Solution-based science to prevent and control diabetes in underserved communities around the world (commentary, for Diabetes special section)

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Abstract

Despite the numerous successful behavioral interventions that have been published in the behavioral medicine field over a number of decades, surprisingly few have been translated and adapted for real-world settings using participatory research methods. The purpose of this commentary is to highlight the advances in participatory behavioral medicine reflected in the articles contained in the Diabetes special section. The articles contained in the Diabetes special section were reviewed, with a focus on the advances made with this type of research and the challenges that came to light. Numerous strengths of the large-scale translational studies were identified. The studies also highlighted important areas meriting further attention, including exploration of additional dissemination pathways, and further piloting and refinement of program components for different population segments. The articles in this special section represent major advances in implementing successful, impactful programs for diabetes prevention and control in low- and middle-income countries.

Keywords

Type 2 diabetes, Global health, Behavioral interventions, Citizen science, Participatory research, Built environment

Behavioral medicine research spans decades and has provided a wealth of insights related to improving health and quality of life across a range of clinical domains and populations [1]. Yet, despite the numerous successful interventions published in the behavioral medicine field, surprisingly few have made their way across the “divide” from science to implementation and action [2–4]. The dearth of evidence-based behavioral health interventions that have been moved successfully into practice has received increasing attention and concern by funding bodies and scientists alike [5]. This situation calls for action among scientists to think differently about intervention studies—including expanding their focus from problem-oriented to solution-oriented designs and methods that involve larger, more diverse populations and deliver pragmatic interventions and assessment strategies in real-world settings [5].

The large-scale intervention studies highlighted in the Diabetes special section of this issue accomplish just that. Together, they present a compelling

Implications

Practice: The articles upon which this commentary is based provide a ground-breaking set of insights related to the practice and implementation of large-scale diabetes prevention and control programs in major low-to-middle income countries.

Policy: The articles provide examples of effective interventions in health care and community settings which can inform policies, both at the local level and at higher levels of impact, for supporting the implementation and dissemination of these types of multi-component interventions.

Research: The large-scale global intervention programs represent a real-world, solution-based research approach that can serve as a useful model for diabetes and other behavioral medicine research areas. They also provide a foundation upon which digital health behavior change programs and methods can be tested in these and other countries for even greater population scalability and impact.

approach to adapting and implementing effective behavioral health interventions aimed at a dangerous and increasingly common noncommunicable disease in low- to middle-income countries (LMIC)—Type 2 diabetes. While the successful lifestyle program tested in the U.S. Diabetes Prevention Program (DPP) [6] has gained prominence through a growing amount of implementation research for some population segments [7], challenges remain in translating this and other evidence-based diabetes prevention and control programs for underserved, less-resourced populations in the USA and elsewhere.

The articles in this special section represent major advances in implementing successful, impactful programs for diabetes prevention and control in LMIC. The focus on populous regions of the world, specifically China, India, and Africa, presents a number of different program implementation

challenges, including the scarcity and affordability of program staff, logistical and environmental barriers, challenges related to participant communication and engagement, reduced health literacy levels, and issues of incorporating relevant cultural norms as part of program adaptations, delivery, and evaluation.

All research programs were delivered within the context of a community-based participatory approach involving multiyear community engagement and formative research activities, extensive collaboration with relevant governmental bodies and nongovernmental organizations (NGOs), and active participation of community advisory groups and local experts. A number of adaptations occurred as a consequence of this ongoing community engagement process, including use of diverse program delivery channels (e.g., care coordinators, peer support, video instruction, and text messaging); content adaptations in light of reduced literacy and numeracy levels; inclusion of community-specific program elements, such as language translation, recognizable role models, and other cultural features (e.g., a focus on local foods as well as relevant visual aids to enhance participant understanding); and culturally appropriate recruitment sources and sectors that increased participant enrollment and engagement, effective program delivery, and evaluation (e.g., local clubs in Africa, family networks in India, and community health centers in China). The extensive amount of program translation and adaptations that were often informed by formative research yielded generally high levels of program fidelity, as well as participant engagement and satisfaction. The adaptation process for the research projects also was aided by the use of implementation frameworks, such as RE-AIM [8].

