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CENSUS

A national census of population is “the total process of collecting, compiling, evaluating, analysing and publishing or otherwise disseminating demographic, economic, and social data pertaining, at a specified time, to all persons in a country” (United Nations 1988, p. 3). The United Nations encourages its members to take regular censuses and provides technical assistance. It also publishes an annual demographic yearbook and maintains a web site with selected census data and other population information for most countries.

A nation may conduct censuses on other subjects such as housing, business firms, agriculture, and local governments. Because of the close link between families and housing units, censuses of population and housing are usually combined.

The actual enumeration for a national population census is usually spread over a period of weeks

or months, but an attempt is made to record circumstances as of a designated census day (April 1 for the 2000 U.S. census). In some censuses, persons are reported in their legal or usual place of residence (*a de jure enumeration*). According to the Bible, a census decree issued by the government in Rome ordered that persons be counted and taxed in their home towns. In response, Joseph and his pregnant wife, Mary, traveled from Nazareth to Bethlehem, where Mary gave birth to Jesus. Other censuses record people where they are on the census day (*a de facto enumeration*). Whatever residency rule is followed, all conceivable special circumstances must be anticipated, questionnaires well designed, and census staff thoroughly trained.

The U.S. census uses the concept of “usual residence,” where the person lives and sleeps most of the time, but some exceptions are made. A few examples from the 2000 U.S. census illustrate the range of circumstances. Some persons staying in hotels and rooming houses are transients temporarily absent from their usual homes; they completed special census forms that were later compared to the census forms received from their home addresses to confirm that they were properly reported by other household members. An operation called “Service-Based Enumeration” was designed to locate homeless persons and others with no usual residence. College students were presumed to be residents at the place they lived while attending college, even if they were at home on spring break on census day. Efforts were made to avoid having an away-at-college child erroneously double-counted as a member of the home household. Pre-college students at away-from-home schools were assigned to the parental household. Citizens working in another country for the U.S. government, and their families, were enumerated (primarily through the use of administrative records), but other citizens living abroad at the census date were not counted. Short-term tourists, however, were supposed to be reported by other members of their households, or by late enumeration upon their return home. Persons not legally resident in the United States were supposed to be counted, but many feared all contact with authorities and took steps to avoid detection by census procedures.

The total population count is only one result of a modern census. Information is also obtained

on many characteristics, such as age, sex, and relationship to others living in the same household, educational level, and occupation. The census then reports on population size and characteristics for provinces, states, counties, cities, villages, and other administrative units. To obtain all this information, the 2000 U.S. census (U.S. Census Bureau 1999) asked every household to complete a “short form” with six questions about each person and one question about each housing unit. A carefully selected sample of one of every six households received a “long form” that included additional questions on fourteen topics for each person and thirteen topics for each housing unit.

Reporting information for the entire country and for the thousands of cities and other subareas results in many volumes of printed reports. Many nations issue additional data on computer-readable files designed for convenient use by national and local governments, organizations, and individuals. Increasing quantities of data are available to anyone with access to the Internet.

In the United States, the idea for a regular census emerged during debates about the problems of creating a representative form of government. The U.S. Constitution (Article I, Section 2) directs that membership in the House of Representatives be based on population: “The actual enumeration shall be made within three years after the first meeting of the Congress of the United States, and within every subsequent term of ten years, in such manner as they shall by law direct.”

The questions asked in a census reflect political and social issues of the day and often provoke spirited debates. For example, slavery was a recurrent divisive issue for the Constitutional Convention. One of the two newly created legislative bodies, the House of Representatives, was to have the number of legislators from each state proportional to the population of the state. Including slaves in the population count would increase the legislative power of southern states. A compromise (Article I, Section 2) provided that: “Representatives. . . shall be apportioned among the several states. . . according to their respective numbers, which shall be determined by adding to the whole number of free persons, excluding Indians not taxed, three-fifths of all other persons.” The distinction between “free persons” and “all other

persons” (slaves) was eliminated after the Civil War (Amendment 14, Section 2).

The 1790 census was modest in scope. Assistants to federal marshals made lists of households, recording for each household the number of persons in five categories: free white males over sixteen and under sixteen, free white females, other free persons, and slaves (Anderson 1988, p. 13).

Censuses from 1790 through 1840 were conducted with little central organization or statistical expertise. A temporary federal census office was established to conduct the 1850 census. The individual rather than the household became the focus of the enumeration, and the content of the census was expanded to include occupation, country or state of birth, and other items. Experienced statisticians were consulted, and the United States participated in the first International Statistical Congress in 1853.

The temporary office for the 1890 census became one of the largest federal agencies, employing 47,000 enumerators and 3,000 clerical workers. To help with the enormous task of tallying data, census officials supported the development by a young inventor, Herman Hollerith, of an electrical tabulating machine. His punched-card system proved effective in census operations and later contributed to the growth of the IBM corporation.

