

Measurement of Household and Family Composition in the United States, 1850–2000

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THE PAST 150 YEARS have witnessed extraordinary change in American living arrangements. In 1850, for example, 70 percent of the elderly resided with their children, and 11 percent lived alone or with only a spouse; by 1990, only 16 percent resided with children, and 70 percent resided alone or with a spouse only. The changes have been almost as great for the young: since 1910, the percentage of children under age five residing without two parents has increased more than fourfold, to 27 percent in 1990; among blacks, the figure is 67 percent (Carter et al. forthcoming).

Demographers and historians are only beginning to understand the dimensions of long-run changes in the American family. Much of the scholarly literature over the past 30 years has stressed the continuities (e.g., Bane 1976; Hareven 1996). In part, this reflects inadequacies of available data. Until the 1990s, only fragmentary data on long-run changes in American living arrangements existed. Except for the mean size of households, the Census Bureau produced no published statistics on family and household composition until 1940, and official published statistics remained scanty until the 1960s.

Within the past few years, the availability of new historical census microdata has led to a flood of research on long-run trends in the American family.¹ Despite the intense interest, however, there has been little attention to problems of comparability in measures of household and family composition over the long run. Some comparability problems are inevitable; in the mid-nineteenth century, census taking was carried out very differently from the way it is done today, and the census was intended to serve different purposes (Magnuson 1995; Anderson 1988).² This article explores the impact of changing census definitions, concepts, and postenumeration processing on the measurement of households and families.

We identify several potential pitfalls for researchers using household and family measures. The introduction of the concept of group quarters in 1930 and its subsequent modifications have important implications for the study of unrelated persons such as boarders and domestic servants. As part of our analysis of definitions of group quarters, we develop a consistent series of the number of households and group-quarters residents since 1850 based on constant definitions. There have been numerous changes in the rules used by the Census Bureau to distinguish one household from the next in multi-household dwellings, and these changes have had a significant impact on the classification of persons residing in single-room-occupancy housing. The introduction of the householder concept in 1980 and a change in the treatment of college students in 1950 can pose special problems for certain kinds of studies. We also identify major problems in the Census Bureau's procedures for identifying subfamilies, and advise researchers to avoid using either aggregate tabulations or microdata variables that rely on these measures. In the concluding section, we discuss the broader limitations of the main Census Bureau classifications of family and household composition and propose basic recommendations for developing measures of living arrangements that minimize problems of long-run comparability.

Data

For quantitative estimates of the consequences of changing census definitions, concepts, and processing, we use the Integrated Public Use Microdata Series (IPUMS), a coherent national database describing the characteristics of 55 million Americans in 14 census years spanning the period from 1850 through 2000 (Ruggles and Sobek 1997). The IPUMS combines census microdata files produced by the Census Bureau for the period since 1960 with new historical census files produced at the University of Minnesota and elsewhere. By putting the samples in the same format, imposing consistent variable coding, and carefully documenting changes in variables over time, the IPUMS is designed to facilitate the use of the census samples as a time series.

The most important innovation of the IPUMS, for the present purpose, is a set of consistently constructed family interrelationship variables for all years. These variables identify the location within the household of each individual's spouse, mother, and father. The family interrelationship pointers provide the essential building blocks to construct measures of family and household composition. Because the family interrelationship variables were designed to be as consistent as possible across census years, they allow us to circumvent some of the comparability problems of published census materials.

A second valuable feature of the IPUMS for the analysis of family and household composition is the imputed family relationship variable con-

structed for the early census years. In the period before 1880, the Census Office did not collect information on the relationship of each person to the household head. The IPUMS includes imputed family relationships using a probabilistic procedure that relies on 18 predictors (Ruggles and Sobek 1997). The imputed relationship variable was constructed for the period from 1850 to 1950, providing an extensive period of overlap between inferred and reported family relationships and allowing evaluation of the method for reliability and cross-year compatibility.³

Changes in the group-quarters concept

The census concepts of household and group quarters did not emerge in their modern form until 1930, and their definitions have shifted significantly since then. Consequently, we lack a consistent series on the total number of households and group-quarters residents for the period 1850 through 1990. To obtain comparable measures, we need to apply a consistent definition of group quarters.

