



Advancing Health Equity Research on Social Determinants of Health Using the National Health and Nutrition Examination Survey (NHANES)

Denys T. Lau, PhD; Namanjeet Ahluwalia, PhD; Cheryl D. Fryar, MSPH; Matthew Kaufman; Irma E. Arispe, PhD; and Ryne Paulose-Ram, MA, PhD

National Center for Health Statistics, Division of Health and Nutrition Examination Surveys

2022 FCSM Research & Policy Conference
October 27, 2022, 1:30 pm

Introduction



Health Equity and Social Determinants of Health

- Health equity is defined as “attainment of the highest level of health for all people”
- Health equity research looks beyond the existence of health disparities towards social determinants of health (SDOH)
- SDOH are conditions in which people are born, live, work, play, worship, and age
- SDOH drive differences in exposures to social risks:
 - e.g., unhealthy foods, poor housing conditions
- Inequitable exposures to social risks manifest in health disparities



National Health and Nutrition Examination Survey (NHANES)

Mobile Examination Center



- A series of cross-sectional surveys on nationally representative samples of adults and children in the US.
- Standardized interviews, physical examinations, and biospecimens such as blood and urine samples
- National estimates and trends in diseases, dietary intake, physical activity, and environmental exposures
- Released data publicly in two-year cycles (~10,000 participants)
- Due to COVID-19, 2019-2020 was not completed so combined 2017-March 2020 Pre-Pandemic Data files were released

NHANES and Health Disparities Research

- Tracks our Nation's progress towards meeting Healthy People objectives.
- Provides evidence of disparities across multiple health and nutrition indicators

Health Indicator	Examples
Chronic conditions	Diabetes, hypertension, respiratory and kidney disease, obesity
Infectious diseases	HIV, HPV, herpes simplex virus, hepatitis
Dietary intake	Fruits and vegetables, added sugar, sodium, fast food
Environmental and dietary chemical exposures	Volatile organic compounds (VOCs), blood lead levels, mercury, arsenic, second-hand tobacco smoke

Objectives

To examine how 1999-2020 NHANES data support health equity research related to social determinants of health (SDOH):

- **Part 1:** Provide examples of NHANES data use for SDOH and health equity research
- **Part 2:** Present potential future opportunities to further NHANES' capacity to advance health equity science

Part 1: NHANES Data Supporting SDOH Research



NHANES: Supporting Health Equity Research

- Household interview items on social risks and personal attributes
- Indoor sample collection to identify household allergen exposures
- Oversampling of subpopulations at disproportionate social risks
- Data linkage to examine health disparities driven by SDOH

Household Interview



- Data on self-reported social risks that can be categorized into five SDOH domains:



- Respondents' personal attributes like sociodemographic characteristics
- Data collected vary by survey cycle

Interview Items on Social Risks

Education Access and Quality

- 1999-2020: Highest education completed

Economic Stability

- 1999-2020: Annual family income, poverty-income ratio
- 1999-2020: Occupation type and work schedule
 - 1999-2004: codes for asthma-related jobs
 - 1999-2014: codes for current and longest-held jobs
- 1999-2020: Home ownership
- 1999-2020: U.S. Food Security Survey Module
 - 2003-2010: Missed meals, not enough money to buy food
 - Varied: SNAP, WIC, home-delivery meals, school breakfast/lunch



Interview Items on Social Risks

Health Care Access and Quality

- 1999-2020: Health insurance
 - 1999-2004: Dental care coverage
 - 2005-2020: Prescription drug coverage
- 1999-2020: Usual source of health care
- 2003-2020 (except 2005-2010): Needed but could not get dental care

Social and Community Context

- 1999-2008: Emotional and financial support



Interview Items on Social Risks

Neighborhood and Built Environment

- 1999-2018: crowding, # of rooms and # of people in the home
- Housing conditions
 - 1999-2004: recent renovation, paint conditions, age of home
 - 1999-2007: products with VOCs
 - 1999-2010: tap water, water treatment
 - 2005-2006: mildew, musty smells, cockroaches, pets
- Workplace conditions
 - 1999-2020 (except 2013-2014): noise and protective hearing devices
 - 2007-2012: dust, exhausts and other fumes
- 1999-2020: second-hand smoking in the home and workplace
 - 2013-2020: other indoor areas like restaurants
- 2017-2020: mode of transportation by walking and biking



Personal Attributes

- 1999-2020: race and ethnicity
 - 1999-2020: Mexican American, Non-Hispanic Black, and Non-Hispanic White
 - 2007-2020: Hispanic
 - 2011-2020: Non-Hispanic Asian American
- 2001-2016: sexual orientation*
- 1999-2020: marital/relationship status



* 2017-2020 data available only in NCHS Research Data Center

Personal Attributes

- 1999-2020: country of birth (nativity)
- 1999-2018: citizenship
- 1999-2020: language spoken
- 1999-2020: years living in the U.S.
- 1999-2018: prior military service
- 1999-2018: physical functioning in daily activities
 - 2013-2018: disability status