A permanent census office was established in 1902. An increasingly professional staff assumed responsibility for the population censuses and a broad range of other statistical activities. Deficiencies in the federal statistical system became apparent during the 1930s as the nation tried to assess the effects of the Great Depression and to analyze an array of new programs and policies. Several federal agencies successfully advocated expansion of the social and economic content of the 1940 census. New questions in 1940 asked about participation in the labor force, earnings, education, migration (place of residence in 1935), and fertility. A housing census was paired with the population census to provide information about housing values and rents, mortgages, condition of dwellings, water supply, and other property issues. The practice of providing population and housing information for subareas of large cities was greatly expanded.

Governmental statistical agencies are often set in their ways, concerned with continuity rather than innovation and removed from the higher levels of policymaking. For several decades beginning in the late 1930s, the U.S. Census Bureau was extraordinarily creative. Social scientists and statisticians employed by the Census Bureau were active in research and scholarly publication and played leadership roles in professional organizations. Census Bureau personnel pioneered in development of the theory and practice of population sampling. To accommodate large increases in content and geographic scope, the 1940 census questionnaire was divided into two parts. A set of basic questions was asked of everyone, while a set of supplementary questions was asked of a one-in-twenty sample. Subsequent U.S. censuses have continued to use sampling, as with the “long-form” versions of the 1990 and 2000 questionnaires that went to one of every six households. Sampling theory was also applied to the development of periodic sample surveys to provide timely information between censuses and to provide information on additional topics.

For the 1950 census, the Bureau participated actively in the development and utilization of another new technology, the computer. In later censuses, the schedules were microfilmed and optically scanned for direct input of information (without names and addresses) into a computer for error-checking, coding, and tabulating.

Through 1950, census enumeration in the United States was accomplished almost entirely by having an enumerator conduct a personal interview with one or more members of each household and write the information on a special form. By 1990, most census questionnaires were distributed and returned to the Census Bureau by mail, with telephone follow-up replacing many personal visits. Large-scale use of the Internet and other innovative response technologies may be practicable for widespread use in the 2010 census.

National censuses have so far been the best method for obtaining detailed information about the entire population. Only censuses provide counts and characteristics for small administrative and statistical areas, such as villages, voting districts, city blocks, and census tracts. Only censuses provide reliable information on small population

groups, such as the income distribution of female plumbers. Only censuses provide the large numbers of cases needed for complex multivariate analyses. But censuses are so large and difficult to process that by the time the data are released they are, for some purposes, out of date, and this problem increases throughout the interval, commonly ten years, until the next census.

To address the timeliness problem, most national statistical agencies conduct a series of large sample surveys that provide select information on key topics at timely intervals. In the United States, for example, the latest unemployment rate, released on the first Friday of each month, is headline news. It is based on the Current Population Survey, a monthly sample survey that provides current information on many social and economic characteristics.

A few countries keep population registers, continuous records of where people live along with some of their characteristics. If reasonably complete and accurate, these may be used to supplement and update some census information. In many nations, administrative records such as social security, national health, tax, and utility company files, may be adapted to provide periodic estimates of population size and a few characteristics, but difficult questions arise about data quality and comparability with census- and survey-based information. Citizens of many nations are wary about letting the government and corporations compile extensive personal data. Legislative restrictions are increasingly being placed on what information may be gathered and stored and how it may be used.

The questions asked in successive censuses typically change more slowly than the procedures. Keeping the same topics and the same wordings of questions help a government measure change from one census to the next. This appeals to researchers and policy analysts, but policymakers and administrators, whose attention is focused mainly on current programs and next year's budget, often plead for new wording to better serve current concepts. Another reason tending to stifle innovation is that the census is an expensive and visible tool. A lengthy review process confronts any agency that seeks to add, delete, or alter a question. In the United States, both the executive branch and the

Congress must approve the final census schedule. A question on pet ownership has been regularly proposed but rejected because there is no compelling governmental interest in such a question and private sample surveys can provide the desired information. A third reason the content of the questionnaire changes little is that proponents of new topics and questions must compete for questionnaire space, while questions previously asked tend to already have a network of users who have a vested interest in retaining the topic. This competition spurs extensive lobbying and mobilization of support from federal agencies, congressional committees, and interest groups.

An innovative approach to providing timely data is "continuous measurement" using a "rolling-sample" survey. The *American Community Survey* has been implemented by the U.S. Census Bureau (1999), with plans to expand to three million households a year in 2003. Because the survey uses a small, permanent, well-trained and supervised staff (as compared to the large, temporary, briefly trained staff utilized for a census), data quality may be higher than in a census. Another advantage of a monthly survey over a decennial census is the ease of introducing new topics and testing the effects of changes in the wording of questions.

