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Introduction to the Special Issue on the Scientific Assessment of Biomeasures in the Panel Study of Income Dynamics

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Abstract

This special issue of *Biodemography and Social Demography* assesses the value to social science and health research of incorporating biomeasures in a social survey. The focus is on the Panel Study of Income Dynamics (PSID), an on-going, nationally-representative panel study of U.S. households. A brief description of the PSID and the features that make it a promising survey for biomeasures is provided along with an overview of each individual article. Seven of the nine articles cover a major health domain: fatness and obesity, metabolic syndrome and cardiovascular disease, inflammation and immune function and cardiovascular disease, infectious disease, daily stress exposure and reactivity, respiratory health, and genetics. These articles describe the scientific rationale for collecting data in each domain as well as the specific biological samples or measurements needed to assess the domain, potential respondent burden, ethical and legal issues, fieldwork logistics, and costs. The final two articles address a pair of overarching issues: one provides international comparisons and perspectives and the other discusses ethical and legal concerns.

This special issue of *Biodemography and Social Demography* is comprised of nine invited articles that were presented at a conference entitled “The Scientific Assessment of the Value of Biomeasures in the Panel Study of Income Dynamics.” The conference was held at the University of Michigan in Ann Arbor, MI, on December 10 – 11, 2008. Funding was provided by the National Institute on Aging, one of the main sponsors of the PSID. All of the articles went through the normal refereeing process of *Biodemography and Social Demography* and were revised in response to comments from reviewers and the editors of this special issue.

The goal of the conference was to convene a group of scientific experts to advise the PSID on whether to collect biomeasures and, if so, which specific biomeasures to collect. However, the articles should be of interest to a broad set of researchers studying the relationship between social, demographic, and economic factors and health outcomes including current and future PSID data users, particularly those interested in analyzing the health measures, and researchers contemplating such measures for other similar longitudinal social surveys. There has been a tremendous growth in the collection of biomeasures in social science surveys over the past five years (see Weinstein, Vaupel, and Wachter, 2007), and the conference was well-timed to provide an assessment of biomeasures that are currently being collected and to identify biomeasures that might be collected in the future.

PSID is an on-going, nationally-representative panel study of U.S. households. It was established to study the dynamics of income and poverty, although today the data are used to study a wide array of topics including the interconnections between health and socioeconomic status. PSID started with a national sample of about 5,000 households in 1968 and has attempted to find and interview the approximately 18,000 individuals from those households and their descendants in subsequent waves (see Brown, Duncan, and Stafford, 1996). The sample has expanded over time, with information for about 9,000 households containing 24,000 individuals being collected in the 2009 wave. PSID interviews have been conducted by telephone since 1973, with interviews conducted every year from 1968 to 1997 and biennially

after 1997. Wave-to-wave core reinterview response rates typically range between 96 and 98 percent. There have been over 2,600 peer-reviewed publications using the PSID and its design has been replicated in many countries around the world. PSID is also regularly used for policy analysis by U.S. federal government agencies. On the National Science Foundation's fiftieth anniversary, it named PSID one of the fifty most significant scientific advances ever funded by NSF. The data are publicly available through the on-line PSID Data Center (<http://psidonline.org>) and a restricted version is also available that provides detailed information on the geographic location of PSID households, cause of death, and certain other topics.

The PSID has a number of unique design features, but also shares many similarities with other social surveys. Key features of PSID include its national representativeness, the long duration of the panel, the genealogical design, and its broad and deep content. PSID includes adult respondents of all ages and hence covers the entire lifecourse. Collection of detailed information on a cohort of PSID children aged 0 to 12 years was begun in 1997 as part of the three-wave PSID Child Development Supplement, and planning is currently underway to launch a new data collection initiative on PSID children that would cover all children and be repeated every five years. The genealogical design means that in any wave of PSID, interviews are being conducted with multiple generations from the same family, including the parents—and often the grandparents—of adult respondents. Over time, the genealogical design has led to additional generations of the same family being added to the sample as well as to large samples of siblings and of cousins. PSID collects detailed information on family economic status, including income, wealth, pensions, and consumption expenditures; demographic behavior, including fertility, mortality, migration, and marriage; and health, including health status, health conditions, health behaviors, and health insurance. The Child Development Supplement collected information on children's cognition and psychosocial well-being, topics that are being collected for this cohort as it transitions to adulthood and will be extended to all children as well as adult respondents in the future. These features of the PSID, and its status as an on-going survey, make the potential addition of biomeasures especially attractive because it will open new areas of scientific inquiry regarding the dynamic interrelationship between health status and socioeconomic and demographic behavior.