Indoor Sample Collection

Dusts (floor, windowsill, beds)

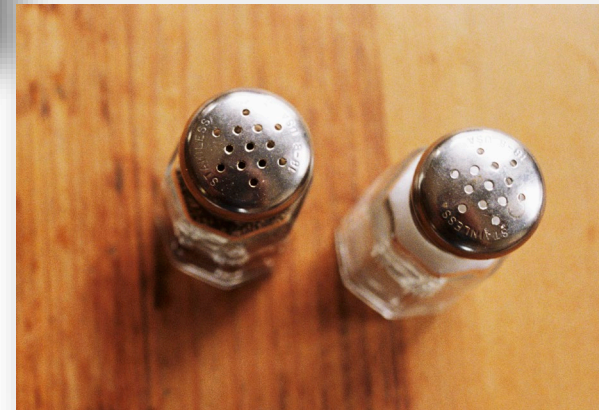
- 1999-2004: Lead
- 2005-2006: Allergens

Drinking water

- 1999-2010: VOCs
- 2005-2010: Perchlorate
- 2013-2016: Fluoride

Table salt

- 1999-2020: Iodine



Oversampling of Subpopulations

Survey years	1999-2006	2007-2010	2011-2014	2015-2018	2019-2020
Race / Ethnicity					
Hispanic	Mexican American	Hispanic	Hispanic	Hispanic	Hispanic
Non-Hispanic	Black	Black	Black	Black	Black
			Asian	Asian	Asian
Age	12-19 years old; and Non-Hispanic White and other race/ethnicities ages 70+	Non-Hispanic White and other race/ethnicities ages 80+	Non-Hispanic White and other race/ethnicities ages 80+	Non-Hispanic White and other race/ethnicities ages 0-11 and 80+	Non-Hispanic White and other race/ethnicities ages 0-11 and 80+
Income	Low-income (\leq 130% of FPL*) non- Hispanic White and other race/ethnicities	Low-income (\leq 130% of FPL*) non-Hispanic White and other race/ethnicities	Low-income (\leq 130% of FPL*) non-Hispanic White and other race/ethnicities	Low-income (\leq 185% of FPL*) non- Hispanic White and other race/ethnicities	Low-income (\leq 185% of FPL*) non- Hispanic White and other race/ ethnicities
Supplemental sample	Pregnant women				

*FPL = Federal Poverty Level

Data Linkage

- Conducted at the individual level
- Examples of linked data:
 - National Death Index
 - Medicare and Medicaid
 - U.S. Renal Disease System ESRD data
 - Department of Housing and Urban Development
 - Department of Veterans Affairs



Merged Data

- Merge external sources of contextual data with NHANES data by geocodes
- Offers insights into respondents' community context
- Examples of contextual-level data are available in the Agency for Healthcare Research and Quality SDOH Database



Part 2: Future Opportunities in NHANES SDOH Research



Future Opportunities

- Evaluate new SDOH-related household interview items
- Examine new ways to collect indoor samples
- Consider oversampling different subpopulations
- Consider follow-up data collection among survey participants
- Expand data linkages and access to linked data
- Engage with local programs to understand SDOH in diverse communities

Future Opportunities

Household Interviews

- Evaluate new items on social risks and personal attributes
 - e.g., discrimination and gender identity items
- *Challenges*: respondent burden, survey space, validated measures

Indoor Samples

- Examine new ways to collect dust, water, and other indoor samples
- *Challenges*: survey costs, respondent burden, privacy, in-person interactions during COVID-19 Pandemic



Future Opportunities

Oversampling

- Oversample different subgroups of specific characteristics
- Reintroduce population-specific surveys
 - e.g., Hispanic HANES 1982-1984 and the 2012 NHANES National Youth Fitness Survey
- *Challenges*: survey costs, sampling frames, community engagement



Follow-up Data Collection

- Follow up participants to enhance trend assessment and causal inference of SDOH's impact
- *Challenges*: survey costs, respondent burden, attrition rates

Future Opportunities

Data Linkage

- Increase number and types of external sources
 - e.g., Medicaid and CHIP claims
- Privacy preserving record linkage strategies
- *Challenge:* Many NHANES linked files must be accessed through the RDC



Engagement with Local Programs

- Engage with state/local survey and research programs to better understand SDOH in communities with high social vulnerabilities
- *Challenges:* Programs with different priorities, willingness to engage, approaches to measuring SDOH

Conclusions



Conclusions

- NHANES has a rich history of supporting studies examining markers of health disparities
- NHANES data can be used to inform researchers and policymakers on both social drivers and markers of health disparities
- For future opportunities identified, implementation challenges will need to be evaluated
- NHANES can inform researchers and policymakers on health equity and SDOH