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Development, Adaptation and Scale-up of a Community-wide, Health Behavior Theory-based Stroke Preparedness Intervention

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Abstract

Objective: Acute stroke treatments reduce the likelihood of post-stroke disability, but are vastly underutilized. In this paper, we describe the development, adaptation, and scale-up of the Stroke Ready program – a health behavior theory-based stroke preparedness intervention that addresses underlying behavioral factors that contribute to acute stroke treatment underutilization. **Methods:** Through a community-based participatory research (CBPR) approach, we conducted needs and determinant assessments, which informed creation and pilot testing of Stroke Ready. Based on these results, we then scaled Stroke Ready to the entire community by greatly expanding the delivery system.

Results: The scaled Stroke Ready program is a community-wide stroke preparedness education program consisting of peer-led workshops, print materials, and digital, social, and broadcast media campaigns. Whereas the Stroke Ready pilot workshop was delivered to 101 participants, 5945 participants have received the scaled Stroke Ready peer-led workshop to date. Additionally, we

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Conflicts of Interest Disclosure Statement

The authors have nothing to disclose.

Human Subjects Approval Statement

This study was approved by the University of Michigan Institutional Review Board (HUM00126955 and HUM00112536). The study is registered at www.clinicaltrials.gov Identifier: [NCT03831451](https://doi.org/10.1186/1745-6215-14-151); Date of Registration: August 24, 2018.

have sent mailers to over 44,000 households and reached approximately 35,000 people through our social media campaign.

Conclusion: Strategies including an expanded community advisory board, adaptation of the intervention and community-engaged recruitment facilitated the scale-up of Stroke Ready, which may serve as a model to increase acute stroke treatment rates, particularly in majority African-American communities.

Keywords

acute stroke; African Americans/Blacks; community-based participatory research; health behavior theory; scale-up; Stroke Ready program

Stroke is common with nearly 800,000 strokes occurring in the United States (US) annually.

¹ Approximately two-thirds of stroke survivors are left with residual disability, making stroke a leading cause of disability.^{2,3} Acute stroke treatments reduce the likelihood of post-stroke disability; yet, they are vastly underutilized. Most of the underutilization is due to delays in stroke patients presenting to the emergency department (ED), as these treatments can only be administered at the hospital, and typically, must be given within a few hours of symptom onset.^{4–7} Although calling 911 for stroke is associated with decreased prehospital delay, emergency medical services (EMS) are alerted in about only 50% of acute stroke cases.^{8,9} Contributing factors to increased prehospital delay include a limited ability to recognize stroke symptoms and lack of knowledge that stroke treatments exist.^{10,11}

Minority and underserved populations experience significant stroke disparities, particularly African Americans who face higher stroke incidence, prevalence, and post-stroke disability than non-Hispanic Whites.^{12,13} African-American stroke patients are less likely to receive acute stroke treatments due to greater prehospital delays and also are less likely to call 911 than their white counterparts.^{14–19}

Interventions to increase stroke preparedness – the ability to recognize signs of stroke and the intention to immediately call 911 – have been shown to decrease prehospital delay and increase acute stroke treatment rates and can serve as a starting point to address health inequities in underserved populations.²⁰ However, to reduce stroke disparities in underserved communities, and to achieve population-wide health improvement, scale-up of effective, culturally-tailored, multi-component and multi-level stroke preparedness interventions is crucial.^{21,22}

Scaling-up is defined as “deliberate efforts to increase the impact of successfully tested health interventions so as to benefit more people and to foster policy and program development on a lasting basis.”²³ Yet, the pathways through which interventions are scaled-up often are not well described, which limits understanding of how effective, small-scale, interventions are expanded under real-world conditions to impact the health of broader populations.^{22,24} Thus, in this paper, we describe our process for adaptation and scale-up of the Stroke Ready project, a program to increase acute stroke treatment rates in the predominantly African-American community of Flint, Michigan, from a small-scale

community-based participatory research (CBPR) developed, health behavior theory-based pilot study to a multi-faceted, community-wide stroke preparedness intervention campaign.

