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Civilian First Responder mHealth Apps, Interface Rhetoric, and Amplified Precarity

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Our article uses case studies of two civilian emergency response mHealth apps—PulsePoint and OD Help—to theorize the ways the mobile mapping functionality embedded in these tools, which is integrated with the Google Maps platform, enables yet also constrains users' agential practices. Using an interface rhetoric approach, we unpack assumptions related to the embodied contexts of use facilitated by this functionality within the unique scenario of civilian emergency response. We argue that interactions between and among humans and these apps' mapping interfaces involve complex, negotiated, contextually situated enactments, which align with a posthumanist perspective toward agency. At the same time, these interactions may also inadvertently amplify the precarity of vulnerable groups. Better understanding the ways that mobile mapping technologies shape agential enactments, particularly in ways that affect precarious and dispossessed populations, has important implications for the design of mHealth technologies—and the users who rely on them—moving forward.

KEYWORDS: rhetorical agency, interface rhetoric, mHealth apps, mobile mapping, precarity

mHealth Apps, Interface Rhetoric, and Amplified Precarity

Over the past decade, the proliferation of mobile or mHealth tools, such as wearables and smartphone apps, has reinforced and enabled a culture of participatory care, which can in theory better position people to make their own health-related decisions and assist others (Arduser, 2018; Bivens et al., 2018) in life-threatening situations (Bivens, 2019). More recently, the advent of "emergency intervention" apps (see Gaziel-Yablowitz & Schwartz, 2018, p. 151), many of which mobilize bystanders to assist during acute adverse health events, suggests that this trend is carrying over to public spaces and restructuring the ways that users of these tools enact rhetorical agency. For example, the civilian first responder apps PulsePoint and OD Help, which we describe in more detail in the next section, rely on crowdsourcing to alert nearby users who have agreed to provide on-the-scene care during sudden cardiac arrest (SCA) and opioid overdose, respectively.

Research at the intersection of the rhetoric of health and medicine (RHM) and technical and professional communication (TPC) has extensively theorized rhetorical agency (Arduser, 2017; Bellwoar, 2012; Gouge, 2018a; Graham, 2009; Koerber, 2006; Novotny & Hutchinson, 2019) with scholarship on mHealth apps also incorporating this theme (Kirkscey, 2020; Teston, 2016; Welhausen, 2017; Welhausen, 2018). As these tools have continued to rapidly proliferate (see Roess, 2017), some that focus on emergency response rely on mobile mapping technologies (see Merchant et al., 2013; Ringh et al., 2015). Indeed, the mapping interface embedded in PulsePoint and the OD Help prototype, which is integrated with the Google Maps platform, serve as the critical functionality that enables users "to take meaningful action," as TPC scholar Sonia Stephens (2018, p. 281) defined agency in her work on mobile apps—that is, for civilian responders to arrive on the scene and provide care. Yet while some attention has been directed toward Google Maps in the overlapping fields of critical cartography and cultural geography (see Ström, 2020; 2017; McQuire, 2019), the ways that this functionality may enable, but also limit users' agential practices in the use of mHealth apps that rely on this platform have not been explored.

In this article, we use PulsePoint and OD Help as case studies to theorize these agential practices within the unique context of civilian emergency response. More specifically, we draw from Stephens' (2018) interface rhetoric approach, which explored "the values and ideology that are embedded in [the] interface design" (p. 281; adapted from Neill, 2013), to unpack assumptions related to the embodied contexts of use (see Melonçon, 2017) facilitated by the mobile mapping functionalities of these apps. We argue

that interactions between and among humans and the mapping interface involve complex, negotiated, and contextually situated enactments, which aligns with a posthumanist perspective toward agency (see Boyle, 2016) in health-related contexts (see Gouge, 2018a), yet might also inadvertently privilege certain populations, amplifying the precarity (see Butler, 2009) of dispossessed (Butler & Anthanasiou, 2013) and vulnerable groups who perhaps could benefit from the life-saving actions that these apps enable.

In her foundational work on patient-centered design, Lisa Melonçon (2017) argued that increased attention should be directed toward the embodied contexts in which patients use health-related materials in order to improve information design. More specifically, she stated: "contexts of use need to be better theorized [and] participatory design has not been sufficiently embodied, which would make it more meaningful as a method and methodology . . ." (p. 21). Through our analysis, we endeavor to respond to this call by bringing together rhetorical agency, the interface rhetoric of mobile mapping technologies, and precarity in the unique and evolving contexts of use posed by participatory emergency response apps—that is, locating the person who needs help and providing life-saving care. Better understanding the ways that mobile mapping technologies may enable yet also constrain agential enactments, particularly in ways that affect precarious and dispossessed populations, has important implications for the design of mHealth technologies—and the users who rely on them—moving forward.

Background: PulsePoint[1] and OD Help

In efforts to reduce deaths from SCA, which kills nearly 90% of people who experience it (Sudden Cardiac Arrest Foundation, 2022), in 2010 PulsePoint released two location-aware apps designed to work together: PulsePoint Respond and PulsePoint Automated External Defibrillator (AED) (Figure 1). These apps can be integrated with local or community emergency call systems.

PulsePoint Respond sends a smartphone alert (triggered by a 911 call) to users who have registered to provide CPR when someone in their nearby

[1]Generally, Good Samaritan laws protect individuals who assist others during medical emergencies. According to PulsePoint's FAQs (2022), "Since the Good Samaritan typically does not have medical training, the law protects him or her from being liable from injury or death caused to the victim during a medical emergency" ("Can I be successfully sued if I voluntarily help a victim in distress?", n.p.)