From 1790 to 1920, large dwelling units such as institutions, hotels, and boarding houses were enumerated as if they were simply very large households.⁴ In 1930, such units were classified as “quasi-households” and excluded from the count of households. The term quasi-household was changed to group quarters in 1950; to simplify the discussion, we use the term group quarters throughout. In all periods since 1930, the group-quarters category included residents of correctional institutions, asylums, homes for the aged or needy, convents and monasteries, workers’ dormitories, crew quarters on inland vessels, college dormitories and fraternities, hospitals, hotels, missions, flophouses, camps, and large lodging houses.

In each census year since 1930, the Census Bureau also classified as group quarters any unit with more than a specified number of persons unrelated to the householder. This threshold number of unrelated persons has not remained constant. In 1930 and 1940, units had to contain 11 persons unrelated to the head before they were classified as group quarters; from 1950 through 1970, the threshold was five unrelated persons; and since 1980 the cutoff has been ten unrelated persons. Further confusing the issue, when the 1940 public use microdata sample was designed in the late 1970s, it imposed the then-contemporary criterion of five persons unrelated to the head, so in 1940 the microdata are incompatible with the published statistics. For subsequent census years, the published statistics are compatible with the microdata samples.

Table 1 presents estimates of the number of households and the size of the group-quarters population under both the 1950–70 definition (households must have fewer than five nonrelatives) and the 1980–2000 definition (households must have fewer than ten nonrelatives). The details of

TABLE 1 Estimates of the number of households and number of group-quarters (GQ) residents under 1950–70 and 1980–2000 group-quarters definitions

Year	Number of households			Number of GQ residents	
	Published	1950–70 definition ^a	1980–2000 definition ^b	1950–70 definition	1980–2000 definition
1850	3,598,240	3,539,847	3,581,172	808,353	361,720
1860	5,210,934	5,138,372	5,193,150	886,001	371,285
1870	7,579,363	7,477,665	7,552,352	1,293,722	571,046
1880	9,945,946	9,824,573	9,907,583	1,656,167	802,140
1890	12,690,152	12,530,206 ^c	12,638,749 ^c	NA	NA
1900	15,963,965	15,977,199	16,119,014	2,604,683	1,974,006
1910	20,255,555	19,984,021	20,165,673	3,508,773	1,793,064
1920	24,351,676	24,073,793	24,233,961	3,135,649	1,827,598
1930	29,904,663	29,798,665 ^c	29,904,663 ^d	NA	NA
1940	34,948,666	34,904,634	34,948,666 ^d	2,807,103	NA
1950	42,857,335	42,857,335	NA	4,075,907	NA
1960	53,021,061	53,023,935	NA	2,881,383	NA
1970	63,573,042	63,637,721	NA	3,659,644	NA
1980	80,389,673	80,351,102	80,389,673	3,500,854	3,242,871
1990	91,947,410	91,873,988	91,947,410	3,806,303	3,363,726
2000	105,480,101	NA ^e	105,480,101	NA ^e	3,719,514

^a1950–70 definition: units with five or more persons unrelated to the head are classified as group quarters.

^b1980–2000 definition: units with ten or more persons unrelated to the head are classified as group quarters.

^c1890 and 1930 group-quarters residence interpolated.

^d1930–40 definition (ten or fewer unrelated persons).

^eThe 2000 census microdata file needed to estimate the number of households and the number of group-quarters residents using a 1950–70 definition had not been released at the time the final version of this article went to press.

SOURCES: Published total households: U.S. Census Bureau (1955b, 1972, 1975, 1982, 1992, 2001b). Estimates by household definitions and group-quarters residents calculated from Ruggles and Sobek (1997); see Appendix for a description of methods.

our calculations are given in the Appendix. The aggregate impact of variations in the group-quarters definition on the total number of households is small. In no case does the difference between the published total number of households and the number of households under the 1950–70 definitions exceed 2 percent, and in the 1980–90 period the effect of differences between the two definitions is trivial.

The effect of definitional changes is much greater, however, for the size of the group-quarters population. Indeed, in the period 1850 through 1880, the number of people residing in noninstitutional group quarters is twice as large under the 1950–70 group-quarters definition as under the 1980–2000 definition. Most of these cases consist of groups of unrelated persons such as boarders, lodgers, and domestic servants, many of whom resided with ordinary families.

A substantial percentage of group-quarters residents in the late nineteenth and early twentieth centuries resided with kin. The pre-1940 IPUMS samples created at the University of Minnesota were designed to capture

information about all related groups, even those residing in group quarters (Ruggles and Sobek 1997). These data reveal that under the 1950–70 definition, 42 percent of group-quarters residents in 1880 and 35 percent in 1920 had coresident relatives. About half of these were family groups composed of boarders or other persons unrelated to the household head. The other half appear to be ordinary primary families—with a head, spouse, children, and other relatives—who happen also to reside with five or more boarders or servants, and are therefore classified as group-quarters residents. Even under the 1980–2000 definition of group quarters, which requires ten or more unrelated persons, 25 to 29 percent of group-quarters residents between 1880 and 1920 had coresident relatives.