METHODS

Stroke Ready was conceptualized in response to the need for practical, culturally appropriate, theory-based interventions to increase acute stroke treatment rates in communities with low utilization rates. Flint, MI, is home to about 100,000 people, of which 54% are African-American and over 40% live below the poverty level.^{25,26} Once a thriving industrial city, Flint, like many cities in the industrial Midwest, experienced an economic depression after the collapse of the automobile industry.²⁷ Genesee County, where Flint is the largest city, has one of the highest age-adjusted stroke hospitalization rates in Michigan.²⁸ Flint also has one of the lowest acute stroke treatment rates of any community its size in the US. Nationally, 4.2% of stroke patients receive acute stroke treatment, but in Flint, the mean treatment rate is 2.2%.¹⁴

The cornerstone of Stroke Ready is the commitment to engagement and involvement of community partners and organizations, across sectors, that share the vision for improving the health and well-being of Flint. Given the existence of health disparities, complexities of racial and income discrimination, and mistreatment within disinvested communities, it is crucial to partner with the community and consider the behavioral constructs and structural barriers that may inhibit and facilitate action when designing and implementing interventions. Building on a long-standing community-academic partnership, a community-based participatory research (CBPR) approach was implemented, where community and academic partners “share the responsibility of conceiving, designing, testing, and disseminating interventions to improve the health of the community.”^{29,30}

Stroke Ready Pilot Study: Theory-Based Development and Efficacy Testing

In 2009, we established a community advisory board (CAB), co-chaired by the academic and community principal investigators (PIs). Stroke emerged as a nearly unanimous priority, not only from quantitative data, but also during discussions with community leaders to determine the health needs and priorities of the community.³¹ Therefore, it was deemed vital to increase acute stroke treatments in Flint. Despite economic hardships, a water crisis, and overburdening of community members, Flint has maintained a resilient, strong, prideful and passionate community committed to health, making it critical to involve the community in the design and implementation of Stroke Ready.

We conducted the Stroke Ready pilot study in 3 predominantly African-American churches in Flint, MI. The pilot was developed through a CBPR approach that included a survey and focus groups with community members to determine barriers and facilitators to stroke preparedness and community interest. We found that psychologic factors of attitude toward the behavior, social norms, and self-efficacy to call 911 were identified as being low among participants. These factors draw from constructs of the Theory of Planned Behavior (TPB) and Social Cognitive Theory (SCT) and included a fatalistic attitude towards stroke due to feeling a lack of control over the outcome, negative outcome expectations for seeking medical attention, and unawareness of stroke burden in Flint.³¹ Consequently, the Stroke

Ready pilot intervention was developed largely through application of these health behavior theories.

Overall, 101 individuals participated in the pilot intervention which included 2, 90-minute, multimedia, peer-led workshops. Compared to pre-intervention, stroke preparedness and stroke self-efficacy (confidence in ability to take action when seeing signs of stroke) increased among participants.³¹ A post-intervention assessment helped to expand our understanding of participants' perceived barriers in the decision to call 911.²⁹

Though we recognized that 180 minutes of peer-led workshops was not scalable to the community level, the pilot study confirmed acceptability of the intervention, as well as our ability to train peer leaders and recruit participants. Thus, the pilot formed the foundation for expanding the Stroke Ready community intervention to include the entire Flint community.

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RESULTS

Phase 1: Community Advisory Board Expansion

Just as in the pilot, Stroke Ready leadership consists of both academic and community PIs, who co-chair the CAB. In addition to the original community PI, we have added a co-community PI who had previously served as a peer educator in the pilot study, as she has extensive knowledge of the community, a background in community theatre, and the ability to connect with and engage community members, particularly younger adults. Given the scope of the Stroke Ready scale-up, the academic and community PIs felt that the program team would benefit from greater and more diverse community involvement. Thus, in 2016, the CAB was expanded to include representatives from approximately 18 Flint-based organizations including local hospitals, health department, area agency on aging, emergency medical service (EMS) authorities, neighborhood organizations, faith-based organizations, and city council. Each organization is committed to successful completion of the Stroke Ready project. CAB members provide invaluable insight on ways to reach community members, suggest strategies for recruitment and community intervention delivery, facilitate relationships between research team and other community organizations, and most importantly, promote sustainability. CAB members receive an agenda, lunch, and a \$200 stipend for each 1–1/2-hour meeting they attend.

