

Commentary

Understanding Socioeconomic and Racial/Ethnic Status Disparities in Diet, Exercise, and Weight: Underlying Contextual Factors and Pathways

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It is clear that Americans of various income and education levels and racial/ethnic backgrounds differ in their diets, exercise patterns, and body weight. Moreover, there have been vast changes in obesity-related behaviors over time, and there is substantial heterogeneity in these changes by race/ethnicity and socioeconomic status (SES). For example, whereas blacks of low SES consumed a relatively healthier diet than whites in the 1960s, by the 1990s diets were more similar by race/ethnicity and income (1,2). There are clear disparities in obesity by individual-level and neighborhood-level SES and race/ethnicity and a major need to reduce these disparities (3-6).

The critical issue is not whether health disparities exist, but rather to understand the types of changes that have the most potential to appropriately reach those in greatest need and effectively reduce health disparities. At the same time, effective programs and policies require understanding the potential reach across national, state, and local levels. Currently, policies aimed at the School Lunch Program are underway (7), and many states have forged policy to increase children's exercise (8). Within the field of nutrition, obesity prevention and treatment efforts have historically relied on individual-level initiatives that focus on changes related to knowledge, attitudes, and practices. It is within this context that Wang and Chen address the issue of race/ethnic disparities in diet, exercise, and weight status (9).

Wang and Chen address race/ethnic differences in diet, exercise participation, and obesity across health- and nutrition-related psychosocial factors, an important area of research (9). The relationships among race/ethnicity, socioeconomic status, and diet, exercise, and obesity are the result of a complex and multidimensional process that occurs over time. Wang and Chen's research can be

viewed as a stepping stone to future longitudinal analyses that can help fully understand the temporality of these relationships and the pathways through which social and psychosocial factors exert their influence on health. Understanding these pathways, and the context in which these pathways exert influence, is necessary to understand and prevent disparities.

Clearly, there are important links between nutrition- and health-related psychosocial factors and their association with SES, diet, exercise, and obesity. However, the inherent complexity of the pathways leading to health disparities makes intervention and policy in this area quite complex. Future research should incorporate the wider context in which these disparities develop to help elucidate the core pathways. Within epidemiology there is much discussion of the analytical tools needed to understand these complex pathways underlying racial/ethnic health disparities (eg, the work by Kaufman [10,11]). There is also increased understanding of the multiple levels of influence that shape obesity and obesity-related behaviors (eg, reviews on this topic [6,12,13]). Ultimately, the field needs longitudinal data and advances in rigorous analytical methodologies to fully understand the pathways among the wider environment, individual-level factors, and obesity.

THE WIDER CONTEXT OF OBESITY

A highly simplistic conceptual framework adapted from published socioecological and systems-based conceptual models is shown in the Figure (14,15) to illustrate the current understanding of factors underlying racial/ethnic and socioeconomic health disparities in body weight. Wang and Chen (9) address the role of nutrition- and health-related psychosocial factors in racial/ethnic disparities in dietary intakes, exercise, and weight status (the shaded boxes in the Figure). However, there are also a wide range of factors that are extremely important in shaping the individual-level socioeconomic, psychosocial, and diet and exercise behaviors that are the focus of study in Wang and Chen. These unaddressed factors (the non-shaded boxes in the Figure) relate to the policy environment, the environmental behavior setting where diet and exercise occur, as well as the individual-level biological factors that influence body weight (eg, physiological, genetic, neurohormonal factors). Wider environmental factors and individual-level biological factors can complement the territory covered in Wang and Chen (9).

Within the policy environment, changes at the national, state, and local levels have great potential to influence the environmental behavior setting and further

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Manuscript accepted: September 1, 2011.