From 1940 onward, it is impossible to identify the families of group-quarters residents using census data, because such units were sampled at the individual level and all information on family relationships was lost. On the basis of our analysis of the earlier census years, we expect that fewer than 2 percent of all related groups resided in group quarters between 1940 and 1990, and therefore cannot be identified in the census. Among family groups unrelated to a household head, however, as many as 50 percent may be impossible to identify in the census.

The peak census year for boarding and lodging in the United States was 1940 (Goeken 1999). That is also the year of the key shift in the census microdata group-quarters definition, when all units containing five or more persons unrelated to the head were classified as group quarters. By the time the definition was again modified in 1980, boarding and lodging were comparatively rare, so the impact of the change was less significant. Nevertheless, analysts focusing on unrelated individuals—or on households containing multiple unrelated individuals—should pay close attention to the effects of definitional change in both 1940 and 1980.

The only way to impose consistency over the entire data series is to apply the 1950–70 definition of households and eliminate any unit with five or more unrelated persons. There are costs, however, to restricting ourselves to this narrow household definition in the pre-1940 period. In the late nineteenth and early twentieth centuries, boarding, lodging, and domestic service were common. If we classify any unit with five or more persons unrelated to the head as group quarters, then we eliminate from analysis thousands of apparently ordinary households with five or more boarders or servants, and may unnecessarily obscure some of the changes in household composition.

We have no blanket recommendation to resolve group-quarters incompatibilities. For many analyses of family living arrangements in the population as a whole, it will make little substantive difference whether researchers apply the 1950–70 group-quarters standard or allow the standard to vary across census years. But for those focusing on unrelated persons or other subpopulations with high group-quarters residence, the best solution will depend on the particular topic of analysis and measures employed.

Changes in the criteria for distinguishing households

Most households in all census years are composed of a group of persons related to one another who reside together in a separate physical dwelling and who share common eating and cooking facilities. In these cases, the divisions between successive households are usually clear, and the slight variations from year to year in the way households are defined are irrelevant. Beginning in the mid-nineteenth century, however, tenement houses and apartment buildings began to be built in New York and other large cities, and these often contained multiple distinct family groups. Census enumerators were forced to make judgments about which of these structures should be classified as boarding houses or apartment hotels, and thus enumerated as a single unit, and which should be classed as apartment buildings containing multiple separate households. The Census Office developed rules specifying which households in multi-unit dwellings should be enumerated as separate units; these rules are summarized in Table 2.

In the mid-nineteenth century the definition of the household was a preindustrial one: the household was an economic unit that depended on "one common means of support," and its members resided together in a house or part of a house. This definition was becoming obsolete in 1850, as the rise of wage labor was already breaking down the traditional family economy. Nevertheless, the definition was retained in 1860 with only a slight modification to allow enumerators to divide institutions into multiple households if they contained distinct families. In all censuses before abolition, slaves were considered members of their owners' families.

In 1870, the Census Office dropped the criterion of a common means of support and instead instructed enumerators to distinguish separate households based on the existence of a common dining table. The condition of separate tables was retained in 1880, when the enumerator instructions for the first time alluded to the problem of the tenement houses and flats of the great cities. The census of 1900 introduced some ambiguity by instructing enumerators vaguely that each household "usually, though not always" eats separately. The censuses of 1910 through 1930 dropped the requirement of separate tables and substituted the requirement of separate housekeeping. Although housekeeping is never defined, it no doubt was interpreted mainly as cooking and eating arrangements, though it might also have included other household maintenance activities. The 1940 census specifies that either cooking or housekeeping facilities may identify households.