Since initiation of the Stroke Ready scale-up, we have held 4 CAB meetings. The CAB has contributed to development and adaptation of program messaging, community implementation strategy, planning for and promoting reach, acceptability, and penetration of the Stroke Ready intervention. Our CAB members provided guidance on setting achievable reach goals based on their experiences within the community, which led us to reduce our yearly workshop goal and to add a goal for number served. The resulting intervention goal is to deliver 300 workshops over the 2-year period and to reach approximately 5% of the Flint community population, age 18 or older.³² Regarding acceptability, the CAB also made the critical suggestion of reducing the length of the workshops, requesting that the initial 60-minute workshop be decreased to 30-, 15-, and even 5-minute versions. This alteration has undoubtedly led to an increase in the reach and acceptability of Stroke Ready.

Phase 2: Theory-based Adaptation of Intervention Messaging

A growing body of evidence suggests that interventions developed with theoretical foundations have greater effects than atheoretical interventions. Health behavior theories provide an understanding of the relationship between beliefs and action and can serve as guides for changing and sustaining behavior change.³³ Because we aim to reach a wider, more diverse population than the pilot, the intervention messaging and materials have undergone adaptation through application of health behavior theory. Table 1 provides examples of identified barriers and corresponding intervention messages developed by theoretical construct.

The Stroke Ready pilot was grounded in the Theory of Planned Behavior (TPB) which posits that the intention to change a behavior is the biggest and most immediate predictor of behavior change. Behavioral intention is a function of 3 psychological constructs: attitude towards the behavior, subjective norms (perceived social pressure to perform the behavior), and perceived behavioral control (PBC; perception of ease or difficulty with which one can perform the behavior). The TPB suggests that by modifying the psychological constructs through a theory-based intervention, one's intention of performing a behavior can be increased.³⁴

In hypothetical stroke situations, the overwhelming majority of people report they would call 911. However, in reality, only half of stroke patients arrive by ambulance.⁸ To motivate intention to call 911, we primarily focused our messaging on increasing awareness that stroke treatment exists, changing the attitude and social expectation toward calling 911, and increasing the perception that it is easy to take action if you see someone having signs of stroke. Additionally, the presence of only one stroke symptom may not be perceived as "severe enough" to warrant an emergency response. Therefore, we employed messaging like, "just one sign is an emergency," throughout all materials to increase behavioral response to call 911.

The community's fatalistic attitude towards stroke, compounded by the lack of awareness that acute stroke treatments exist, led to messaging on changing the attitude that 'there is nothing that can be done' by increasing the awareness that stroke is, in fact, treatable. To increase social motivation for calling 911, we focused on increasing the awareness that stroke is common in Flint, that treatment is available at the hospital, and that "you," as the individual and as the community, have the power to call 911 and help those you care about get treatment for stroke.

Behavioral interventions do not exist in a vacuum. The community context including fundamental causes of disease also must be considered. In the years since the pilot, Flint experienced a water crisis which exacerbated the community's mistrust of the healthcare system.³⁵ To address this mistrust, our community partners impressed upon us the importance of displaying that acute stroke treatment is not an experimental or research drug, but a medicine that has helped well over 100,000 Americans. Moreover, keeping in mind that this intervention was to be implemented in a community with a history of racial and ethnic inequity, Stroke Ready was developed from a positive message perspective. Additionally, the more positive a person's attitude, social support, and perceived ability to

perform a behavior, the stronger the intention, resulting in a greater likelihood to perform the behavior.³⁶ Thus, we reduced focus on the negative consequences of stroke, and instead, promote that there is something that can be done (eg, stroke is treatable). The hope is that this perspective will empower the community to call 911 as soon as stroke symptoms occur and create a more positive outcome expectation in seeking treatment in the event of a stroke.

Furthermore, we included messaging to encourage people to speak up about stroke. After a CAB meeting, one Flint-based pastor synthesized the entire presentation as “stroke is not a secret worth keeping.” He explained that specifically within the male African-American community, there is a stigma associated with showing signs of weakness and illness, and those members of the community particularly needed to be encouraged not to stay silent if they are having signs of stroke.

