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Understanding socioeconomic and racial/ethnic status disparities in diet, exercise and weight: underlying contextual factors and pathways

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Introduction

It is clear that Americans of various income levels and education 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 60's, by the 1990's 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 reduce health disparities and appropriately reach those in greatest need. 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)

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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 relationship between race/ethnicity, socioeconomic status and diet, exercise, and obesity is the result of a complex and multidimensional process that occurs over time. Wang and Chen can be viewed as a stepping stone to future longitudinal data 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 in order 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 fully understand the underlying pathways. Within epidemiology there is much discussion of the analytical tools needed to understand these complex pathways underlying racial/ethnic health disparities (e.g., the work by Kaufman(10, 11)). There is also increased understanding of the multiple levels of influence that shape obesity and obesity-related behaviors (e.g., reviews on this topic (6, 12, 13)). Ultimately the field needs longitudinal data and advances in rigorous analytical methodologies to fully understand the pathways between 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 Figure 1(14, 15) to illustrate and discuss 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 Figure 1). 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 Figure 1) 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 (e.g., physiological, genetic, neurohormonal factors). These upstream and downstream factors can complement to 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 influence diet and exercise behaviors. For example, policy changes related to zoning can change the environmental behavior setting to increase access to healthy diet sources 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 upon environmental behavior settings which then have further influence on the types of factors addressed in Wang and Chen.(9) Building upon 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 (e.g., complex sequential modeling) are also needed to address individual characteristics that may contribute to these dynamic inter-relationships. 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 behavioral changes in association with these 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 et al.,(19) found that greater availability of neighborhood fast 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 et al., (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, HOMA-IR, and total energy intake over time. In Hou et al., (21) higher community-level gasoline prices over time were associated with a substantial temporal increase in physical activity, suggesting that rising gas price 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 the relationship is quite complex, with differential impact in less versus more 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 gender, by income, and by degree of urbanicity. In an examination of neighborhood deprivation, Boone-Heinonen et al.(23) addressed unmeasured individual characteristics related to residential decision making. In U.S. blacks, physical activity declined with increased neighborhood deprivation, suggesting association between neighborhood deprivation and reduced physical activity. Clearly these complex policy and environment behavior settings are important to consider in fully understanding the context in which individual-level socioeconomic, psychosocial, and obesity-related behaviors are situated. Furthermore, changes to the environmental behavior setting (e.g., economic environments, food environments) can have differential influence on population subgroups (e.g., low income groups) in terms of individual-level psychosocial factors (e.g., 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, and 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 that prevent a full understanding of how wider environmental contexts can be best maximized in relation to individual-level socioeconomics, psychosocial factors, and individual-level behaviours.

A further complexity is that while there are no arrows in Figure 1, 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. A greater understanding of the pathways through which each component of the system influences individual-level obesity-related behaviors and further through this pathway, obesity itself – is clearly needed to develop effective and cost-efficient intervention strategies.

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, as well as rural and inner city residents. The more the field can move towards deeper understanding of the complex system as well as heterogeneity in effects, the closer we can get to moving beyond documenting the existence of health disparities, to understanding how and when to intervene to reduce health disparities.

At 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 (e.g., labeling chain restaurant menus/menu boards; front of package labeling; advertising to children), prices (e.g., taxing sugar-sweetened beverages), and neighborhood changes (e.g., 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 allow the understanding of 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 et al. (28) studied changes in fruit and vegetable consumption following the opening of a supermarket-type store in the United Kingdom (UK) finding similar associations in the “experimental” relative to control neighborhood. There are also examples in the US in relation to welfare, food stamp, and health care programs.(29) The Supplemental Nutrition Assistance Program (SNAP) is currently testing the use of food stamps at small groceries, fruit and vegetable markets, and farmer's markets on individual-level dietary intake. SNAP has been an outstanding example of how small policy changes with rigorous process evaluation and pilot study has 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 raised by Wang and Chen.(9) Ultimately, efforts that address the multiple pathways to disparities, ranging from broader contextual forces simultaneous with individual-level behavioral choices, are likely to make progress towards 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 towards understanding these complex relationships.