Figure 1. Image of app icons for PulsePoint Respond and PulsePoint AED.

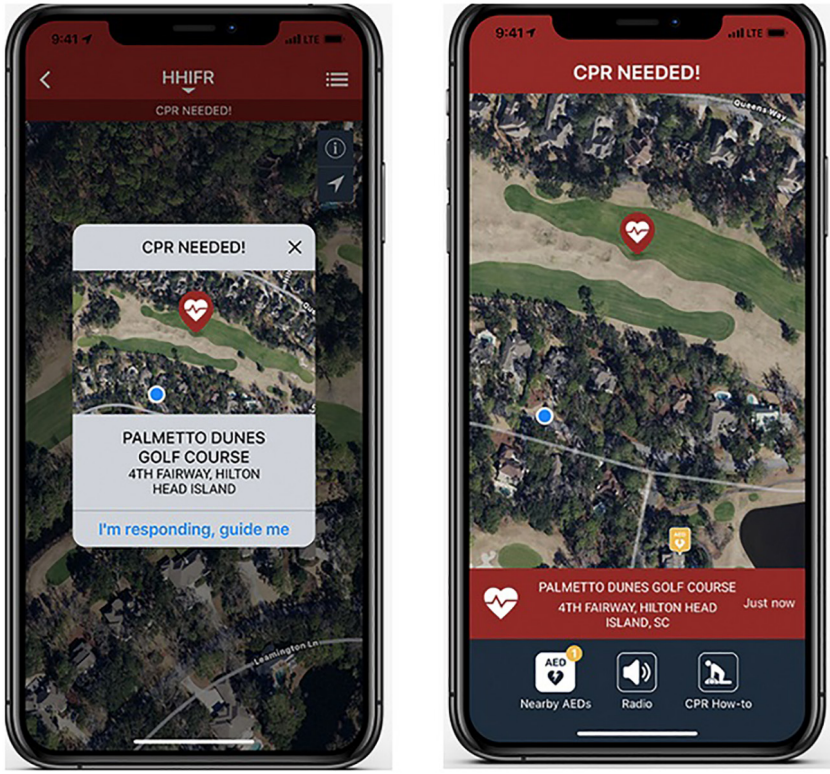

Figure 2. Screenshots of a hypothetical CPR alert from PulsePoint's website.

area (within a quarter of a mile) needs help (Figure 2). The location of the person who needs help is shown via the red PulsePoint Respond logo toward the center and top of the user's smartphone screen, and the user's location is shown via the blue dot towards the bottom left (see Figure 2). Once the civilian first responder has arrived on the scene, they can provide CPR and use an AED (if available) until emergency response personnel arrive.

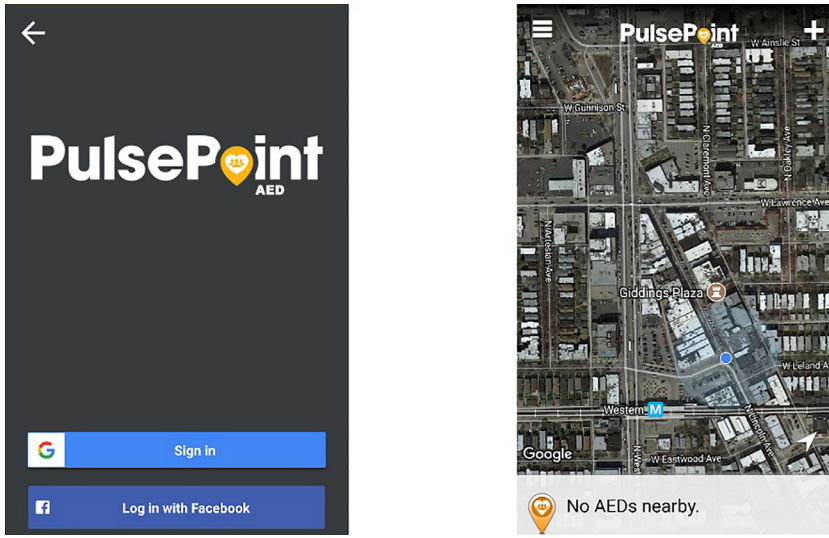

Figure 3. PulsePoint AED sign in (Google and Facebook).

The second app, PulsePoint AED (Figure 3), uses crowdsourcing to document the locations of AED machines, which users can then access as needed when they are responding to a PulsePoint Respond alert (Figure 2). Through this tool, users can view AEDs in their area, as well as add machines. To view AEDs, users are not required to register or log in. However, to add an AED's location, users must log in via either Google or Facebook (see Figure 3; left panel). The information on PulsePoint AED's crowdsourced maps is then reviewed for accuracy and vetted before it is added to the AED app. Once approved, PulsePoint Respond users can then access this crowdsourced information through PulsePoint AED.

PulsePoint Respond addresses SCA, an adverse health event that can affect anyone at any time. OD Help was created specifically to address adverse health events caused by the opioid epidemic. In October of 2016, the United States Food and Drug Administration (FDA) held an app design competition (#naloxoneapp) that sought to expand access to and the use of naloxone—a drug that temporarily reverses opioid overdose, through "the development of a low-cost, scalable, crowd-sourced mobile phone application" (US FDA, 2016, para. 2). In response, PwrdBy, a company that creates healthcare technology products for nonprofits, created OD Help.