Authors of seven of the nine articles were asked to identify biomeasures in an assigned area that would contribute to the generation of scientific knowledge. These areas covered fatness and obesity, metabolic syndrome and cardiovascular disease, inflammation and immune function and cardiovascular disease, infectious disease, daily stress exposure and reactivity, respiratory health, and genetics. These domains were selected because they correspond to the major domains of adult health status, reflect the most important causes of disease, disability, and death, and correspond closely to self-reported measures of health in the PSID and other social surveys. The authors were also asked to identify synergies between biomeasures in their assigned area and key features of the PSID, ethical and legal concerns, and operational aspects of biomeasure collection. The final two articles in this special issue addressed a pair of separate overarching issues: one provides international comparisons and perspectives and the other discusses ethical and legal concerns.

The first article in this special issue, by Richard Burkhauser and John Cawley, discusses adding biomeasures of fatness and obesity to the PSID. They note that although research on the causes and consequences of obesity has increased greatly over the past 20 years—along with the prevalence of obesity itself—social science research on this topic has too often used self-reports of height and weight. PSID relies exclusively on adult self-reports of height and weight—which may be misreported and leads researchers to a measure of obesity based on the body mass index that has a number of shortcomings. Burkhauser and Cawley recommend that PSID add multiple indicators of obesity, including anthropometry-based measures of height and weight, waist

circumference as a measure of central adiposity, body and fat mass using bioelectrical impedance analysis, and genetic markers related to obesity.

The article by Jennifer Dowd and Noreen Goldman considers biomesasures of cardiovascular and metabolic risk that might be added to the PSID. The importance of this domain is reflected in cardiovascular disease being the leading cause of death in the U.S. Respondent reports of a medical diagnosis for diabetes, hypertension, and cardiovascular disease are currently obtained in the PSID. However, the potential bias from relying on self-reports may be substantial. Dowd and Goldman outline the scientific opportunities from adding biomesasures of cardiovascular and metabolic risk in the PSID, which include using these biomesasures as both outcomes and predictors. The biomesasures recommended for collection in the PSID by Dowd and Goldman include anthropometry-based measures of obesity, blood pressure and heart rate, total and HDL cholesterol, glycosylated hemoglobin (a measure of blood glucose), C-reactive protein (a marker of inflammation), and cystatin C (an indicator of kidney function). The latter four measures are blood-based, but can be assessed using dried blood spot samples collected on special filter paper and only require a finger-prick rather than venipuncture.

Thom McDade and Mark Hayward describe how infectious disease may shape the trajectories of biological risk and health and, in particular, how infectious disease exposure over the lifecourse may be linked to chronic disease in later life. The link to chronic disease is through immune function and inflammation, which is the same pathway through which psychosocial stress is thought to affect chronic disease—highlighting the interrelationship between infectious disease, psychological factors, and stress. McDade and Hayward discuss self-report, observational, and biemeasure approaches to collecting information about infectious disease exposure, immune function, and inflammation. They suggest that the PSID consider adding interview-based measures of infectious disease history and likely pathogen exposure; anthropometric measures that reflect health during early life (such as leg length); and biemesasures based on dried blood samples that quantify immune function and levels of infection and inflammation such as Epstein-Barr virus antibodies and C-reactive protein.

The article by Allison Aiello and George Kaplan discusses the links between psychosocial stress and physical health. The specific focus is on socioeconomic position as an indicator of psychosocial stress, which capitalizes on the strengths of PSID and other social surveys, and on cardiovascular disease as the primary health outcome. Aiello and Kaplan highlight the role of inflammatory and immune pathways to cardiovascular disease and, in particular, microbial pathogens and adhesion and proinflammatory molecules. They recommend adding biemesasures that reflect these pathways and are relatively stable over time, including proinflammatory cytokines (such as Interleukin-6 and tumor necrosis factor- α), markers of inflammation and injury (such as C-reactive protein), inflammatory markers of thrombogenesis (such as fibrinogen), and persistent infectious agents such as cytomegalovirus and herpes simplex virus. Many of these biemesasures require serum collected through venipuncture, although some, such as C-reactive protein, cytomegalovirus, and herpes simplex virus, can be assessed using dried blood spot samples.