REFERENCES

1. Popkin BM, Siega-Riz AM, Haines PS. A comparison of dietary trends among racial and socioeconomic groups in the United States. *N Engl J Med*. 1996; 335(10):716–720. [PubMed: 8703172]
2. Popkin BM, Zizza C, Siega-Riz AM. Who is leading the change?. U.S. dietary quality comparison between 1965 and 1996. *Am J Prev Med*. 2003; 25(1):1–8. [PubMed: 12818303]
3. Department of Health and Human Services. Health and Human Services Action Plan to Reduce Racial and Ethnic Health Disparities. United States Department of Health and Human Services. , editor. US government printing office; Washington DC: 2011.
4. Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care. Board of Health Sciences Policy. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*. Smedley, BD.; Stith, AY.; Nelson, AR., editors. National Academy Press; Washington DC: 2003.
5. Ogden CL. Disparities in obesity prevalence in the United States: black women at risk. *Am J Clin Nutr*. 2009; 89(4):1001–1002. [PubMed: 19244372]
6. Larson NI, Story MT, Nelson MC. Neighborhood environments: disparities in access to healthy foods in the U.S. *Am J Prev Med*. 2009; 36(1):74–81. [PubMed: 18977112]
7. Food and Nutrition Service USDA. [August 3, 2011] Healthy, Hunger-Free Kids Act of 2010 (HHFKA). http://www.fns.usda.gov/cnd/Governance/Legislation/CNR_2010.htm. Available at.
8. Division of Nutrition Physical Activity and Obesity Centers for Disease Control and Prevention. [August 3, 2011] Physical Activity Policy Resources. <http://www.cdc.gov/nccdphp/DNPAO/policy/physicalactivity.html>. Available at.
9. Wang Y, Chen X. How much of racial/ethnic disparities in dietary intakes, exercise and weight status can be explained by nutrition- and health-related psychosocial factors and socioeconomic status among US adults. *JADA*. 2011; 111:xxx–xxx.
10. Kaufman JS. Epidemiologic analysis of racial/ethnic disparities: some fundamental issues and a cautionary example. *Soc Sci Med*. 2008; 66(8):1659–1669. [PubMed: 18248866]
11. Kaufman J, MacLehose R, Kaufman S. A further critique of the analytic strategy of adjusting for covariates to identify biologic mediation. *Epidemiol Perspect Innovations*. 2004; 1(1):4.
12. Harnack LJ, French SA. Effect of point-of-purchase calorie labeling on restaurant and cafeteria food choices: A review of the literature. *Int J Behav Nutr Phys Act*. 2008; 5:51. [PubMed: 18950529]
13. Kumanyika SK, Obarzanek E, Stettler N, et al. Population-based prevention of obesity - The need for comprehensive promotion of healthful eating, physical activity, and energy balance - A scientific statement from American Heart Association Council On Epidemiology And Prevention, Interdisciplinary Committee For Prevention (formerly the Expert Panel on Population and Prevention Science). *Circulation*. 2008; 118(4):428–464. [PubMed: 18591433]
14. Huang TT, Drewnowski A, Kumanyika SK, Glass TA. A systems-oriented multilevel framework for addressing obesity in the 21st century. *Prev Chronic Dis*. 2009; 6(3):A97. [PubMed: 19527598]
15. Davison KK, Birch LL. Childhood overweight: a contextual model and recommendations for future research. *Obes Rev*. 2001; 2(3):159–171. [PubMed: 12120101]
16. Cebu Study Team. Underlying and proximate determinants of child health: The Cebu Longitudinal Health and Nutrition Study. *Am J Epidemiol*. 1991; 133(2):185–201. [PubMed: 1985447]
17. Cebu Study Team. A child health production function estimated from longitudinal data. *J Dev Econ*. 1992; 38:323–351. [PubMed: 12285368]
18. Boone-Heinonen J, Gordon-Larsen P, Guilkey DK, Jacobs DR Jr, Popkin BM. Environment and physical activity dynamics: the role of residential self-selection. *Psychol Sport Exerc*. 2011; 12(1): 54–60. [PubMed: 21516236]