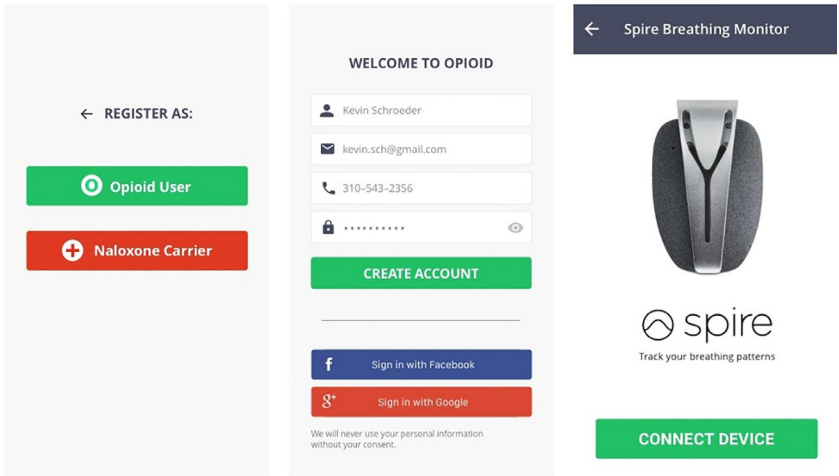

Figure 4. Screenshots of the OD Help interface.

As of January 2022, OD Help remains a prototype.[2] However, the app's functionality is visualized in a video (PwrdBy, 2016) explaining how the mobile mapping feature integrates with "on-demand crowd-sourced networks" to deliver naloxone to opioid users via two methods: networks of users (drivers) through ride-sharing services, such as Lyft; and pre-loaded contacts, such as friends and family, in the user's "personalized network" (PwrdBy, 2016) within the app itself.

The app envisions two kinds of users: those who need help (opioid users) and those who are willing to provide help (naloxone carriers or drivers and friends and family in users' trusted networks). The app requires users to register as either an opioid user or naloxone carrier (see Figure 4; left panel). Opioid users might use legally obtained, prescribed opioids or illegal drugs, such as heroin. Once registered, they can preload a trusted network of family and friends and connect with the breathing monitor device Spire (see Figure 4; right panel), which checks a user's breathing rate through the device's integration with the app.

[2] PwrdBy partnered with Brave Technology Coop in Canada to re-design the OD Help app as BeSafe Community, which was launched in September 2018. Since June 2021, the BeSafe app is The Brave App (Brave Technology Cooperative, 2022a; Brave Technology Coop, 2018).

The integration with Spire allows OD Help to surveil a user's breathing rate, track respirations over time, and sound an alarm if respiratory signs of overdose are present—fewer than six breaths per minute. If respirations decrease to fewer than six breaths per minute, a notification appears as an in-app message. If users are not overdosing, they can indicate that on the app.

mHealth Apps, Agency, Mobile Mapping, and Precarity

mHealth apps have long been positioned as empowering users by allowing them to construct their own knowledge about their bodies and consequently their health. Envisioned from this perspective, agential practices related to the use of these tools then has tended to be understood as something that users possess (e.g., see Arduser, 2017)—that is, as a transfer of power (see Foucault, 1980) from healthcare providers or other subject matter experts to patients or people. However, scholarship in RHM offers a more nuanced interpretation by accounting for the influences and effects of "other emergent actors—both human and nonhuman," as Catherine Gouge (2018b, p. 126) put it. More specifically, a posthumanist perspective (see Boyle, 2016) endeavors to attend to these complex interactions and relationships by reconfiguring agency as an "enactment"—to use Meredith Johnson and Nathan Johnson's (2018, p. 127) characterization of Michel Foucault's (1980) position. Defined as such, agency is still grounded in power relationships (Foucault 1980), but agential practices are seen as distributed, dynamic, and contextually situated, occurring *through* interactions, as RHM scholars have explored, between and among humans and technologies (e.g., Arduser, 2015; 2017; Graham, 2009).

Critical scholarship on digital artifacts in cultural geography aligns with this perspective. In fact, Gillian Rose (2016) situated agency as co-constructed interactions between humans and interfaces through "frictional networks" in her call for new analytical approaches to "cultural 'objects'" (p. 334). More specifically, because such artifacts (including digital maps) are ephemeral and also prompt action, "[c]ultural meanings are no longer *represented* . . . [rather they] are *produced* at multiple sites and interfaces, between hardware, software and humans" (Rose, 2016, p. 347; emphasis in original; see also Lammes, 2017). Indeed, from this disciplinary perspective,

maps are seen as "processual, rather than representational . . ." as Rob Kitchin and Martin Dodge put it (2007, p. 331; see also Kitchin et al., 2013; Cosgrove, 2008), ". . . brought into being through practices (embodied, social, technical)" (p. 335; see also della Dora, 2009; Brown & Laurier, 2005) that "have diverse effects within multiple and shifting contexts" (p. 337). As such, power is no longer ontologically located *within* maps, but diffuses through spatially situated, problem-solving practices. With the "digital turn" in geography (Ash et al., 2018) and shift toward spatial media (see Kitchin et al., 2017) erasing distinctions between map creators, users, and spatial information as Mark Monmonier (2007, p. 372) anticipated, such practices are now increasingly performed using digital technologies like mobile mapping, which tend to be integrated with the Google Maps platform (McQuire, 2019).