Although the language varies from one census year to the next, the content of the enumerator instructions appears to be reasonably compatible for the period 1870 through 1940. The earlier censuses—1850 and 1860—do not mention tables, housekeeping, or cooking facilities; their focus on a common means of support therefore potentially introduces some

TABLE 2 Criteria for distinguishing separate units in multi-unit dwellings, 1850–1990

1850	Living together in a house, or part of a house, upon one common means of support and separately from others in similar circumstances.
1860	Living together in a house, or part of a house, upon one common means of support and separately from others in similar circumstances; institutions may be broken into multiple units if there are several tenements or distinct households.
1870	Living together under one roof and provided for at a common table.
1880–90	Common roof and table; in “tenement houses and the so-called ‘flats’ of the great cities,” households distinguished by separate tables.
1900	“Best test” is number of separate tables; each unit “usually, though not always, has its own meals.”
1910–30	Separate portions of the dwelling house and housekeeping entirely separate.
1940	Separate portion of house and separate cooking or housekeeping facilities.
1950	Room with separate cooking equipment or two or more rooms with direct access to a common hallway.
1960	Live and eat separately from others and direct access to a common hall or cooking equipment.
1970	Live and eat separately from others and direct access to a common hall or complete kitchen facilities (the rules were not strictly enforced).
1980	Live and eat separately from others and direct access to common hall (the rules were not strictly enforced).
1990	Live and eat separately from others and direct access to common hall.

SOURCES: Census enumerator instructions, as published in Ruggles and Sobek (1997)

comparability problems. In practice, however, the incompatibility of the 1850–60 census definitions is probably of little consequence for most researchers, since large multi-unit dwellings were still quite rare in that period. Nevertheless, investigators focusing on residence in multi-household dwellings should be aware of the potential for some incompatibility between 1860 and 1870.

The period after World War II saw more significant changes in the definition of households. In 1950 the housekeeping criterion was narrowed to include only households with separate cooking facilities, and a criterion was added to count units with two or more rooms as separate households if they had a separate entrance to a common hallway. In 1960, even single-room units without separate cooking facilities could qualify as separate

households if they had direct access to a common hallway. The common hallway criterion meant that hundreds of thousands of single-room-occupancy units that had previously been regarded as hotels or boarding houses were reclassified in 1960 as independent households.

The effects of these changes are uncertain. It is clear that the census enumerators had trouble classifying large residential units from the moment such units appeared on the scene. As the 1930 census instructions note, "the distinction between an apartment house and an apartment hotel, and in turn between an apartment hotel and a hotel devoted mainly to transients, will often be difficult to establish." Before 1950, much was left to the enumerator's discretion, but the instructions do suggest that individuals residing in single rooms in apartment hotels were not to be counted as constituting separate households. For example, in 1930 the instructions specify:

All of the persons returned from a hotel should likewise be counted as a single "family," except that where a family of two or more members (as a husband and wife, or a mother and daughter) occupies permanent quarters in a hotel (or an apartment hotel), it should be returned separately, leaving the "hotel family" made up principally of individuals having no other family relations. (quoted in Ruggles and Sobek 1997: 3.2.85–86)

This instruction suggests that persons residing without family in an apartment hotel should never be enumerated as constituting distinct households. By 1960, however, the rules specify that such persons *should* be counted as separate units, provided they have access to a common hallway.

There has been little change in the formal definition of households since 1960, except that in 1980 the cooking-facilities criterion was dropped, leaving direct access as the sole criterion for distinguishing one household from another. The microdata for 1970, however, contain a significant number of households with neither the cooking facilities nor the direct access necessary to qualify as a separate unit. Similarly, there are many households in 1980 without direct access.⁵ In practice, the definition of a household since the mail-back census became widely used in 1970 may simply be the existence of a mailing address, despite the continuity of the formal definitions.

How important are the changes in the definition of households after 1950? The IPUMS samples for the period 1960 to 1980 provide direct information on the number of rooms, hallway access, cooking facilities, and number of units in the structure. This allows us to apply the 1950 census definition to the 1960–80 census years, by requiring that households in multi-unit buildings have either cooking facilities or two or more rooms and access to a common hallway. Imposing these requirements means that we shift many persons residing in single-room-occupancy apartment hotels from households into group quarters. The effect on the total number of households

TABLE 3 Number of households under contemporary household definitions and estimated number under 1950 household definition (no one-room units without kitchens in multi-unit dwellings), by household type: U.S. censuses 1950–80

Household type/ census year	Contemporary estimate	Included under 1950 definition	Percent excluded
Total households			
1950	42,857,335	42,857,335	0.00
1960	53,021,061	52,651,193	0.70
1970	63,573,042	63,179,568	0.62
1980	80,389,673	80,146,000	0.30
Nonfamily households			
1950	5,093,534	5,093,534	0.00
1960	7,958,394	7,616,554	4.30
1970	12,483,748	12,110,709	2.99
1980	21,257,704	21,038,107	1.03
Male-headed nonfamily households			
1950	2,016,295	2,016,295	0.00
1960	2,983,869	2,715,559	8.99
1970	4,595,253	4,306,781	6.28
1980	8,955,551	8,785,509	1.90
Single-person households			
1950	4,193,497	4,193,497	0.00
1960	7,062,901	6,729,661	4.72
1970	11,173,390	10,809,870	3.25
1980	18,217,377	18,005,370	1.16