19. Boone-Heinonen J, Gordon-Larsen P, Kiefe CI, Shikany JM, Lewis CE, Popkin BM. Fast food restaurants and food stores: Longitudinal associations with diet in young to middle-aged adults: The CARDIA Study. *Arch Intern Med.* 2011; 171(13):1162–1170. [PubMed: 21747011]
20. Duffey KJ, Gordon-Larsen P, Shikany JM, Guilkey D, Jacobs DR Jr, Popkin BM. Food price and diet and health outcomes: 20 years of the CARDIA Study. *Arch Intern Med.* 2010; 170(5):420–426. [PubMed: 20212177]
21. Hou N, Popkin BM, Jacobs DR Jr. et al. Longitudinal trends in gasoline price and physical activity: The CARDIA study. *Prev Med.* 2011; 52(5):365–369. [PubMed: 21338621]
22. Hou N, Popkin BM, Jacobs DR Jr. et al. Longitudinal associations between neighborhood-level street network with walking, bicycling, and jogging: the CARDIA study. *Health Place.* 2010; 16(6):1206–1215. [PubMed: 20801072]
23. Boone-Heinonen J, Gordon-Larsen P, et al. Neighborhood socioeconomic status predictors of physical activity through young to middle adulthood: the CARDIA study. *Soc Sci Med.* 2011; 72(5):641–9. [PubMed: 21316829]
24. [July 7, 2010] Let's Move. Accessing healthy & affordable food. <http://letsmove.gov/accessing/index.html>.
25. Treasury Public Affairs USDA Office of Communications HHS/ACF Press Office. [July 25, 2011] Obama Administration Details Healthy Food Financing Initiative. 2011. <http://www.hhs.gov/news/press/2010pres/02/20100219a.html>.
26. The White House Office of the First Lady. [July 25, 2011] First Lady Michelle Obama Announces Nationwide Commitments to Provide Millions of People Access to Healthy, Affordable Food in Underserved Communities.. Statements and Releases. 2011. <http://www.whitehouse.gov/the-press-office/2011/07/20/first-lady-michelle-obama-announces-nationwide-commitments-provide-milli>.
27. Roodenburg AJ, Popkin B, Seidell JC. Development of international criteria for a front of package nutrient profiling system: International Choices Programme. *Eur J Clin Nutr.* 2011 Advance Online Publication: doi: 10.1038/ejcn.2011.1101.
28. Cummins S, Petticrew M, Higgins C, Findlay A, Sparks L. Large scale food retailing as an intervention for diet and health: quasi-experimental evaluation of a natural experiment. *J Epidemiol Comm Health.* 2005; 59(12):1035–1040.
29. Shadish, W.; Cook, T.; Campbell, D. *Experimental and Quasi-Experimental Designs for Generalized Causal Inference.* Wadsworth Publishing; New York City: 2001.
30. Food and Nutrition Service USDA. [August 3, 2011] Supplemental Nutrition Assistance Program (SNAP) Studies. <http://www.fns.usda.gov/ORA/menu/Published/SNAP/ProgramDesign.htm>.

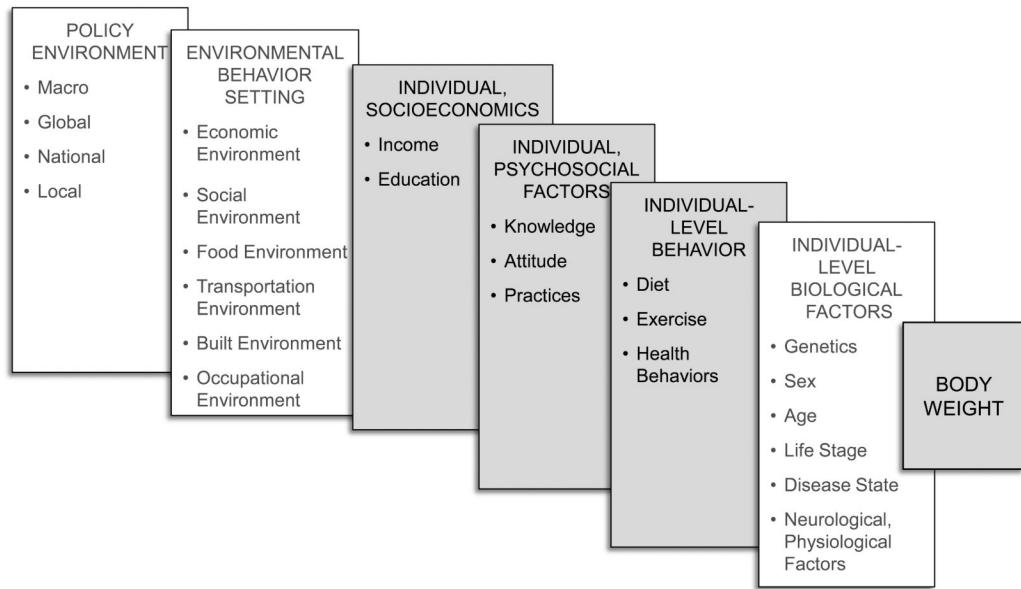


Figure 1. Simplified conceptual model: systems and environments underlying obesity