Available on smartphones since 2008 (McQuire, 2019), Google Maps enables a wide range of agential practices or enactments through familiar, well-established "slippy" (Crampton, 2009, p. 92) navigational affordances like scrolling, panning, zooming, clicking on icons, sharing one's location, and getting location-specific updates in real time. Yet as an "interface" (see Rose, 2016) or "technological apparatus" (Ström, 2017, p. 79), Google Maps is "without a definitive, final or stable form" (McQuire, 2019, p. 153). In other words, the interface is continually reconstructed through "ever-shifting processes" (Ström, 2017, p. 84) including, in part, "'participatory' strateg[ies]" (see McQuire, 2019, p. 151) as well as the technology's "surveillance-engines" (Ström, 2020, p. 6). In this way, then, Google Maps illustrates the convergences of interface, network, and friction that Rose (2016) theorized, while enacting what Timothy Erik Ström (2020) described as "cybernetic capitalism" (p.1). More specifically and pushing back to some extent against Kitchin and Dodge (2007), Ström (2020) argued that Google Maps reflect "co-existing layer[ed ontologies] that can conflict or contradict with one another" (p. 3). Indeed, the interface is seemingly individualized, bound to powerful GPS technologies that locate users in real time and space and invite them to interact with the map in performing particular kinds of navigational performances and enactments. At the same time, Google Maps also digitally constructs a particular worldview—arguably its own unique, totalizing "cartographic gaze" (see Pickles, 2004, pp. 80–84)—that conflates wayfinding and corporate interests overtly through advertising (McQuire, 2019) as well as covertly by privileging certain kinds of landmarks like businesses (Dalton & Thatcher, 2019). Indeed, these capitalist values and

ideologies are couched in a narrative of technological progress (see Ström, 2017) embedded within this tool.

Such positionalities, Simone Kalkman (2019) has argued in her study focusing on a project that sought to include Rio de Janeiro's favelas in Google Maps' interface (see also Luque-Ayala & Maia, 2019), have important implications for the ways that socio-disadvantaged areas are represented and thus the people who occupy those spaces. Indeed, populations like those in Kalkman's study are likely to be experiencing precarity, a "politically induced condition in which certain populations suffer from failing social and economic networks of support and become differentially exposed to injury, violence, and death" (Butler, 2009, p. 25). Human bodies are vulnerable, and thus we all experience precariousness to some extent (Butler, 2009, p. 33). However, as Lavinia Hirsu (2018) explained, precarity specifically "refers to a complex system of sociopolitical circumstances that position the body" (p. 158). Judith Butler and Athena Athanasiou (2013) complicated notions about the politics of precarity asking, "who deserves a livable life, whose life counts" (p. 99), when ". . . the unequal and unjust ways in which precarity is differentially distributed as a condition of social ontology" (p. 102)? Such associations also speak to "failed connective relations between humans and nonhumans" (Hirsu, 2018, p. 165). As their work makes clear, the relationship between precarious and dispossessed humans and mobile technologies is complex, introducing new considerations for agency, posthumanist sociotechnical practices, and the contexts of use surrounding these tools.

In this study, we seek to extend these themes to mHealth apps with a particular focus on mobile mapping and the functionalities that "afford[s] and constrain[s] access of the user to the information" (Stephens, 2018, p. 283) in civilian emergency response scenarios. The two apps that we use as case studies—PulsePoint and OD Help—were designed to help anyone experiencing SCA and opioid overdose, respectively, regardless of socioeconomic background or other considerations. However, some people who can potentially be helped by these apps are at greater risk of experiencing precarity than others. For instance, many of the eventual users of OD Help are likely to be "precarious publics" (see Teston et al., 2019) or individuals "who may or may not self-identify as . . . drug addicted . . ." (p. 326).

In what follows, we first theorize the ways that the interface rhetoric of the mapping functionality (i.e., Google Maps) of PulsePoint and OD Help enables yet also constrains particular kinds of agential enactments. We then argue that particular enactments enabled by these interfaces and their

functionalities may also privilege certain populations, inadvertently amplifying the precarity of vulnerable groups with low material resources. We then conclude by proposing design and functionality changes to the mobile mapping interface, which we suggest may allow for greater flexibility when using these apps.

The Interface Rhetoric of Civilian First Responder Apps

When civilian responders use the mapping functionalities of PulsePoint or OD Help, they engage in specific navigational tactics (de Certeau, 1984) that are facilitated and influenced by the mapping interface, which enables them to engage in identifiable agential practices—that is, to traverse the geographic space depicted to reach the person who needs help. Further, the mapping interface visually constructs and promotes distinctive navigational performances that are shaped by specific functionalities, such as markers that show the location of the responder and person who needs help and related, embedded technologies like GPS that enable these performances.

Interacting with a map—regardless of its form (e.g., print-based or digital)—allows users to perform complex, problem-solving tasks that involve an exchange between the user of the map (as a material object or a digital interface) and a confluence of contextual factors (including interactions with other humans) that act upon and shape users' navigational performances and agential practices within a space. Such factors include, but are not limited to users' prior knowledge with/in the geographic space as well as their current embodied navigational experience as they simultaneously mentally situate themselves *within* the map (or mapping interface) as well as in the actual lived environment (see also Brown & Laurier, 2005). Other exigencies, too, influence this interaction, such as permanent and situational barriers (e.g., vehicle or pedestrian traffic) and interactions with other digital (e.g., clicking on an icon in the map or snapping a photo) and non-digital (e.g., depositing quarters into a parking meter) technologies. Further, interacting with other people can also influence the user's experience. Thus, the interface "acts" on the user, but the user also "acts" on the interface. Through these exchanges, users are continually constructing and reconstructing the meaning(s) of space (see Kitchin & Dodge, 2011), virtual and lived.