In the Stroke Ready scale-up, we decided to focus even more on self-efficacy to address the identified barrier of lack of control over the outcome. Thus, similar to another stroke preparedness intervention,³⁷ we focused on the Social Cognitive Theory (SCT) construct of self-efficacy, which is an individual’s belief in their ability to perform specific behaviors. Self-efficacy is enhanced through behavioral mastery experiences, social modeling, verbal persuasion, and practice under stress-free conditions.³⁸ To bolster participants’ confidence in ability to perform the behavior of calling 911 when witnessing signs of stroke, we placed additional emphasis on skills such as role playing and skill building into the scaled-up Stroke Ready intervention. Through facilitating experiences to promote mastery of information, such as symptom recognition in a non-acute situation, participants have the ability to obtain and practice skills, thereby increasing self-efficacy. By increasing self-efficacy in stroke symptom recognition, theoretically speaking, people will demonstrate a higher intent to call 911 and will be more likely to perform the task when an acute stroke situation arises.

It is believed that knowledge of stroke symptoms is beneficial, but not sufficient in influencing immediate behavior in response to a suspected stroke emergency. As such, in addition to the TPB and SCT constructs, we incorporated insights from behavioral economics, namely pre-commitment and behavioral nudge, to influence bystander responses to stroke. Pre-commitment prompts people to think through how and when they will follow through on their goal. Research on heuristics (efficient cognitive processes that create mental “shortcuts” to process information) indicate its utility in behavior change in rapid-onset, high-threat conditions such as stroke.^{39,40} In other words, having mental shortcuts may result in more appropriate and efficient behavioral response to stroke. One way to create a heuristic is through pre-commitment. Action planning helps set a heuristic that the immediate response after witnessing a stroke is to call 911. It is an example of an implementation intention of an ‘if, then’ statement - ‘if I witness a stroke, I will call 911,’ which may make the pre-commitment more effective. When individuals commit to performing a certain behavior, the likelihood that the individual will engage in the designated behavior in the future increases.^{41,42} Thus, pre-commitment to call 911 as soon as stroke symptoms occur will, in theory, increase the likelihood of actual performance during a stroke emergency and has been employed in another stroke preparedness community intervention.⁴³

Behavioral nudge is another strategy to influence action by setting default responses.⁷ Incorporating activities to encourage behavioral nudges can be effective to motivate action when stressing a simple response (such as, calling 911) to a complex problem.^{44,45} For instance, the Stroke Ready action plan includes the pledge to call 911 and get to the hospital as soon as symptoms start if one were to have, or witness, a stroke. The reverse side of the pledge includes the specific steps to follow after calling 911 for mental rehearsal of the behavior, as well as to increase ease of performance during an actual event. We encourage the action plan be put in an area of public display, such as on the refrigerator, as their commitment to calling 911, and also as a strategy to increase the effectiveness of the pre-commitment.^{32,46,47}

Community feedback.—In keeping with CBPR, input on messaging and materials was sought from Flint community members and incorporated to ensure messaging was culturally relevant and would resonate with the broader community. All intervention messaging and selected materials were iteratively pre-tested through semi-structured individual interviews and focus groups at multiple phases of development. The research team compiled notes of suggested changes from the interviews and focus groups, noted relevance to theory and frequency with which comments emerged until thematic saturation was reached.

A total of 39 people across 6 community locations throughout Flint participated in the pre-testing. Participants ranged in age from 26 to 82 years, with a median age of 68; in our sample of participants, 64% were women and 67% were African-American. Interviews and focus groups lasted approximately 45–60 minutes, during which participants were asked about their understanding of the content, perceptions, and feelings toward the main message conveyed on each material, and impressions of illustrations. Participants also were given a \$20 incentive for providing feedback.

Some messages and materials were modified more so than others based on participant feedback. Much of the general changes centered around changing pictures to actual people depicting behaviors and situations instead of drawings or illustrations, to simplify wording, and to use standard, easy-to-read fonts. One of the more specific modifications requested by participants was focused on changing the message conveyed. For example, one of our initial messages was ‘act FAST - stroke treatment is a time-limited offer’ to convey the need to get to the hospital in a short window of time to get treatment. However, the general consensus from participants was that the message came off as more of an advertisement and they did not want to feel as though they were being sold to. Thus, the message was changed to ‘if you see any sign of a stroke, act FAST, and get stroke treatment.’