In addition to their successes, the research studies highlighted important areas meriting further attention, including exploration of additional dissemination pathways, addressing NGO- and health care system-based priorities to aid program sustainability, and further piloting and refinement of program components for different population segments.

The size and scope of the translational trials were notable; for example, the Kerala Diabetes Prevention Program in India included 30 intervention communities and 30 control communities. This level of scale is typically unheard of in industrialized nations and provides the possibility of unique insights in relation to program adaptations across the different types of communities that were involved.

Additional areas that merit further exploration include increased systematic attention to built environment contexts, which have been shown to have important impacts on a variety of diabetes-relevant health behaviors, including food choice and eating behaviors, as well as physical activity patterns [9,10]. The increasing spread of mobile information and

communication technologies across the global landscape, including LMIC, offers unprecedented opportunities to capture, in a cost-efficient and scalable manner, built environment barriers to and enablers of the health behavior changes that the programs are targeting [10]. Additionally, residents themselves can be trained to use simple, evidence-based neighborhood audit tools to capture important aspects of their local environments in relation to health behaviors, such as physical activity and food access [11,12].

In addition to built environments, a particularly fruitful area for further exploration in such community-engaged research is the systematic measurement of the types of naturally occurring “ripple effects” that such approaches may engender due to the increased individual and community agency and empowerment they often create [13,14]. One qualitative method for capturing these additional community program effects, called Ripple Effects Mapping, uses a participatory technique to engage participants and stakeholders in visually mapping project efforts and results to better gauge the fuller impacts of community interventions [14]. This method can provide researchers with a more systematic approach than the anecdotal reports of additional program effects that are more typically used.

An example of a data-driven community-engaged approach that can be employed to capture both physical environment contexts and potential ripple effects is “citizen science” (also referred to as resident participation) methodology [13,15,16]. A particular form of citizen science engagement process, referred to as “by the people” citizen science [16], uses simple mobile apps as entry points for engaging patients or other community members as both data gatherers and interpreters of their own local contexts. Participants then learn how to develop consensus, prioritize, and communicate their findings to local decision-makers in compelling ways to activate practical yet meaningful health-supporting changes in their communities [15,17,18]. Citizen scientists also can be involved in capturing, over time, the multiple program impacts that have occurred beyond the originally identified program objectives [13,15,16]. Such citizen science/resident participation methods can complement researcher- and clinical/community organization-driven methods, extending project effects beyond their originally stated research goals through fuller participatory engagement and resident empowerment. The frequent use of trained peer leaders across a number of the projects described in this special section provides an excellent, potentially cost-efficient vehicle for accomplishing this additional level of participatory engagement, evaluation, and positive community activation.

In conclusion, the articles in this issue provide a ground-breaking set of insights into the large-scale implementation and uptake of behavioral

interventions for diabetes prevention and control in major low- to middle-income countries. There is much here that can be applied or adapted to other behavioral health areas and populations, including scalable program recruitment, stakeholder collaboration, cultural customization, and intervention adaptation and delivery methods. In addition, these projects set the stage for opportunities to increasingly harmonize relevant measures and methods to collectively advance diabetes prevention and control around the world. Equally important, these research programs provide a solid framework upon which globally emerging mobile health-based behavior change programs and methods can be tested for even greater population scalability and impact.

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Compliance with Ethical Standards

Conflicts of Interest: Dr. A. C. King declares that she has no conflicts of interest.

Ethical Approval: This manuscript is a commentary and does not present human subject data. The published studies cited in this commentary for which Dr. King was an author were in accordance with the ethical standards of the institutional research committee at Stanford and with the 1964 Helsinki declaration and its later amendments or comparable ethical comparisons. This commentary does not contain any studies with animals.

Informed Consent: As this is a commentary, this work does not involve human participants and informed consent was therefore not required.

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