SOURCES: See Table 1 for source information on total households. Estimates by household type calculated from Ruggles and Sobek (1997).

and the number of nonfamily households is given in Table 3. The results suggest that in the aggregate the effects of changing definitions were small. However, studies focusing on the living arrangements most affected by the change—such as single-room-occupancy housing—should use the kitchen, rooms, number of units, and access variables to impose greater consistency.

The shift from household heads to householders

In 1980, the Census Bureau eliminated the concept of “household head” and substituted the gender-neutral concept of “householder.” The concept of household head was never clearly defined by the census; it was simply assumed that every household had one, and that it was obvious who it was. There has been debate about the meaning of headship in the census, but it presumably implies some degree of authority or status in the household (Shammas 2002; Smith 1992; Kobrin 1973). A householder is defined as the homeowner or leaseholder of the home; if a husband and wife jointly own or lease their home, either may be listed as the householder.

Household heads in married-couple households before 1980 were ordinarily male. From 1850 to 1920, female heads never exceeded 0.2 percent in married-couple households. For the microdata samples from 1940 to 1970, the Census Bureau's editing procedure allowed no cases of female heads in married-couple households. Since then, however, female householders have been relatively common, accounting for 3.5 percent of married-couple households in 1980 and 7 percent in 1990.

The shift from household head to householder has modest implications for the measurement of household composition. In most cases under the old system, the householder would have been identified either as the head or the spouse of head. To make the family relationships of ascendant or lateral kin compatible, it is necessary to account for the sex of the householder in married-couple households. For example, researchers can reclassify the relationship parent-in-law as parent of husband or parent of wife, as appropriate. Such recodes are comparatively simple when using microdata, but are generally impossible for aggregate statistics.

The change in definitions may also affect the measurement of multigenerational families. Under the old system, an unmarried elderly parent often continued to be listed as head of a multigenerational household even after he or she had transferred the property to the next generation (Ruggles forthcoming); under the new definition, this would be impossible. As discussed below, under the Census Bureau classification system a subfamily would exist only when the older unmarried parent is listed as the householder. Thus, there is some risk that the shift from heads to householders may have reduced the proportion of households with subfamilies. We suspect that this is a minor problem. In any case, the problem can easily be avoided by adopting measures of family composition that do not depend on headship, as discussed below.

Changes in the treatment of college students

One additional change in census procedures should be noted. From 1880 to 1940, the census enumerated college students at their "usual place of abode," which meant that those in dormitories were usually counted as part of their parental family.⁶ In 1950, the census instructions specified that enumerators should not include in a household a son or daughter "attending college elsewhere and not sleeping at home most of the week"; instead, such persons were enumerated in the community where they attended college (Ruggles and Sobek 1997: 3.4.100). The effects of the change were substantial: 63.7 percent of students aged 18 to 22 resided without family in 1950, compared to just 7.0 percent in 1940. Among college-age persons not attending school, by contrast, the percentage of persons residing with family changed only slightly over the course of the same decade.

Even though the change in enumeration rules had notable consequences for the recorded living arrangements of the college population, the consequences for the population as a whole were small because the number of students was still small in 1950. Ruggles (1988) estimated that if the 1950 census had been enumerated according to 1940 rules, the percentage of persons aged 15 or older residing without family would have been reduced from 12.5 to 11.9 percent. If the pre-1950 censuses had enumerated college students where they attended school, the impact would have been even smaller because of the smaller college population. Nevertheless, researchers studying the college-age population should be aware of the potential for this change of procedures to distort their results.

Measurement errors in published census statistics

The Census Bureau has published a standard set of household and family classifications since 1940. The terminology of these classifications has changed, but their definitions have not. Table 4 lays out the basic Census Bureau categories in both modern terminology and the terms used prior to 1980.