It also was noted that African-American participants wanted to see pictures of more diverse groups of people. While they wanted to see a representation of their respective demographic groups in the pictures used, they did not want to feel as though they were being targeted as the only demographic group at risk for stroke (eg, “We want to see other people on this stuff. We’re not the only ones who have strokes.”).

Phase 3: Adaptation and Refinement of the Scaled Stroke Ready Intervention

To maximize community exposure to the stroke preparedness messaging, the resultant Stroke Ready program consists of a variety of intervention materials and methods. All program components and materials exhibit the tailored, theory-based stroke preparedness messaging, as Figure 1 describes.

Intervention materials.—The scaled program, like the pilot, includes a workbook, action plan, and music video, however, each has been adapted to ensure relevance to the broader community. Table 2 compares intervention methods for the pilot study versus those for scale-up. Dissemination methods added as part of the scale-up include print materials (brochures, action plan cards, and posters) that are used in peer-led workshops, brief sessions and mailers, as well as digital, social, and broadcast media campaigns.³² Mailers are sent to all residential addresses in each quadrant and include a brochure, action plan, magnet, and information letter explaining the program. Stroke Ready coasters also were created for dissemination to local eateries, with a QR code on the back to direct community members to the Stroke Ready website when scanned.

Print materials are available as part of the Stroke Ready toolkit and can be accessed through the Stroke Ready website – (www.strokeready.com) – in addition to links to stroke resources and the Stroke Ready music video. While maintaining the original gospel-based music score for the Stroke Ready music video, which was developed for the pilot, we adapted the video to include a group of community members acting out a scenario of signs of stroke and emphasizing the importance of spreading the word about calling 911 for stroke symptoms.³²

The social media campaign includes posts related to stroke information and resources on Facebook and Instagram which are then boosted to the Flint community. Additionally, the broadcast media campaign plays on 3 Flint radio stations and includes a shortened version of the song from the music video and 2 additional spoken public service announcements, one which focuses on improving stroke awareness and the other on improving outcome expectations of receiving acute stroke treatment.³²

Adapted peer-led workshops.—Similar to the pilot, the Stroke Ready program consists of workshops led by locally recruited peer educators who are trained in delivery of the intervention to community members. However, specific content and duration of the workshops have undergone significant adaptation. Peer-led workshops are offered to a wider community audience and with greater frequency than the pilot, act as standalone sessions instead of a series, and are shorter in duration than the pilot. For example, there are now 4 versions of workshops, of various durations, for community organizations to choose from (5, 15, 30, and 60 minutes).³² Participants of the 30- and 60-minute workshops receive a workbook that includes a full-page action plan, whereas participants of the 5- and 15-minute brief sessions receive a brochure and action plan card.

A keystone of the scaled-up Stroke Ready program is the 5-minute, very brief session, which was designed to be delivered at community events, such as health fairs, as a one-on-one discussion between a peer educator and community member. This session uses the Stroke Ready brochure and action plan card for concise delivery of stroke-preparedness education,

and has been shown to increase stroke preparedness.⁴⁸ Adaptation of the intervention into its very brief session format has enabled greater reach to community members, particularly those who would be disinclined or do not have the flexibility to attend a longer session, as they are able to receive the session while engaging in their life activities or attending a community event.

Scaled Intervention Recruitment Strategy

Community members are recruited to participate in Stroke Ready through community-sponsored events, which we define as recurring meetings or events, such as health fairs, that community members regularly attend, or events outside the purview of Stroke Ready. The Stroke Ready workshop is then added to the agenda for the scheduled meeting or event. This strategy promotes partnership with community organizations committed to addressing local health issues, and building on their strengths, to reach community members “where they are” – particularly in regard to delivery of health-related information. It has proven to be an effective recruitment strategy for the scaled Stroke Ready intervention. A few examples of community sponsored meetings and events include those held at neighborhood advocacy groups, senior centers, senior living facilities, faith-based organizations and churches, community water distribution sites, barber shops and beauty salons, shelters and soup kitchens, and staff meetings at local businesses, among others. Many of these do not have capability to run PowerPoint presentations and so workshop flipcharts are used. As of publication of this paper, peer educators have delivered the Stroke Ready in-person workshop to 5945 Flint community members in 234 workshops. Additionally, we have sent mailers to over 44,000 households and reached approximately 35,000 people through our social media campaign.