At the same time, users' navigational performances involving digital mapping interfaces further complicate these processes because the interface

also continually reconstitutes space through its functionalities. In this way, these practices then become more deeply temporally situated, which is particularly significant in contexts of use that involve emergency response, such as SCA and opioid overdose—adverse health events that are often fatal. Consequently, from the moment OD Help or PulsePoint app users receive an alert, they are working against the clock to arrive on the scene and provide help, which likely influences their agential practices as expediency now becomes foregrounded in their navigational performance.

To illustrate using PulsePoint, Figure 2 shows a CPR alert in which the person who needs help is located at Palmetto Dunes Golf Course. In this hypothetical response scenario, the user might follow the app's suggested route, which may involve accessing the golf course from the east. However, because the entrance is not shown in this visualization, the fastest way to reach the person who needs CPR is unclear. The most expedient route appears to be to walk through the trees and then across the south green and sand trap. However, if users take this route, there may be permanent (e.g., fences and locked gates) as well as situational barriers (e.g., road construction or poor weather conditions) not shown on the mapping interface that may slow their response time.

To further complicate the user's response, Figure 2 (middle panel) shows an available AED nearby (see the square at the bottom with the AED logo). However, the device is located in the opposite direction of the person who needs help. Consequently, the civilian first responder/user must also immediately determine if they have time to retrieve the AED. Acquiring this device could improve the chances of survival for the person who needs help. However, retrieving the AED could also consume valuable time. If the civilian first responder decides to not retrieve the AED, they may infer that they need to be prepared to quickly administer CPR when they arrive on the scene.

As users determine how best to reach the person who needs help, they are simultaneously situated in digitally mapped space and lived geographic space. When they shift their attention between the mobile map and the physical environment, they navigate in real time. In this way, users are bound by the mapping interface, which mediates and shapes their agential practices; they construct knowledge from this artifact as a material object while also constructing their own embodied interpretations of the space as they move through it. Their movements may be informed by previous knowledge and experiences. To illustrate, users may need to reload the map due to a

poor network signal. Or they may need to take a moment after receiving navigational instructions from the app to align their understanding of their location in their physical environment with the abstracted version depicted in the map. In these moments of mentally situating themselves in the mapped space and the lived geographic space, users may also decide to use a different navigational tactic than the route the map suggests. Returning to our example in the previous paragraph, if a user decides to retrieve the AED, the user's interactions with this object, too, become embedded within that user's agential practices, particularly if the device is used later once on the scene.

Arguably the Google Maps interface is largely driver-centric, providing highly detailed information about navigational features that are important for this mode of transportation, such as the direction of streets and their names. For instance, in Figure 2 (middle panel) the street at the top is labeled (Queens Way) and the street nearest to the responder is clearly visible (although not labeled) whereas other navigational options like paths and sidewalks are not shown. This is not to say that walking or bicycling are not options. However, in this context, non-driving choices are made far more difficult by the interface rhetoric of Google Maps—that is, Google Maps[3] prioritizes certain routes, such as paved roads.

The interface rhetoric of Google Maps also makes other assumptions about users, such as able-bodiedness. More specifically, suggested routes can include stairs, steep hills, or other terrain that could limit some responders' abilities to arrive on the scene quickly to provide care. Indeed, while going down a flight of stairs might be timesaving for some users, this same navigational strategy might be prohibitive for those with mobility limitations.

People experience SCA anywhere and at any time—meaning that users may provide care at someone's private residence or in a public place. Opioid overdose, too, may be more likely to occur where someone lives. However, someone who occupies an abandoned building or lives in a tent community may use OD Help to request help (see Bivens, 2019). Since street names and their location are visually emphasized with PulsePoint, this app arguably prioritizes a driver-centric perspective, while buildings (both size and type) are visually downplayed (light grey) (see Figure 5). When the person delivering naloxone arrives at the location they have been directed to via

[3] Although Google users can contribute to Google Maps by suggesting an edit to a map, such as adding or fixing a place, address, or road, this information may not be widely known or acted upon.