A family household is a household containing at least one person related to the householder by birth, marriage, or adoption. Family households

TABLE 4 Basic Census Bureau classification of household and family composition

Family households (termed primary families before 1980)

- Married couple
- Male householder
- Female householder

Nonfamily households (formerly primary individuals)

- Male householder
- Female householder

Related subfamilies (formerly subfamilies)

- Married couple
- Father-child
- Mother-child

Unrelated subfamilies (formerly secondary families; combined with secondary individuals in decennial censuses beginning in 1970)

- Married couple
- Father-child
- Mother-child

Secondary individuals

are subdivided into those in which the householder is married and those in which the householder is an unmarried male or an unmarried female. Nonfamily households consist of persons living alone or with unrelated individuals only; nonfamily households are also subdivided according to the sex of the householder.

A related subfamily is a married couple with or without their own children, or one parent with one or more never-married children under 18 years old, living in a household and related to the householder or spouse. Related subfamilies are divided into married couples (with or without children), father-child subfamilies, and mother-child subfamilies.

Unrelated subfamilies are the same as related subfamilies, except that they are unrelated to the householder. Secondary individuals are persons unrelated to the householder who are not members of a subfamily. In recent decades, unrelated subfamilies have become rare. As a result, the Census Bureau ceased tabulating the number of unrelated subfamilies in the decennial census beginning in 1970, and has combined them with secondary individuals.

We have evaluated the published statistics for each of these categories in the period since 1940 and have compared them with evidence from the IPUMS. In general, we have found that the statistics on family households are consistent with the harmonized microdata, and the statistics on nonfamily households and secondary individuals are problematic only insofar as they are affected by the definitional changes discussed above.

Census Bureau measures of related subfamilies, by contrast, are not reliable. After examining the problem closely, we recommend that analysts not use Census Bureau measures of related subfamilies for any period, whether they are published statistics or Census Bureau-produced variables in census microdata.

The tabulation procedures for subfamilies have gone through three phases. Before 1960, census staff punched a "family card" for each person in the sample population who was the head of a family or subfamily. They apparently worked directly from the enumeration forms, which recorded family relationships in longhand, but we have not been able to uncover specific instructions for coding subfamilies from this period (U.S. Census Bureau 1955a).

The procedure was revised in 1960 to accommodate technological change. The 1960 data were converted to machine-readable form by means of the Film Optical Sensing Device for Input to Computers (FOSDIC). Under the FOSDIC system, coders were required to fill out machine-readable paper forms by blackening small numerically coded circles with number two pencils. To identify subfamilies, coders filled in circles in a "special office code box for item P3" to create a somewhat confusing two-digit number, the first digit of which was a detailed relationship code and the second

digit of which was a subfamily or secondary family sequence number. According to the 1960 procedural history, "the coder identified family groups within households on the basis of name and relationship codes but used as additional aids the order in which persons were listed by the enumerator" (U.S. Census Bureau 1966: 187). A similar procedure was adopted for the Current Population Survey (CPS), and it remained essentially unchanged for both the census and the CPS until 1983.

Shortly after the 1980 census, the Bureau became aware that the CPS coders were missing a high percentage of parent-child subfamilies. Accordingly, in 1982-83 the Bureau revised its coding procedure for subfamilies in the CPS. Instead of having coders identify subfamilies after the fact, they instructed interviewers to identify parent-child relationships. The CPS interviewer's manual reads:

You will enter parents' line number for all individuals in the household whose parent(s) is (are) members of the household. Use relationship to reference person and your knowledge of the family structure within the household to complete this item. (U.S. Census Bureau 1994: Part C Chapter 3)

The information on the presence of parents for each individual, as identified by the interviewers, became the basis for the subfamily codes. The CPS interviewers were not, however, normally expected to ask respondents about the presence of parents; the information they gathered on relation to head was supposed to provide them with sufficient information to infer these items. Interviewers were encouraged to "ask if there is any doubt." The revised procedures led immediately to a doubling in the frequency of related parent-child subfamilies.

The 1990 decennial census also used new procedures to improve the count of subfamilies. The details are unclear, but apparently the manual coding procedures used in 1980 and earlier census years were replaced in 1990 by an automatic classification program that relied exclusively on the family relationship variable to identify subfamilies related to the householder. The census did not attempt to identify subfamilies unrelated to the householder.

Like the 1990 census, the IPUMS uses an automatic coding procedure to identify subfamilies. The IPUMS procedure, however, is considerably subtler than the Census Bureau method. The IPUMS uses not only family relationship, but also marital status, age, sex, sequence in the household, surname code (where available), and number of children ever born (where available). The procedure is designed to yield results that are as consistent as possible across time (Ruggles and Sobek 1997).

