

# Time to start addressing (and not just describing) the social determinants of diabetes: results from the NEXT-D 2.0 network

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**To cite:** Siegel KR, Gregg EW, Duru OK, *et al*. Time to start addressing (and not just describing) the social determinants of diabetes: results from the NEXT-D 2.0 network. *BMJ Open Diab Res Care* 2021;9:e002524. doi:10.1136/bmjdr-2021-002524

Received 3 August 2021  
Accepted 13 August 2021

Social determinants of health (SDOH) are not new. For example, observational data over 40 years have shown consistent—and often heart-wrenching—differences in diabetes outcomes across populations, where populations at socioeconomic disadvantage, in terms of lower education and income levels, experience less access to care and preventive services,<sup>1</sup> lower rates of diagnosis, poorer health behaviors and control,<sup>2</sup> worse cardiometabolic outcomes,<sup>3</sup> and shorter life expectancy as compared with more advantaged populations of higher socioeconomic status.<sup>4</sup> These findings suggest that diabetes is not a purely biological issue; its onset and progression are heavily influenced by the broader social context. In particular, type 2 diabetes is in large part the result of choices that people are unable to make based on the health-promoting resources and opportunities available and accessible to them.<sup>5</sup> In the USA, social and economic stressors and related disparities are patterned by geography and race/ethnicity.<sup>6</sup> Type 2 diabetes, therefore, is as much an issue of where you live, as it is an issue of how you live.

The WHO defines SDOH as the complex, integrated, and overlapping social structures and economic systems (eg, the social environment, physical environment, health services, and structural and societal factors) that are responsible for most health inequities (disparities) around the world.<sup>7</sup> Health disparities across socioeconomic gradients have been noted around the world, but are especially acute in countries that invest less in social systems to support the less advantaged.<sup>8</sup> In the USA, for example, the patchwork of social and healthcare safety nets is not always cohesive enough to provide sufficient assistance to individuals, households, and

communities at social and economical disadvantage. This is clearly illustrated by studies that have shown that almost 70% of the variance in differences in diabetes incidence and related vascular outcomes across counties in the USA is explained by demographic and socioeconomic indicators.<sup>9</sup>

To advance the knowledge base of how rigorously evaluated population-based program or policy changes can influence disparities in type 2 diabetes prevalence and diabetes outcomes, the Natural Experiments for Translation in Diabetes (NEXT-D) 2.0 network of studies presents its findings in this issue of *BMJ Open Diabetes Research and Care*. This collection of reports represents the work of some of the research studies that have evaluated naturally occurring program and policy exposures at the federal (eg, expanded insurance coverage for the underserved), state (eg, funding to support care delivery innovations), employer (eg, generous or penalty benefit designs), or clinic level (eg, reimbursements for specific diabetes prevention or management interventions).<sup>10</sup> From this collection of findings, three key themes emerge.

## THEME 1: THE IMPACTS OF EXPANDING INSURANCE COVERAGE ON ACCESS

First, a few studies explore the question of whether more access via expansion of insurance coverage that was driven by the Patient Protection and Affordable Care Act (ACA) really increases utilization of diabetes care and prescriptions. The study from Northwestern University used a well-harmonized database of linked electronic medical records (EMR) across multiple midwestern health systems in eight states to study approximately 1.5 million low-income adults aged 55–74



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years over the period 2011–2018.<sup>11</sup> Results showed no increases in outpatient use, emergency room (ER) utilization, diagnosis, or treatment of diabetes post implementation of the ACA (2014–2018) compared with a pre-implementation period (2011–2013), and the findings were similar for Medicaid expansion versus non-expansion states. The NEXT-D2 Oregon Health Sciences University team examined Medicaid drug utilization data from 26 137 642 prescription claims from 44 states (25 expansion vs 19 non-expansion) over 2012–2017.<sup>12</sup> The researchers noted that prescriptions for metformin, insulins, and newer generation non-insulin medications (eg, glucagon-like peptin 1 (GLP-1) and sodium-glucose transport protein 2 (SGLT2) inhibitors) increased in expansion states and were either stable or declined somewhat in non-expansion states over time. It is unclear whether these increases represent more diabetes diagnoses, or those with diabetes gaining coverage such that prescriptions themselves increased. The prior literature has shown that expansion of insurance coverage led to greater utilization of diabetes health services.<sup>13</sup> As such, these findings from NEXT-D 2.0 suggest that Medicaid expansion has nuanced impacts on certain segments of the population.