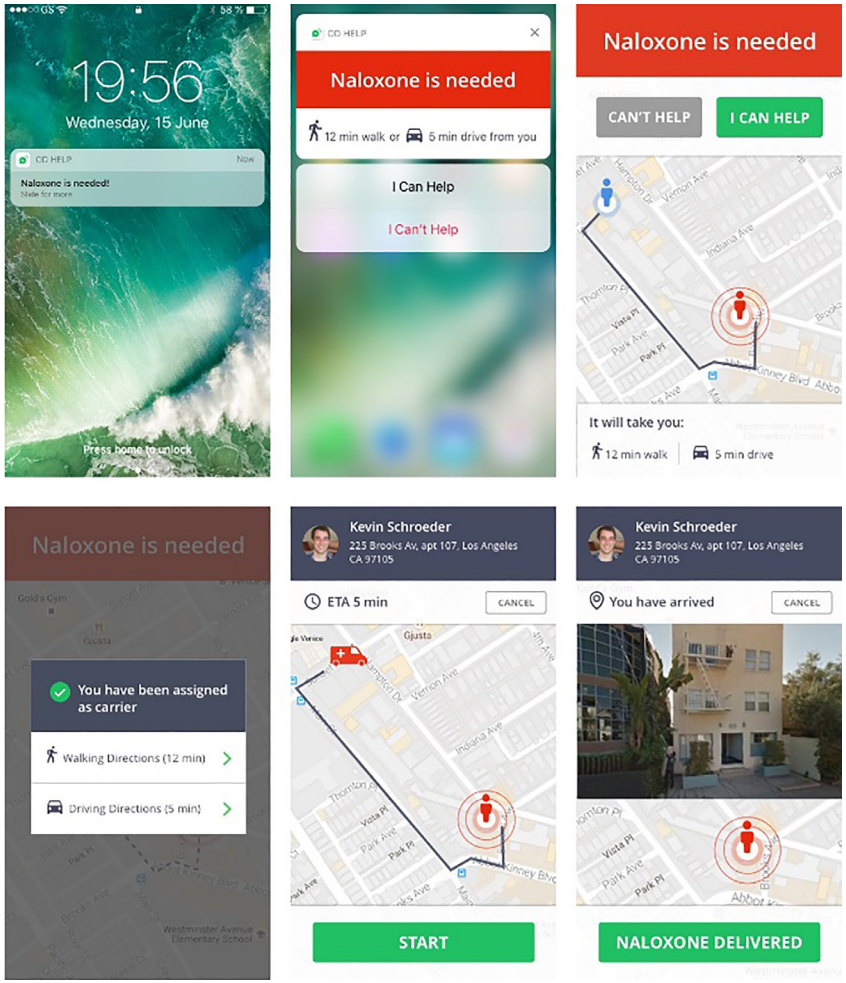

Figure 5. Screenshots illustrating the hypothetical screen movements in an opioid overdose response scenario using the OD Help app.

the mapping interface, a picture of the building is shown so they can confirm that their location is correct. However, if the person requesting help is not located in a building or in the building shown on the map, providing naloxone could quickly become problematic. Google Maps' street view functionality is routinely updated; however, navigational difficulties may arise if the appearance of the building has recently changed, the imagery has not

recently been updated, or the mapping software does not identify the correct location.

Also, like PulsePoint, the OD Help's interface does not include information perhaps important for someone arriving by bicycle or foot, such as a path between buildings or along alleyways. The person requesting help may be located just inside the courtyard of an apartment complex that has locked gates, an alleyway, or another difficult to access location. Yet this information is not apparent on the map. Like PulsePoint, permanent and situational barriers may also be applicable, such as fences, locked gates, motor vehicle traffic, pedestrian density, and available parking, as well as on-the-scene situational contingencies, such as a crowd of people surrounding the person who needs help. Further, OD Help does not account for mobility restrictions users may face, such as not being able to walk up or down a flight of stairs, steep hills, or other potentially challenging terrain. These factors—as discussed previously—may influence a responder's ability to arrive on the scene and provide timely care

Finally, because OD Help mobilizes assistance through ride-sharing services, the interaction between users and their cars add another object (in addition to the user's smartphone) and layer of complexity to the interaction as does managing the device that contains naloxone, which users will also interact with. Indeed, users' agential practices, too, are shaped by enactments between and among these objects in these digital and physical geographic space as they toggle their attention between the mobile map on their smartphone, the physical geographic space, and the other objects they are managing. More specifically, regardless of the location—public or private—where responders provide assistance or the exigencies surrounding the response scenario, users' agential practices are shaped and bounded by the interface rhetoric of the Google mapping feature of these apps; their interactions with the map in the digital and the lived environments; and their interactions with other objects that they use to act and make decisions in that space, such as smartphones, AED machines, and naloxone.

Amplified Precarity and Civilian First Responder Apps

In this section, we discuss the ways the enactments we theorize in the previous section might leave some populations vulnerable. In theory, PulsePoint and OD Help can be used to help anyone who needs the kind of

assistance that these apps offer. Yet the interface rhetoric of these apps reflects embedded assumptions about users' contexts of use and material realities that may inadvertently privilege some individuals who can benefit from these resources and further compound health inequities that tend to be experienced by precarious publics. As Hirsu (2018) noted, smartphones and the work that they do are "co-constitutive of human life" (p. 153). For instance, mobile app users need a charged, service-enabled smartphone. However, lower income populations who are disproportionately affected by the opioid epidemic (National Institute on Drug Abuse, 2017) may not have consistent access, especially since nearly 30% of all adults who earn less than $30,000 a year do not own a smartphone (Anderson & Kumar, 2019, para. 2), which prevents certain groups from accessing or using the OD Help app.

Secondly, OD Help does not differentiate between legal and illegal opioid use, presumably to treat drug overdoses similarly as well as to lessen the stigma associated with addiction. Yet people who use legal opioids may be more likely to have access to resources than those who use heroin, such as health insurance and various formal and informal support systems who help them manage their use and get help, if needed. Because illegal drug use is still often heavily stigmatized in the United States, heroin users may also be afraid or unable to seek help due to financial, legal, or other barriers. As Kristin Marie Bivens (2019) pointed out, since some opioid use is illegal, it makes some users and those nearby unwilling to seek help in cases of overdose due to potential "unwanted personal consequences" (p. 8). These personal consequences can cause "value clashes" that "can lead to severe negative outcomes, ranging from social isolation to job loss to death" (Ding, 2018, p. 43). In other words, opioid users might be unwilling to trade one problem (overdose) that amplifies their precarity for another one (incarceration), which has similar effects. The dilemma then becomes what Butler (2009) argued regarding vulnerable populations: those who are precarious must rely on the very states that make them vulnerable for help remediating their vulnerabilities (p. 26). In the case of OD Help, vulnerable populations must rely on mHealth technologies to stay alive or be revived. In these ways, such users may be more vulnerable to overdose than legal opioid users and more likely to benefit from apps like OD Help.

