporting, and deaths is clear. It may be impossible to delimit a causal, law-like relationship between WEA message issuance and Covid-19 outcomes. Nevertheless, the evidence presented herein suggests that a positive effect cannot be ruled out. To help identify more factors that might explain, support, or challenge our findings, we urge researchers to conduct similar and expanded studies as more communities (both in the United States and internationally) issue WEA, WEA-like, or SMS messages in response to the Covid-19 pandemic.

Author Biography

Hamilton Bean (Ph.D., University of Colorado Boulder) is Associate Professor of Communication at the University of Colorado Denver, hamilton.bean@ucdenver.edu

Nels Grevstad (Ph.D., Perdue University) is Professor in the Department of Mathematical and Computer Sciences at Metro State University of Denver, ngrevsta@msudenver.edu

Alex Koutsoukos (B.A., University of Colorado Denver) is a graduate of International Studies program at the University of Colorado Denver, alexander.koutsoukos@ucdenver.edu

Abigail Meyer (B.A., University of Colorado Denver) is an MA student in the Department of Communication at the University of Colorado Denver, abigail.2.meyer@ucdenver.edu

REFERENCES

- [1] Bean, H., Sutton, J., Liu, B. F., Madden, S., Wood, M. M., & Mileti, D. S. (2015). The study of mobile public warning messages: A research review and agenda. *Review of Communication*, 15, 60-80. <https://doi.org/10.1080/15358593.2015.1014402>
- [2] Bean, H., Liu, B. F., Madden, S., Sutton, J., Wood, M. M., & Mileti, D. S. (2016). Disaster warnings in your pocket: How audiences interpret mobile alerts for an unfamiliar hazard. *Journal of Contingencies and Crisis Management*, 23, 141-142. <https://doi.org/10.1111/1468-5973.12108>
- [3] Doermann, J. L., Kuligowski, E. D., & Milke, J. (2020). From social science research to engineering practice: Development of a short message creation tool for wildfire emergencies. *Fire Technology*, 1-23. <https://doi.org/10.1007/s10694-020-01008-7>
- [4] Kim, G., Martel, A., Eisenman, D., Prelip, M., Arevian, A., Johnson, K. L., & Glik, D. (2019). Wireless emergency alert messages: Influences on protective action behaviour. *Journal of Contingencies and Crisis Management*, 27, 374-386. <https://doi.org/10.1111/1468-5973.12278>
- [5] Kuligowski, E. D., & Doermann, J. (2018). A review of public response to short message alerts under imminent threat. Washington, DC: US Department of Commerce, National Institute of Standards and Technology. <https://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.1982.pdf>
- [6] Sutton, J., & Kuligowski, E. D. (2019). Alerts and warnings on short messaging channels: Guidance from an expert panel process. *Natural Hazards Review*, 20, 04019002. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000324](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000324)
- [7] World Health Organization. (2011). *mHealth: New horizons for health through mobile technologies*. Geneva: World Health Organization. https://www.who.int/goe/publications/goe_mhealth_web.pdf
- [8] Bean, H. (2019). *Mobile technology and the transformation of public alert and warning*. Santa Monica, CA: Praeger Security International.
- [9] Federal Communications Commission. (2020). Wireless emergency alerts. <https://www.fcc.gov/consumers/guides/wireless-emergency-alerts-wea>
- [10] National Academies of Sciences, Engineering, and Medicine. (2018). *Emergency alert and warning systems: Current knowledge and future research directions*. Washington, DC: The National Academies Press. <https://www.nap.edu/catalog/24935/emergency-alert-and-warning-systems-current-knowledge-and-future-research>