### THEME 2: HEALTH PLANS ARE CHANGING AND CAN INFLUENCE CARE

Second, given that a large segment of America's population accesses health and preventive services through their employer, it is important to understand how the growth of employer-sponsored high-deductible health plans (HDHPs) is impacting diabetes health outcomes. In a previous work by Harvard University, HDHPs were associated with delayed care<sup>14</sup> and more acute diabetes complications,<sup>15</sup> especially among populations disproportionately at risk. In this issue, the same group reports findings among commercially insured individuals over 2005–2013 HDHP and showed a remarkable (~400%) increase in HDHP prevalence over the period among both chronically ill and healthy individuals.<sup>16</sup> Members with diabetes and cardiovascular disease (CVD) were slightly less likely than healthy members to be in HDHPs throughout the study period. HDHPs were associated with higher out-of-pocket (OOP) costs, especially for those with diabetes and/or CVD; the average OOP cost burden was five to seven times higher for HDHP members with chronic diseases compared with healthy members in HDHPs. As such, HDHPs may be particularly detrimental to the health and financial well-being of people with chronic diseases who have more healthcare needs than healthier populations. Across all disease categories, members were significantly less likely to be enrolled in an HDHP if they were insured through larger and self-insured employers, lived in New England, or lived in predominately low-income or non-white neighborhoods.

Coverage for diabetes services might also be influenced by public insurance. In a study by Tulane University, the

use of diabetes self-management education and support (DSMES) among newly diagnosed patients with type 2 diabetes was low overall.<sup>17</sup> The study showed that DSMES use varied by race/ethnicity, insurance type, and insulin versus non-insulin use.

### THEME 3: INNOVATIONS IN DELIVERY OF CARE

The third theme highlights the importance of finding novel ways to provide care for populations that are underserved, which tend to have large gaps in their care and may not adhere to the care they receive due to social and economic factors.<sup>5</sup> This is even more complicated for those with multiple chronic conditions. In an analysis of a cohort of 532 323 adult patients with diabetes using linked EMR data across six academic health systems and over the decade from 2009 to 2019, the NEXT-D2 Penn State University team found that comorbidities like chronic kidney disease and cognitive impairment tripled the odds of hypoglycemia-related hospitalizations.<sup>18</sup> The same models showed that non-Hispanic Black race/ethnicity doubled the risk of hypoglycemia. Moreover, these disparities were more pronounced in rural areas than in urban areas, suggesting that there may be environmental and geographic factors at play in influencing diabetes outcomes.

Chronic care management programs that address social and health needs may be a strategy for improving care and reducing costs among populations with multiple chronic conditions. A team led by the Icahn School of Medicine at Mount Sinai has found in prior qualitative work that in the eyes of its patients, New York State Medicaid's Health Home (HH) program (which provides care management services to Medicaid-insured individuals with chronic conditions, including diabetes) addressed social needs and promoted greater access to care and services.<sup>19</sup> In this issue, the Mount Sinai team presents their findings examining the impact of the HH program on access to care (using multiple metrics) using a Medicaid-claims analysis.<sup>20</sup> This study examined 11 011 HH enrollees between 2010 and 2017 compared with a weighted and matched group of non-enrollees, three-quarters of which were Black and Hispanic patients. Over the 12 months after enrollment compared with the pre-enrollment 12 months, those in the HH program had 3.8 more outpatient visits than expected and were more likely to have a 7 and 30-day follow-up visit after ER or inpatient admissions when compared with Medicaid-insured patients with diabetes who did not enroll in an HH. The group concluded that the HH program improved access to care for this population, a finding that suggests that Medicaid and Medicare policy innovations in chronic care management can be effective in improving access and care for people with chronic conditions like diabetes.

### FUTURE DIRECTIONS

This compilation of six research studies from the NEXT-D 2.0 consortium highlights how changes along

the spectrum of the healthcare system can impact health outcomes in different ways. First, the extent of health insurance coverage may increase access to prescriptions for important diabetes medications, although the studies did not find evidence that expanded coverage increases outpatient and ER visits, diabetes diagnosis, or treatments in large, academic health systems. Second, the structure and benefit designs of health insurance can play a role, with evidence showing that the growth in HDHPs and their resulting high OOP costs may not be beneficial to some of the populations most at risk, especially individuals with low incomes and with multiple chronic conditions. Third, the manner in which care is delivered matters, and delivery models that innovate to treat multiple comorbid chronic conditions or to address social needs in addition to health needs can help to improve health outcomes and reduce high-cost utilization.

The magnitude of effects seen in these studies was generally small. This may be because the impacts are larger in specific segments of the population, and the ‘average’ effects are being blunted by the large sample sizes; or because these healthcare and payer innovations are too far downstream to make a significant impact on disparities.<sup>5</sup> This point also highlights that current research into how to address social determinants of diabetes tends to focus on health system interventions because that is where the bulk of the data is; as such, investments in data systems and research in the upstream determinants of diabetes and health disparities can provide huge value to this topic area.