American Community survey results will be cumulated over a year to provide estimates of numbers and characteristics for the nation, states, and places or groups of 65,000 or more people. For smaller places and groups, or for more reliable and detailed data for larger places, data will be cumulated for periods of up to five years. The five-year cumulated sample is designed to be approximately equivalent to the census "long-form" sample and may eliminate the need for a "long form" in the 2010 census. Moving averages could provide annual updates and be used for time series. There are many issues to be worked through in developing and evaluating this type of survey and in determining how well information averaged over a long period compares to standard statistical measures based on time-specific censuses and surveys.

In many nations, questions on race and ethnicity are a sensitive and contentious topic. In the United States, the groups recognized have changed

from each census to the next. For example, special tallies were made from the 1950 and 1960 censuses of persons with Spanish surnames, but only for five southwestern states. Beginning in 1970, and elaborated in later censuses, persons were asked if they were of Spanish/Hispanic origin. Many responses to this question have seemed to be inconsistent with responses to the separate question on race. The Bureau has conducted sample surveys to test various question wordings, and has sponsored field research and in-depth interviews to provide insights into how people interpret and respond to questions about ethnicity. For the 2000 census the basic concepts were retained, but the wording of each was adjusted, provision was made for individuals to report more than one race, and the question on Hispanic ethnicity was placed before the question on race.

In recent decades, extensive social science research has been conducted in many parts of the world on issues of racial and ethnic identity. These identities are almost always more flexible and more complex than can be captured with simple questions. A further complication is that many persons have ancestral or personal links to two or more racial and ethnic groups; how they respond depends on how they perceive the legitimacy and purposes of the census or survey.

In the 1990s, the U.S. Office of Management and Budget conducted an extensive review of its policy statement that specifies the standard race and ethnic classifications to be used by all government agencies, including the Census Bureau (Edmonston and Schulze 1995). Serious methodological problems have arisen as a result of inconsistencies among classifications of individuals on repeated interviews and in different records. A dramatic example occurs with infant mortality rates for race and ethnic groups, which are based on the ratio of counts based on birth registration to counts based on death registration of infants less than one year old. Comparing birth and death certificates for the same person, recorded less than one year apart, revealed large numbers for whom the race/ethnic classification reported at birth differed from that reported at death. The high-level government review also heard from many interest groups, such as Arab-Americans, multiracial persons, and the indigenous people of Hawaii,

who were anxious for the government to enumerate and classify their group appropriately.

In the United Kingdom, controversy about a proposed question on ethnic identity led to the question's omission from the 1981 census schedule, thus hindering analyses of an increasingly diverse population.

The most politically intense and litigious controversy about recent U.S. censuses is not that of content but of accuracy. States, localities, and many interest groups have a stake in the many billions of dollars of government funds that are distributed annually based in part on census numbers.

President George Washington commented about the first census that "our real numbers will exceed, greatly, the official returns of them; because the religious scruples of some would not allow them to give in their lists; the fears of others that it was intended as the foundation of a tax induced them to conceal or diminish theirs; and through the indolence of the people and the negligence of many of the Officers, numbers are omitted" (quoted in Scott 1968, p. 20).

A perfect census of a school, church, or other local organization is sometimes possible, if membership is clearly defined and the organization has up-to-date and accurate records, or if a quick and easily monitored enumeration is feasible. A national census, however, is a large-scale social process that utilizes many organizations and depends on cooperation from masses of individuals. Planning, execution, and tabulation of the 2000 U.S. Census of Population extended over more than ten years. Hundreds of thousands of people were employed at a cost of several billion dollars. A discrepancy between the results of a national census and "our real numbers" is inevitable.

Statisticians, recognizing that error is ubiquitous, have developed many models for identifying, measuring, and adjusting or compensating for error. Census statisticians and demographers around the world have participated in these developments and in trying to put professional insights to practical use.

Following the 1940 U.S. census, studies comparing birth certificates and selective service records to census results documented a sizable net

undercount. To provide more information on census coverage and accuracy, a post-enumeration survey was conducted following the 1950 census using specially selected and closely supervised enumerators. One finding from the survey was that the undercount of infants in the census did not arise, as first thought, from a tendency for new parents to forget to mention a new baby to the census enumerator. The problem, rather, was that many young couples and single parents had irregular and difficult-to-find living arrangements, and entire households were missed by census enumerators. Based on this and related findings, much effort was given in subsequent censuses to precensus and postcensus review of lists of dwelling units.