The problem with the Current Population Surveys before 1983 has been noted in the literature (Graham and Beller 1985; Bianchi 1995; London 1998). Sweet and Bumpass (1987) suggested that similar problems ex-

ist in the census. No attempt has been made, though, to determine whether the post-1983 reforms actually corrected the problem.

To evaluate the procedures used by the census to code subfamilies, we individually examined several thousand cases in which the IPUMS subfamily codes disagree with the census codes. In every case, we decided that the IPUMS codes were preferable to the census codes. This was true even in the 1990 census, when the problem had theoretically been corrected.

Table 5 gives four examples of the discrepancies we encountered in the 1990 census. Example 1 shows a case that was classified by the census as a father-child subfamily but by the IPUMS as a married-couple subfamily. The problem is that the daughter-in-law (person 4) was erroneously listed as "other

TABLE 5 Examples of discrepancies in subfamily coding between the 1990 census and the IPUMS

Example and person number	Relationship to householder as recorded in the census	Age	Sex	Marital status	Children born	Census subfamily	IPUMS subfamily
Example 1							
1	Householder	74	M	Married	NA		
2	Spouse	72	F	Married	2		
3	Child	39	M	Married	NA	Parent	Spouse
4	Other relative	35	F	Married	2		Spouse
5	Grandchild	16	F	Never married	0	Child	Child
6	Grandchild	12	M	Never married	NA	Child	Child
Example 2							
1	Householder	60	M	Married	NA		
2	Spouse	44	F	Married	9		
3	Child	26	F	Never married	2		Parent
4	Grandchild	6	M	Never married	NA	Child	Child
5	Child	17	M	Never married	NA	Parent	
6	Child	14	F	Never married	NA		
7	Child	13	F	Never married	NA		
8	Child	9	F	Never married	NA		
Example 3							
1	Householder	52	F	Widowed	3		
2	Child	29	F	Never married	0	Parent	
3	Grandchild	15	F	Never married	0	Child	
Example 4							
1	Householder	87	M	Married	NA		
2	Spouse	85	F	Married	8		
3	Grandchild	22	F	Separated	2		Parent
4	Grandchild	2	F	Never married	NA		Child
5	Grandchild	0	M	Never married	NA		Child

SOURCES: Census coding from U.S. Census Bureau (1995); IPUMS coding from Ruggles and Sobek (1997).

relative," so the Census Bureau coding software did not recognize that she was married to the son (person 3). This type of error occurred frequently, because the census form did not provide a category for child-in-law, so all children-in-law had to be manually coded and they often ended up as "other relative." As a result the census count for 1990 includes far too many father-child subfamilies and too few married-couple subfamilies.

Examples 2 through 4 illustrate the consequences of relying exclusively on the relationship variable without consulting age, children ever born, or sequence in the household. The census classified Example 2 as a father-child subfamily in which a 17-year-old son was considered to be the father of an 11-year-old grandson. The IPUMS assigned the grandson instead to the 26-year-old daughter who immediately precedes him. Although there are no instructions governing the sequence of enumeration of relatives in 1990, we have found that in most cases children are listed following their parents. Moreover, the age difference of the son and grandchild is implausible, and we know that the daughter has borne two children. In Example 3, the census assigned a grandchild to a 29-year-old daughter who is explicitly listed as having no children ever born; we think it more plausible that the grandchild is the daughter of an absent child. Finally, the IPUMS shows a subfamily in Example 4 where the census recorded none. Great-grandchildren often receive a relationship code of grandchild; accordingly, the IPUMS procedure assigns the 22-year-old granddaughter who had borne two children as the mother of the infant and toddler who are also listed as grandchildren.