In particular, diet and physical activity play major roles in the development and potential prevention of type 2 diabetes and diabetes complications.<sup>21</sup> Food and agricultural policies and programs, as well as public policy, planning, legislative, and community-based initiatives that alter the built environment to enhance physical activity levels, may play a large role in affecting diabetes risk at the individual and population levels. However, while prevention of type 2 diabetes and diabetes complications is a critical public health goal, relatively little is known about the effectiveness of large-scale policies and programs that could help achieve this goal at the population level, or any differential effects on subpopulations.<sup>22</sup> Rigorous scientific evaluation of such policies and programs can help build an evidence base to inform public policy approaches to prevent type 2 diabetes and diabetes complications by encouraging healthier diets and increased physical activity.

To date, studies evaluating innovative policy approaches to change the availability of healthy foods through incentives and taxation, or efforts to improve food and physical activity environments through neighborhood and urban planning, have been limited, and relatively scattered across the landscape. For example, sugar-sweetened beverage taxes have received a relatively large evaluation focus in recent years in US cities like Berkeley<sup>23</sup> and Philadelphia<sup>24</sup>—while recent legislation for menu or front-of-package calorie and nutrition labeling, school food

programs (including school fruit and vegetable gardens), and changes to foods eligible for Supplemental Nutritional Assistance Program benefits, such as Wholesome Wave, have all proceeded with little empirical evaluation of the behavioral, economic, and health impact, or unintended consequences.

The Community Preventive Services Task Force recommends built environment strategies that combine one or more interventions to improve pedestrian or bicycle transportation systems with one or more land use and environmental design interventions to increase physical activity.<sup>25</sup> There are several evidence gaps however that remain to be filled through longitudinal assessments of policy, systems, and environmental intervention approaches. Studies describing both the implementation and evaluation of coordinated built environment approaches, such as Complete Streets,<sup>26</sup> would strengthen the evidence base and provide direct guidance and support to help community, urban, and regional planners.

One could argue that even these upstream interventions are still downstream of the major drivers of disparities. For example, efforts to change the food and built environments may have little impact on individuals and communities that are focused on assuring shelter and safe housing.<sup>27</sup> These aspects are especially relevant during the current COVID-19 pandemic, which has highlighted the disproportionate effects of COVID-19 on racial and ethnic minorities<sup>28</sup> that already have less healthcare access and worse diabetes-related outcomes. This is also relevant in the context of waves of economic recessions that are felt every decade or so. Recent efforts by cities and health systems to invest in social determinants offer early signals of effectiveness. For example, programs providing cash transfers to homeless individuals for housing and other essential living expenses have led to reduced ER spending<sup>29</sup> and increased food security.<sup>30</sup> It is clear that research in diverse settings and populations and for longer durations is important to demonstrate the ubiquitous influence and sustainable potential these strategies may present.

### CONCLUDING REMARKS

This compilation of NEXT-D 2.0 research findings demonstrates the importance of SDOH, the essential need to understand and mitigate its effects, and the potential value of population-wide policies, programs, and reimbursement schemes for improving health equity. The findings highlight that, despite potential improvements in clinical care and lowering high-cost health service utilization, there remains a considerable preventable burden of diabetes and its complications. A diverse array of effective changes in policies and the environments in which people live, work, and play may help to mitigate the diabetes epidemic—essentially getting to the root cause of inequities in health, particularly diabetes-related disparities.<sup>5</sup> Such changes may be achieved via population health promotion, improving community



resources, enabling access and delivery of preventive services, or policies to change the diabetogenic aspects of US communities, and policies and practices to improve care and management of diabetes—all while engaging the perspectives of key stakeholders (patients, community health workers, healthcare systems, as well as those involved in community and urban planning and design, and food production and distribution). However, the evidence for these policies and programs is currently limited, opening even more avenues for impactful research—including natural experiments—to improve metabolic health and well-being.

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**Contributors** KRS, EWG, OKD, LS, CMM, PLT, SC and MKA participated in the writing and editing of this commentary paper.

**Funding** US Department of Health and Human Services, Centers for Disease Control and Prevention (grant number U18DP006535).

**Disclaimer** The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or of the National Institutes of Health and the National Institute of Diabetes and Digestive and Kidney Diseases. The views presented in this article are solely the responsibility of the authors and do not necessarily represent the views of the Patient-Centered Outcomes Research Institute (PCORI), its Board of Governors, or its Methodology Committee.

**Competing interests** None declared.

**Patient consent for publication** Not required.

**Provenance and peer review** Not commissioned; internally peer reviewed.

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