Shifting our discussion to SCA and PulsePoint, research has consistently established that bystander intervention can dramatically improve survival rates from adverse health events (Cummins et al., 1985; Blewer et al., 2018) with the use of AEDs playing a significant and contributing role in

improving survival outcomes (see Eftestøl et al., 2004). Some scholars have proposed that such bystander interventions are crucial for reducing deaths from SCA, while also arguing that the socioeconomic status of the neighborhood where the intervention is deployed is a key indicator of success (see Reinier et al., 2006). However, when connected to low material resource communities, PulsePoint potentially contributes to exacerbating vulnerabilities within these communities by not meeting expectations regarding privacy. For example, if a 60-year old person who is involuntarily unemployed with a chronic health condition lives alone in an urban area, experiences an SCA in their home, and receives help from a PulsePoint bystander-responder, their living situation may be subject to unwanted exposure, such as revealing their chronic health condition through medication bottles or their employment status on documents with their social security number. Unwanted exposures may lead to potential exploitation or abuse.

Although PulsePoint connected communities tend to be metropolitan cities rather than rural communities, even populations in more densely occupied areas with fewer or low material resources may not benefit from this app. In Philadelphia, for instance, public AEDs tend to be in areas with higher median household incomes (see Griffis et al., 2016). Further, bystander CPR is less likely to be available in lower income and minority community localities (see Sasson et al., 2011) perhaps since PulsePoint users who register as first responders may disproportionately occupy other communities. Vulnerable populations who occupy lower material resource neighborhoods, such as women, may also have less access to healthcare since the intersection of multiple material vulnerabilities often occurs among materially-deprived community members (Whittle et al., 2020) and thus, members of these communities are potentially more predisposed towards worse survival outcomes related to SCA (Blewer et al., 2018).

Another concern are these apps' data collection and management practices. If users register for OD Help or PulsePoint through social media platforms, they can potentially and unwittingly disclose highly personal health information, including legal or illicit opioid use. In her rhetorical work on online breast cancer patient support groups, Carie S. Tucker King's (2017) discussion of big data described the risks that collecting personal information about users in digital spaces can pose. Although PulsePoint does not collect personal information about users, users can only create accounts using Facebook and Google credentials. Since users can sign in to either OD Help or PulsePoint through Google or Facebook, these practices potentially

expose personal health information to third parties. According to tech blogger Natasha Stokes (2017), such practices "allows the website to make a request for data about you" (para. 4). Users may potentially give developers access to private information, such as illicit or prescribed drug use in the case of OD Help or SCA adverse event and location with PulsePoint Respond. At the very least, as Stokes (2017) pointed out, Facebook and Google know "your habits and preferences [as] Facebook Like buttons littered throughout the Internet bounce back data about products or articles you've liked, while the Facebook Open Graph [protocol] platform [from] other [web]sites comes with plug-ins that collect data . . ." (para. 11). The Open Graph protocol, "enables any web page to become a rich object in a social graph" ("Open graph protocol," n.d., para. 1), allowing websites to collect information about users and create a profile without their consent. In her study, King explained that in support groups, users provide health information, which is captured, scrubbed, and aggregated, likely using the Open Graph protocol, to create a profile—or social graph—of a user's online activities and connections for advertising purposes, which can later be used in unwelcome, perhaps surprising, personalized ways (see Jennings, 2018; Warren, 2010). Improperly collected and misused data caused two 2018 scandals featuring Facebook and Cambridge Analytica (see *The Great Hack*, 2019). Depending on the app's data collection and management practices, those who use these apps potentially disclose highly sensitive personal information (even though they potentially benefit from these apps' lifesaving practices).

Mitigating Precarity in Civilian First Responder mHealth Apps

Creators of mHealth apps, regardless of the intended purpose and uses, need to make decisions about the interface design and the specific functionalities that these choices will enable. Further, we recognize that it is not possible to account for the full range of contingencies that surround and influence the use of these apps, particularly in terms of established mobile mapping functionalities (i.e., Google Maps). At the same time and as our discussion has sought to demonstrate, these choices as well as the interface rhetoric of these functionalities can shape agency in ways that may inadvertently exacerbate the precarity of vulnerable groups. In this final section, we propose design and functionality changes to the mobile mapping interface

while also suggesting that these adjustments might allow for greater flexibility in the use of these apps.

At this point, it is important to acknowledge that the Google Maps "apparatus" (Ström, 2017, p. 79) poses significant privacy concerns that go well beyond its mapping platform and are, in fact, endemic to the company's data management practices and approach. That said, we presume that mHealth app developers like PulsePoint and OD Help have some level of control over how the navigational features of their apps integrate with Google Maps. In suggesting changes, then, we are endeavoring to take a productive usability (Simmons & Zoetewey, 2012) position—to some extent—towards the design of these apps. Although our focus in this article is not on usability, Simmons and Zoetewey's (2012) work in TPC is applicable for our purposes here because it recognizes that users often have their *own* knowledge-producing goals that can provide "paths to agency," as they put it (p. 260).

In terms of the technological limitations of the mapping interface that we discuss in the first part of our analysis, future iterations of these apps might endeavor to account for users' mode of travel and degree of ablebodiedness *before* the navigation uploads. Google Maps allows users to choose a particular navigational mode—walking, bicycling, or driving. However, important contextual and customizable details are currently missing that are important for the functionality of PulsePoint and OD Help, such as the type of structure where the person needing help is located (e.g., apartment, house, business), the number of floors in the building, the location of entrances and exits, and whether the responder will need to ascend or descend stairs or open a gate, for instance. As real-time tracking and mapping capabilities improve, such information could potentially be provided by other users of these apps, improvements to the Google Maps platform itself, or adapted from other crowdsourced mapping applications like OpenStreetMap. For instance, OffMaps2 was developed specifically for walking in major cities and offers granular detail for this mode of transportation. For a small fee, users of this iOS app can download a city map of their choice and use it offline to navigate by foot.

