

# US National Health and Nutrition Examination Survey Arthritis Initiatives, Methodologies and Data



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## KEYWORDS

- Arthritis • National Health and Nutrition Examination Survey • Prevalence
- Prevention and control • Back pain • Neck pain

## KEY POINTS

- The US National Health and Nutrition Examination Survey has collected US nationally representative arthritis examination, laboratory and radiographic data for more than 50 years.
- The collected data arthritis-related data are high quality and population based; data collection is designed to minimize sampling biases, and almost all data are publicly available.
- Although the data are most often used for basic scientific research, the primary purpose of the arthritis data collection is to support national-level public health prevention and control efforts.
- These data define the population arthritis prevalence; however, public health monitoring was never implemented to reduce arthritis incidence and to ensure early diagnosis and treatment of arthritis cases.
- Despite an impressive body of publications on the arthritis datasets, the bulk of the data remain unpublished; the extent of the existing data is outlined with guidelines for analysis.

## INTRODUCTION

This article reviews population-based arthritis and musculoskeletal disease data available from the US National Health and Nutrition Examination Survey (NHANES) a major program initiative of the US National Center for Health Statistics (NCHS). The purpose is to provide the reader with a basic understanding of the NHANES survey design and

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capabilities, and to systematically review major NHANES accomplishments in the area of arthritis and musculoskeletal diseases. Currently available NHANES arthritis-related datasets are identified and guidelines for interpreting NHANES data and opportunities for data analysis and designing future NHANES studies are also presented.

## **US NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY OVERVIEW**

NHANES is a US nationally representative cross-sectional health survey that simultaneously collects health interview and health examination data in addition to laboratory, radiologic, and imaging studies. Fielded first in the late 1950s as the US National Health Examination Survey (NHES), a national nutritional survey component was added in the early 1970s, hence the acronym NHANES. NHANES is unique in that it has provided high-quality national-level public health examination-based surveillance data for the most important high prevalence public health conditions such as arthritis, hypertension, diabetes, chronic obstructive lung disease, osteoporosis, and obesity as well as for coronary heart disease major risk factors such as high cholesterol and smoking. Importantly, existing NHANES data and stored biospecimens are also routinely leveraged in retrospect to address and answer important health questions that arise years later, for example, the discovery of hepatitis C, human immunodeficiency virus, and hantavirus.

The early successful fielding of NHANES in the 1960s was a remarkable achievement. To accurately and efficiently produce nationally representative prevalence estimates, a staff of demographers and mathematical statisticians created a complex, multistage survey sampling design that included sequential elements of probability, stratification, and cluster sampling and new statistical methods and software were developed to support the complex data analysis required to produce prevalence estimates. Also, trained staff and infrastructure were developed to support national-scale mobile health center-based data collection, and field staff operational procedures developed to keep survey response rates at or above the nominal 70% benchmark for adequate random sampling survey response.<sup>1</sup>

NHANES has, therefore, functioned as the prototype national-level health examination survey and its successful fielding has provided proof of concept of the substantial public health benefits of national-level health examination surveillance data. The public health surveillance function of NHANES has 4 principal aims/goals: (a) situation assessment—to precisely define the overall burden of disease and risk factors on the public and to identify any key disparities in disease burden prevalence in major demographic subgroups (age, gender, race/ethnicity), (b) to acquire population-level surveillance data to support the primary prevention of disease in the first instance, (c) to support public health campaigns for secondary prevention of disease, that is, to monitor and control key factors critical to reducing long-term target organ damage and improving health outcomes, and (d) to provide a platform to conduct basic science studies on disease natural history and risk factors as well as critical methodologic studies required to support these goals.

NHANES national-level health examination survey data are relatively unique, both because of the innovative survey design, but also especially because the data collection is based on standardized active, in-person, examination-based surveillance rather than clinical case series or passive retrospective collection of medical records data. It, thus, represents a largely unbiased source of data for public health planning as well as for basic scientific research. NHANES is also unique in its degree of transparency: almost all data collected is well-documented and publicly available for the general scientific community to use. Historically, the lack of comparable survey data

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