Special surveys preceding, accompanying, and following censuses are increasingly used to provide evidence on magnitude of error, location of error in specific groups or places, and procedural means for reducing error. Techniques of “demographic analysis” have also been developed and continually refined to provide evidence of census error. The basic technique is to analyze the numbers of persons of each age, sex, and race in successive censuses. For example, the number of twenty-eight year-old white women in the 1990 census should be consistent with the number of eighteen-year-olds in 1980 and eight-year-olds in 1970. Information on births, deaths, immigration, and emigration is taken into account. Based on demographic analysis, the estimated net undercount for the total U.S. population was about 5.6 percent in 1940, 1.4 percent in 1980 (Fay, Passel, and Robinson 1988, Table 3.2) and 1.8 percent in 1990. Estimates of net undercount have also been made for specific age, sex, and race groupings.

If the net undercount were uniform for all population groups and geographic regions, it would not affect equity in the distribution of seats in Congress or public funds. But census errors are not uniform. The estimates for 1990 show net undercounts exceeding 10 percent of adult black males and small net overcounts for some age and race groups.

In 1980, the mayor of Detroit, the City of Detroit, New York City, and others sued the federal government, alleging violation of their constitutional rights to equal representation and fair distribution of federal funds (Mitroff, Mason, and

Barabba 1983). More litigation occurred with respect to the 1990 census. In neither case were the initially reported census counts adjusted to reflect estimated errors in enumeration, although in the case of the 1990 census the Census Bureau technical staff and director thought their methodology would improve the accuracy of the counts.

The Census Bureau developed innovative plans for the 2000 census to integrate an evaluation survey with the census, to use sampling to increase quality and reduce costs of enumerating nonresponsive households, and to produce official counts that already incorporate the best available procedures for minimizing error.

These Census Bureau plans engendered major political and budgetary battles between the Republican-controlled Congress and the Democratic administration. Many of the persons hardest to reach using traditional census methods are poor, often minorities. Many members of Congress assumed that a census with near-zero undercount would increase the population reported for states and localities that tend to vote more for Democrats, and hence reduce, relatively, the representation for states and localities that tend to vote more for Republicans. At the national level, this could alter the reapportionment among states of seats in the House of Representatives. Legislatures in states, counties, and cities are also subject to decennial redistricting according to the “one-person, one-vote” rule, and similar shifts in relative political power could occur.

The controversy between legislative and administrative branches over methods for the 2000 census was taken to the Supreme Court, with plaintiffs seeking a ruling that the Bureau’s plans to use sample-based estimates would be unconstitutional. The Supreme Court avoided the constitutional argument, but ruled that current law did not permit such use of sampling. The Democrats lacked the power to rewrite that part of the basic census law. The two parties compromised by appropriating additional dollars to cover the extra costs of complete enumeration while retaining funds for many of the methodological innovations that permit preparation of improved estimates. Reapportionment among states of seats in Congress could therefore use the results of traditional complete enumeration. Most scholars, analysts, and other

users of census data are likely to consider the adjusted estimates more accurate and hence more useful.

The percentage net undercount understates the total coverage error in the census. If one person is omitted and another person counted twice, the total count is correct but there are two “gross” errors that may affect the counts for specific places and characteristics. Identification of gross errors is receiving increased attention, to improve information on the nature of census error and potential error-reducing methods, and to facilitate development of techniques of data analysis that compensate for known and unknown errors.

One of the difficulties in debates about undercount and other census error arises from confusion between the idea of a knowable true count and the reality that there is no feasible method for determining with perfect accuracy the size and characteristics of any large population. A national census is a set of procedures adopted in a political, economic, and social context to produce population estimates. It is politically convenient if all parties accept these results as the common basis for further action, much as sports contests use decisions by umpires or referees. The more that policy and budgets depend on census results and the more aware that politicians and citizens become of the importance of the census, the more contentious census taking will be.

Every nation confronts political and social problems with its censuses. Regularly scheduled censuses are often postponed or abandoned because of international conflict. The United States and the United Kingdom canceled plans for mid-decade censuses because of national budget constraints. West Germany was unable to take a census for several years because of citizen fears about invasions of privacy. Ethnic conflict has interfered with census taking in India, Lebanon, and other nations.

The processes by which census procedures are determined, the ways in which census figures are used, and the conflicts that occur about these procedures and numbers are not merely “technical” but are embedded in a broader social process. The character of a nation’s census and the conflicts that surround it are core topics for the “sociology of official statistics” (Starr 1987).

(SEE ALSO: *Demography*; *Population*)

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CHANGE MEASUREMENT

See Experiments; Longitudinal Research; Quasi-Experimental Research Design; Measurement.

CHILD ABUSE

See Childhood Sexual Abuse; Family Violence; Incest; Sexual Violence.

CHILDBEARING

See Family Planning; Family Size; Fertility Determinants; Pregnancy and Pregnancy Termination.