Some mapping programs also rely on crowdsourced information that is updated in real time, such as the controversial HK (Hong Kong) Map Live, which provided real time updates on the location of police during the 2019 protests (see BBC News, 2019). Much like the crowdsourced traffic app Waze (which is owned by Google) allows drivers to post alerts about

accidents, police sightings, and other hazards such as heavy traffic, the mapping functionality of OD Help and PulsePoint, too, might provide customizable alerts for users depending upon their mode of transportation. Indeed, some of these features are being integrated into Google Maps (see McQuire, 2019). To illustrate, heavy vehicle traffic may not be important to someone who is walking, but other potential obstacles—a steep hill, steps, or a flight of stairs—might affect the user's navigational tactics as well as alternative routes they may choose. Users of Waze can also see current alerts for the entire route before they begin driving. Once driving, suggested routes can change, allowing them to make their own navigational decisions en route. Further, although Waze uses the crowdsourced information it collects to suggest the quickest path, which is continually updated, drivers can also choose a different route at the beginning of their trip (like in Google Maps), decide to change their route at any point during the trip, and receive continual updates in response to their navigational decisions. Similar features might potentially be integrated into PulsePoint and OD Help's mapping interface. Important contextual considerations could also be folded into these app interfaces, such as other people like civilian first responders and emergency response personnel who are already on the scene trying to help. The PulsePoint app might convey information on whether other app users have been alerted and whether they responded, their location, and the estimated arrival time and status of emergency response personnel. Increased crowdsourcing capabilities might also allow responders to communicate with each other. Adding such functionalities will require work and other resources. However, as technological capabilities rapidly expand, these options might become possible in the near future.

Finally, the street view perspective, which is available in Google Maps and gives users a two-dimensional, photographic representation of the space, might also be integrated into first responder apps' mapping interface. This functionality is currently not dynamic and thus cannot account for permanent and situational barriers or the accessibility considerations we describe in the first part of our analysis. However, this perspective could give users more specific, on-the-ground information by allowing them to see features not currently shown in the navigational interface, such as fence or gate locations and the shape and size of natural and built structures. Real time dynamic alerts, too, might also eventually be included, which could give users the detailed information they need to "articulate decisions," as rhetorician Casey Boyle (2016, p. 537) noted in his work on agency and posthumanism

that are "developed and sustained" (p. 544), increasing their ability to respond to a PulsePoint or OD Help alert.

Our suggestions thus far seek to broaden the range of users' agential practices in their interactions with these apps. At the same time, addressing changes that might be made to mitigate the amplified precarity considerations that we point out is a more complex task. In fact, PwrdBy encountered logistical difficulties launching OD Help after conceptualizing and prototyping the app, ultimately opting to partner with Canada-based Brave Technology Coop to redesign and pilot the app—once called "Be Safe"—in 2018 now known as The Brave App since 2021. BeSafe's beta testing ended earlier than expected when the app was launched due to COVID-19. However, instead of relying on an app and smartphone, the program uses Wi-Fi-enabled Brave Buttons inside "supportive housing facilities" that opioid users can press during incidences of overdose (Brave Technology Cooperative, 2019, p. 8). The Brave App no longer requires a user to log in to use the app, which helps protect some of the user's privacy; it also allows users to configure their own overdose plans in cases of opioid overdose (Brave Technology Cooperative, 2022b). Such ameliorative capabilities arguably strive to enable agency as well as address vulnerabilities exacerbated by opioid use. Yet it is also clear that greater attention needs to be directed toward ensuring equitable access in the use of these apps.

To circumvent and mitigate any unintentional intensification of precarity in the ways that we identify in our discussion and to align with a productive usability stance, we also suggest that more attention be directed toward the ways that the design and use of these apps might be modified or adapted to be more helpful specifically for precarious publics. For example, we have been in contact with both PulsePoint (via email) and OD Help (via email and phone). Further, in a recent usability project related to PulsePoint Respond (Welhausen & Bivens, 2021), we asked the organization what kinds of information might be useful for them, and they expressed an interest in talking more with us about improving the functional aspects of the app (S. Smith, personal communication, Oct. 24, 2019). Although our emphasis in this latter interaction was usability, we suggest that this exchange also presents the opportunity to point out the ways that users' lived embodied and contextualized experiences shape and structure the actions and practices that are enabled, but also constrained by the functionalities of

these apps. Indeed, as participatory health-related technologies continue to evolve and new iterations are developed, we foresee the prioritization of these experiences in the creation and design of health-related information—as Melonçon (2017) argued.

We respond to Butler's (2009) provocation that "The precarity of life imposes an obligation upon us. We have to ask about the conditions under which it becomes possible to apprehend a life or set of lives as precarious, and those that make it less possible, or indeed impossible" (p. 2) since it aligns with the "distinctively ethical" research practices commonly attributed to RHM (Baldwinson, 2018, p. 213). That obligation or "responsibilization" . . . ethico-politico lives poses some critical questions regarding the place of responsiveness and responsibility in our ethico-political lives" (Butler & Athanasiou, 2013, p. 104). Our study replies to Butler's responsibilization and accounts for contexts of precarity, such as opioid overdose and SCA, that mHealth app developers and rhetoricians of health and medicine should consider. In this way, we contribute to ongoing efforts by focusing on these specific precarious contexts of use involving mHealth apps.

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