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0002-8223/\$36.00

doi: 10.1016/j.jada.2011.09.017

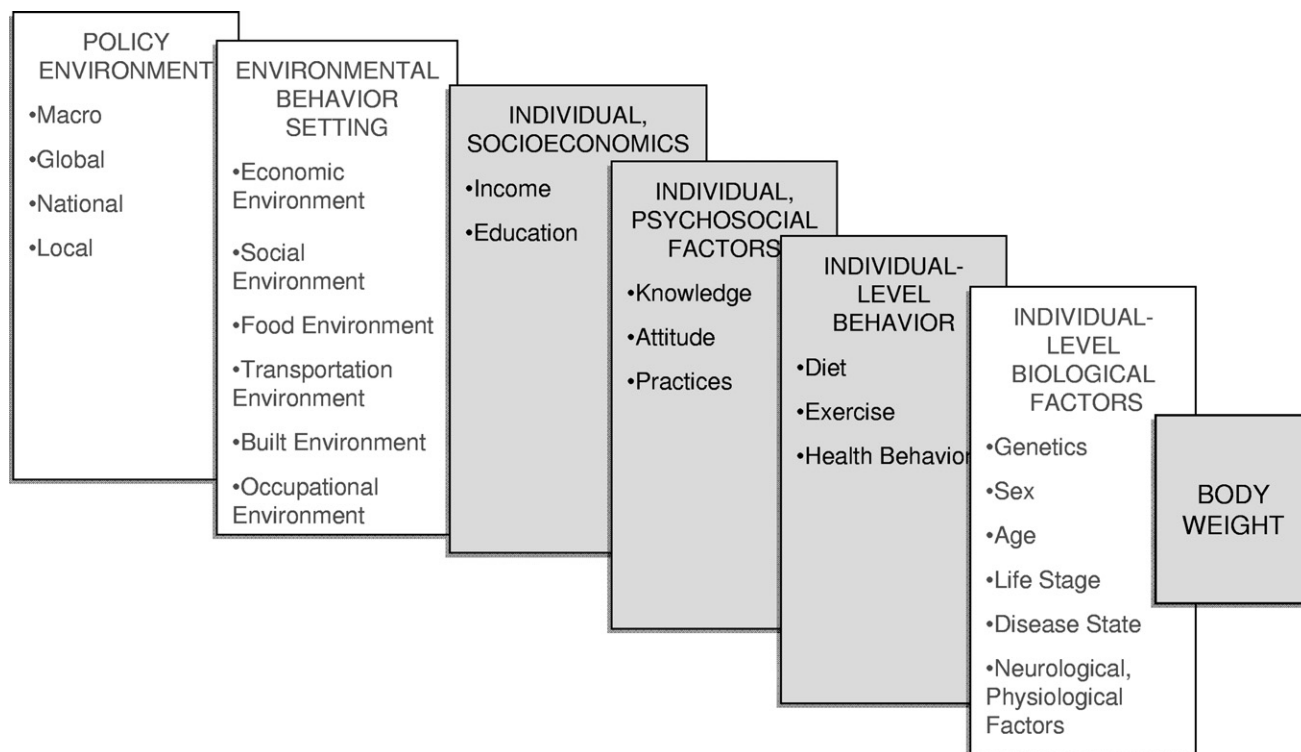


Figure. Simplified conceptual model: Systems and environments underlying obesity.

influence diet and exercise behaviors. For example, policy changes related to zoning can change the environmental behavior setting to increase access to sources of healthy foods and exercise opportunities. For another example, taxation and other programmatic and policy changes can increase economic incentives for engaging in exercise and increasing healthy diet behaviors.

The policy environment has bearing on environmental behavior settings, which then have further influence on the types of factors addressed in Wang and Chen (9). Building on this work, longitudinal data are needed to understand the potential impact of changes at the policy environment level and how they alter environmental behavior settings, and further how they impact diet and exercise behaviors. Longitudinal data and rigorous methodologies (eg, complex sequential modeling) are also needed to address individual characteristics that may contribute to these dynamic interrelationships. For example, using such sequential longitudinal modeling can elucidate how policy efforts to improve maternal education can influence child-care behaviors and further influence child health outcomes (16,17). Similarly, sequential modeling can be used to understand how changes to food and recreational environments might impact individual-level behaviors and further influence incidence of obesity and obesity-related consequences, while controlling for individual preference for environmental behavior settings related to residential choice (18).

Understanding behavior changes in association with changes in environmental behavior settings can be powerful tools to understand potential impacts of broad environmental changes on individual-level behaviors. For

example, using longitudinal data, Boone-Heinonen and colleagues (19) found that greater availability of neighborhood fast-food restaurants over time was positively related to temporal increases in consumption of fast foods among men of low income. On the other hand, this analysis also suggested that the presence of a supermarket, in and of itself, may not be enough to promote higher diet quality and fruit and vegetable intake. Using longitudinal data, associations between community-level prices and individual-level behavior have also been shown. In Duffey and colleagues (20), higher community-level prices of fast foods and soft drinks over time were associated with lower energy intake from these foods as well as reductions in weight, homeostatic model assessment-insulin resistance (HOMA-IR), and total energy intake over time. In Hou and colleagues (21), higher community-level gasoline prices over time were associated with a substantial temporal increase in physical activity, suggesting that rising gas prices could have an unintended increase in leisure physical activity. In other longitudinal analyses we have found that temporal changes in environmental behavior settings, such as neighborhood street design, can promote walking, bicycling, and jogging (22). But that relationship is quite complex, with differential impact in rural, suburban, and urban areas, indicating a sensitivity to street design factors in less urban settings.

CONNECTIONS TO HEALTH DISPARITIES

A central feature of all of these studies is the heterogeneity in effects by sex, by income, and by degree of urbanicity. In an examination of neighborhood deprivation,

Boone-Heinonen and colleagues (23) addressed unmeasured individual characteristics related to residential decision-making. In US blacks, physical activity decreased with increased neighborhood deprivation, suggesting an association between neighborhood deprivation and reduced physical activity. Clearly these complex policy and environmental behavior settings are important to consider to fully understand the context in which individual-level socioeconomic, psychosocial, and obesity-related behaviors are situated. Furthermore, changes to the environmental behavior setting (eg, economic environments, food environments) can have different influences on population subgroups (eg, low-income groups) in terms of individual-level psychosocial factors (eg, knowledge, attitudes, and practices).