David Almeida, Katherine McGonagle, and Heather King discuss opportunities and challenges for assessing the relationship between stress and mental health in social surveys. Their article proposes a specific approach that combines respondent self-reports of daily stressors, using diary methods, with the collection of salivary cortisol, a biomarker of stress. The authors identify daily stressors as features and events of daily life—such as demanding work conditions, financial pressures, and family conflicts—that affect psychological well-being. Exposure to these events is associated with affective well-being, such as psychological distress, and with mental health more generally. Stress can promote the secretion of glucocorticoids, such as cortisol, and persistent elevation of cortisol is associated with dysregulation and poor

physical health. Almeida, McGonagle, and King note that cortisol can be measured in saliva, which can be collected easily using non-invasive methods. However, several saliva samples must be collected over the course of a day from respondents in order to map the diurnal rhythm of salivary cortisol. The authors argue that their approach, which builds on a growing body of experience from other social surveys, is feasible and, if adopted by a study such as PSID, would lead to important scientific advances.

Edith Chen and Jean Yeung consider the assessment of respiratory health in social surveys. Chronic respiratory diseases such as asthma and chronic obstructive pulmonary disease are common and have a high population health burden. Chen and Yeung discuss how, among adults in the U.S., pulmonary function is an important indicator of overall health status and a predictor of mortality risk and is strongly related to socioeconomic status and race and ethnicity. The authors identify spirometry as the gold standard for assessing respiratory health. Spirometry, which measures both the volume and flow of forced exhalation, provides an objective indication of airway obstruction and can be used in conjunction with other reported information to identify asthma and other respiratory conditions as well as to assess their severity. Chen and Yeung argue that spirometry can be conducted with survey respondents using trained interviewers. The main challenge they identify is the effort-dependent nature of spirometry, which requires careful coaching of respondents in order to avoid errors. Recent technological advances have made portable electronic spirometers practical for use in large-scale surveys at reasonable cost.

The integration of genetic markers into social science research and the PSID is the topic of the article by Dalton Conley. This article considers how researchers should assess the direct impact of specific genetic influences on socioeconomic and behavioral outcomes and how to model genetic-environmental interactions. Conley highlights the potential problem with estimating causal effects of genetic factors, which is due to the non-specificity of estimated genetic effects and is compounded by the possibility of interactions across genes. However, he is optimistic about the possibility of obtaining estimates of gene-environment interactions, through the identification of exogenous sources of environmental variation and carefully selected candidate genes. The article also discusses some practical aspects associated with collecting genetic information in social surveys. DNA can be collected easily and reliably through saliva samples with high participation rates. Conley notes that asking respondents for genetic samples may increase attrition and that research results based on the genetic data may lead to dubious and controversial findings. Conley also briefly mentions some of the key human subjects concerns that surround the collection of genetic data.

The article by John Hobcraft provides an international perspective on adding biomeasures to social surveys. He emphasizes the need for researchers to elaborate the pathways from biology to behaviors and outcomes, and highlights, in particular, the role of psychological factors, such as personality traits and cognitive function, and key aspects of the mind, such as trust, ability to delay gratification, and altruism. Hobcraft also emphasizes the need to consider the effects of context or environment and of changes in relationships over the lifecourse. He notes that there are now compelling arguments for incorporating biomeasures such as DNA into social surveys, despite the scientific difficulties, challenges, and pitfalls in undertaking research with these biomeasures, as well as practical concerns about issues such as informed consent, storing samples, and decisions about what specific biological and genetic markers to measure. Hobcraft's article describes plans for collecting biomeasures in international companion studies to the PSID, such as the new *Understanding Society* study in the United Kingdom, which has superseded the earlier British Household Panel Study, and the German Socioeconomic Panel Study. He also provides an overview of experience collecting biomeasures in birth cohort studies in Britain and elsewhere and surveys focusing on particular age groups, such as the elderly. Hobcraft ends his article by providing some useful guidance on the types of

biomeasures and complementary respondent attributes that should be considered for collection in social surveys.

The final article in this special issue is by Henry Greely, and focuses on ethical and legal concerns about collecting biomeasures in social surveys such as the PSID. Greely's article begins by describing how biomeasures are different from other information collected in social surveys. Among the specific issues he tackles next are the research participants' control over subsequent use by researchers of their biomeasure information; their right to withdraw from the study; protection of respondents' privacy; reporting of biomeasure results back to respondents; and the process of obtaining informed consent. Greely argues for a cautious approach that assesses the possibility of harmful effects to respondents—and society more generally—from collecting biomeasures. Only by understanding and assessing these ethical and legal challenges can studies such as PSID reach the appropriate decision about how to proceed regarding the collection of biomeasures.

Taken together, the articles identify many important hypotheses that could be uniquely tested with the addition of a variety of biomeasures to the PSID. While the articles also identify challenges to collecting, processing, and appropriately analyzing biomeasures, recent advances by other social survey have successfully addressed many of these issues. We believe the weight of the evidence is in support of collecting biomeasures in the PSID, and we have begun seeking financial support for this endeavor.

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