Unlike the pilot, participants in the community intervention are not considered human research subjects. Thus, no data are collected from participants, and they do not receive compensation for attending a workshop. However, nominal gifts including pens with the Stroke Ready logo and silicone bracelets are provided for participation.³²

Scaled Intervention Delivery

We define the Flint community as the City of Flint plus a 2-mile perimeter around the city limits, on all sides. The Flint community is naturally divided into 4 distinct quadrants by 2 major intersecting roads. These quadrants were used as the guide for how the intervention is implemented throughout Flint. Corresponding to this natural division, our community partners pointed out that there are differences in population groups across these quadrants – each with its own diverse set of strengths and needs – while opportunities for collaboration with community organizations also differ based on geographic location. For instance, there is a greater density of businesses in the southwest quadrant than in other quadrants. In attempting to reach such a large population, dividing the area into quadrants provided for greater ease of planning dissemination of the multi-level intervention. Dividing the community into the 4 quadrants also has provided the opportunity for further adaptation and improvement of the intervention based on lessons learned in each quadrant, as well as the ability to measure changes in acute stroke treatment utilization over time. Once dissemination in all quadrants has concluded, changes in population level acute stroke

treatment rates will be assessed through acquisition of data from 3 local hospitals in the culminating phase of the study.³²

DISCUSSION

Stroke Ready is now a multi-level, multi-component, intervention being implemented community-wide with the goal of decreasing pre-hospital delay to, in turn, increase acute stroke treatment rates. The Stroke Ready program is one of the first to combine a CBPR approach with a theoretical behavioral framework to increase acute stroke treatments in under-resourced, minority communities. The pilot study legitimized the need to offer the stroke preparedness intervention to the entire city of Flint, and thus, was scaled to the same community by expanding the delivery system.²²

The Stroke Ready pilot revealed the need for interventions to address both individual and community-level factors to reduce delays to treatment.³¹ Subsequently, the CAB has been expanded for more diverse, multi-sector community involvement. The original TPB and SCT theoretical framework was then applied and expanded to include constructs from behavioral economics to enhance pre-commitment and behavioral nudge to take action by calling 911 when seeing symptoms of stroke for adaptation of intervention messaging and materials. To ensure cultural relevance of messaging, community feedback was obtained across multiple iterations of messaging adaptation and refinement. We also addressed structural factors leading to pre-hospital delays such as the history of racial inequity, including the Flint water crisis, and the related mistrust of the healthcare system through positive messaging. Particular attention was paid to the detailing that this is not experimental treatment, but rather, that over 100,000 people have received the treatment, as well as the inclusion of hospitals and EMS representatives on the CAB to increase awareness of the community's perceptions.

Workshop lengths were reduced in response to CAB feedback, providing a variety of length options for increased uptake by community organizations. Intervention materials were also adapted into more condensed versions, such as the participant workbook, brochure and action plan card, for delivery of workshops in a single session and during brief sessions at events. Additional intervention methods were developed to expand reach to members of the community who may not otherwise be exposed to information, including mailers, posters, and digital, social, and broadcast media campaigns.

We believe the Stroke Ready community intervention scale-up provides further evidence of the necessity of community engagement and application of health behavior theory, from pilot intervention conception to community-wide dissemination, to achieve optimal effectiveness in behavior change and improved community health outcomes. The importance of community engagement in effective implementation cannot be overstated. Community involvement has been critical in the development, implementation, adaptation, and scaling of the Stroke Ready community intervention. Using this schema helped us to adapt and deliver messages that empower community members to act quickly once stroke symptoms are recognized and to expand our recruitment through community-sponsored events.

In conclusion, our hope is that Stroke Ready serves as a model for other community and academic partnerships interested in applying health behavior theory to the development and scaling of interventions addressing stroke preparedness, which may serve as a means to reduce stroke disparities among minority populations and under-resourced communities.