A common tool in biomedical and social science research on race/ethnic or SES disparities is the use of regression methods to show how income or various demographic or education or contextual settings relate to prevalence differences across race/ethnic groups. Given the complexity in the systems that produce obesity, more research is needed to focus on policy choices of governments at state and federal levels, namely the prices of food and resources for physical activity, the location and types of diet, and exercise resources across communities. More research is also needed about whether these resources are equitably allocated across social and geographic space. These resources might be potential targets for taxation and other policy efforts to increase access to healthy foods and exercise opportunities and ultimately prevent and reduce obesity and its comorbidities. Yet, there remain critical gaps in current understanding of the complex mechanisms underlying the associations between neighborhood food environments and body weight. These gaps prevent a full understanding of how wider environmental contexts can be best maximized in relation to individual-level socioeconomic, psychosocial factors, and individual-level behaviors.

A further complexity is that although there are no arrows in the Figure, there are highly complex and multidirectional feedbacks across individual-, environmental-, and policy-level realms. Understanding these complex systems-oriented multilevel relationships is a nascent area of research, with rapid development of data and methodology to deal with research questions related to socioeconomic and race/ethnic disparities in relation to obesity and its consequences. In order to develop effective and cost-efficient intervention strategies to confront obesity, it is essential to understand the pathways from the wider societal factors through individual-level diet and activity to obesity and its consequences.

Furthermore, there is heterogeneity across populations and settings that can further complicate the understanding of these complex systems. There are clearly subpopulations at comparatively high risk for obesity, particularly low-income, ethnic minority, and both rural and inner-city residents. The more the field can move toward a deeper understanding of complex systems as well as the heterogeneity within such complex systems, the more we can move beyond documenting the existence of health disparities to understanding how and when to intervene to reduce these disparities.

At the same time that this research area related to

wider systems-based approaches to preventing and treating obesity is moving forward, policy has moved forward as part of recent local, state, and national obesity-prevention initiatives. For example, there are many new efforts in the areas of labeling and advertising (eg, labeling chain restaurant menus/menu boards; front-of-package labeling; advertising to children), prices (eg, taxing sugar-sweetened beverages), and neighborhood changes (eg, introduction of supermarkets, creating safe playgrounds). Many such policy changes address disparities by focusing on improving the access to healthy foods in underserved areas, the most famous of which are occurring under the national Let's Move effort (24-26). Furthermore, the new food-labeling initiative of the IOM (27) aims to address health disparities by bringing healthy foods into underserved schools and communities.

THE FUTURE

As these efforts move forward, critical and rigorous evaluation will provide a wealth of information that will aid in understanding the impact of these environmental policies and changes. Innovative approaches, such as quasi-experimental design methods and natural experiments, will aid in understanding potential impacts of environmental changes. In one of few quasi-experimental studies, Cummins and colleagues (28) studied changes in fruit and vegetable consumption after the opening of a supermarket-type store in the United Kingdom, finding similar associations in the "experimental" relative to control neighborhood. There are also examples in the United States in relation to welfare, nutrition assistance, and health care programs (29). The Supplemental Nutrition Assistance Program (SNAP) is currently testing the use of nutrition assistance at small groceries, fruit and vegetable markets, and farmer's markets on individual-level dietary intake. SNAP has been an excellent example of how small policy changes with rigorous process evaluation and pilot study have been used prior to implementation of large-scale policy changes (30).

Of critical importance is developing a better understanding of how various programs and policy changes can reduce health disparities. Clearly, these policy-level efforts to address the wider context of health disparities are important. Equally important are efforts that address nutrition- and health-related psychosocial factors, such as those discussed by Wang and Chen (9). Ultimately, efforts that address the multiple pathways to disparities (ranging from broader contextual forces to individual-level behavioral choices) are likely to make progress toward ameliorating disparities. The research by Wang and Chen (9) draws attention to the confluence of nutrition- and health-related psychosocial factors and socioeconomic status in relation to racial/ethnic disparities in weight-related behaviors, clearly an important step toward understanding these complex relationships.

STATEMENT OF POTENTIAL CONFLICT OF INTEREST: No potential conflict of interest was reported by the authors.

FUNDING/SUPPORT: The authors received no funding to write this commentary/editorial.

ACKNOWLEDGEMENTS: The authors thank Frances Dancy, UNC Carolina Population Center, for her helpful

administrative assistance. In addition, the authors are grateful to the Carolina Population Center, R24 HD050924 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) for broad support, although no funding was provided by this grant.

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