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Figure 1.
Stroke Ready Community Intervention Health Behavioral Conceptual Model and
Components³²

Table 1
Theory-based Intervention Messages and Techniques to Address Identified Barriers

Theoretical Constructs	Identified Barriers	Intervention Message/Technique
Attitude toward the behavior (TPB)	• Delay in seeking care/calling 911	• If you or someone you know is having signs of stroke, call 911 and get to the hospital as soon as stroke symptoms start
	• Lack of awareness that treatments exist for acute stroke	• Time is everything. Don't delay!
	• Fatalistic attitude toward stroke (ie, nothing can be done for a stroke)	• Stroke is treatable
	• Lack of knowledge regarding stroke signs	• The longer a stroke goes without treatment, more of the brain dies
	• Lack of awareness that one stroke sign is an emergency	• Treatment is only available at the hospital
	• Lack of trust in healthcare providers	• Signs of stroke using FAST acronym
Subjective norms (TPB)	• Stigma with showing signs of weakness/illness, especially in male African-American community	• Just one sign is an emergency and needs to be treated right away
		• Illustration describing how acute stroke treatments work
		• Stroke is not a secret worth keeping
	• Lack of awareness of how common stroke is	• Stroke is especially common in Flint
Perceived behavioral control (TPB)	• Lack of knowledge of how to help someone having signs of stroke	• More people are hospitalized for stroke in Genesee County than in most other areas of Michigan
	• Lack of awareness that treatment is part of the standard care protocol for acute stroke	• Over 100,000 people have been helped by getting acute stroke treatment. You can join them!
	• Desire to help loved ones	• You can help someone you care about by calling 911
	• Lack of confidence in ability to recognize signs of stroke	• I s easy to take action
Self-efficacy (SCT)	• Lack of confidence in knowing what action to take	• You have the power to help someone you care about
		• You have the power to help get someone treatment right away
	• Lack of feeling control over the outcome (ie, there's nothing that can be done)	• List of stroke signs with pictures
		• Chart with ways to check for stroke
Behavioral economics		• Action plan with steps to follow after calling 911; reminder to record time of stroke symptom onset
		• Role play (practice under stress-free conditions; rehearsal)
	• Only half of stroke patients arrive to ED by ambulance	• Action plan as pre-commitment and behavioral nudge to call 911

Note.

TPB = Theory of Planned Behavior; SCT = Social Cognitive Theory; ED = Emergency Department

Table 2**Stroke Ready Intervention Comparison: Pilot²⁹ to Scale Up**

	Pilot	Scale-up
Population	<ul style="list-style-type: none"> 73 adults 28 youth 	<ul style="list-style-type: none"> All Flint community members > 18 years old
Workshop format	<ul style="list-style-type: none"> Peer-led workshops 	<ul style="list-style-type: none"> Peer-led workshops; brief and very brief sessions
Workshop length	<ul style="list-style-type: none"> 2 sessions; 90-minutes each session 	<ul style="list-style-type: none"> Single session; Multiple workshop lengths: 60-minute 30-minute 15-minute (brief) 5-minute (very brief)
Intervention materials	<ul style="list-style-type: none"> 41-page participant workbook Workshop PowerPoint slides Music video Stroke video vignettes 	<ul style="list-style-type: none"> 24-page participant workbook Workshop flip chart Brochure Action plan Mailers Posters Website Adapted music video Social media (Facebook & Instagram) Public service announcements (PSAs) on local radio stations
Intervention recruitment	<ul style="list-style-type: none"> 3 Flint churches 	<ul style="list-style-type: none"> Flint community organizations and events such as: Health fairs Neighborhood advocacy groups Agencies and commissions on aging Senior centers and senior living facilities Hospitals and health clinics Faith-based organizations and churches

	Pilot	Scale-up
		<ul style="list-style-type: none"> • Water distribution sites • Barber shops and salons • Shelters and soup kitchens • Staff meetings at local businesses
Participant Incentives	<ul style="list-style-type: none"> • Compensation for participation 	<ul style="list-style-type: none"> • No financial incentive to participants • Pens and silicone bracelets given as nominal gifts