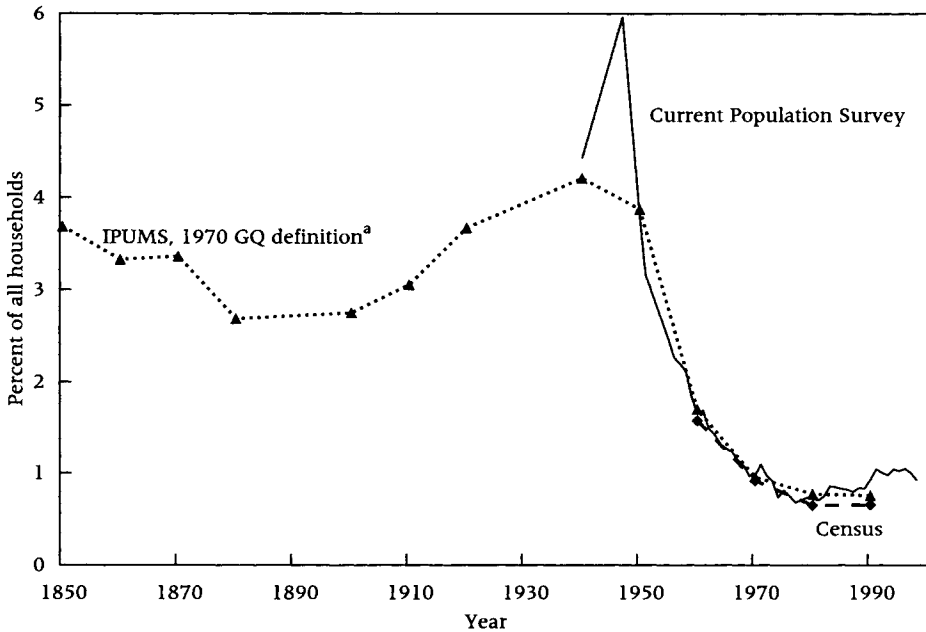
These kinds of errors were frequent. Table 6 shows the percentage of IPUMS-identified subfamilies we believe to be misidentified in the 1990 census. Overall, we estimate that the census missed about 13 percent of married-couple subfamilies and 17 percent of parent-child subfamilies. Even more serious, 28 percent of the parent-child subfamilies identified by the 1990 census were not parent-child subfamilies at all; thus, some 45 percent of parent-child subfamilies in the 1990 census are misidentified. The net error is smaller: the census overestimates the overall number of parent-child subfamilies by only about 10 percent. We do not find this comforting, however, as it is the outcome of much larger gross errors.⁷

Figures 1 through 3 compare the overall percentage of households with subfamilies according to the census, the CPS, and the IPUMS.⁸ The peak

TABLE 6 Estimated percent of error in 1990 census subfamily codes

	Married-couple subfamilies	Parent-child subfamilies
Percent of subfamilies missed	13.03	17.37
Percent erroneously classified as subfamilies	0.22	28.00
Gross error	13.25	45.37

SOURCE: See Table 5.

FIGURE 1 Married-couple related subfamilies: 1850–1998

^aAccording to the 1970 definition, units with five or more persons unrelated to the head are classified as group quarters (GQ).

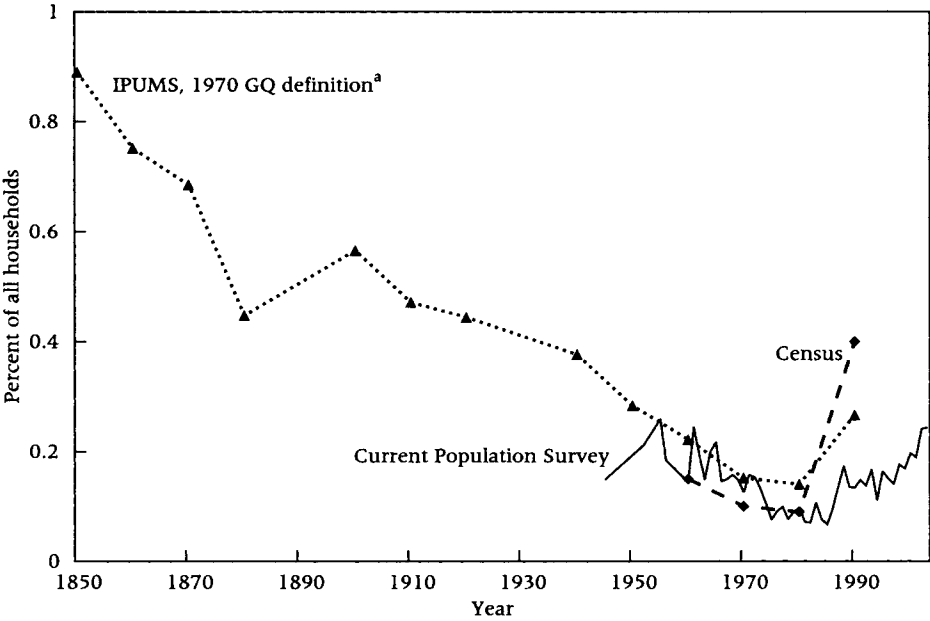
SOURCES: CPS series: U.S. Census Bureau (1975, 1998) and earlier reports on "Household and family characteristics." Census series: 1960–70: U.S. Census Bureau (1972, 1982, 1992). IPUMS series: Ruggles and Sobek (1997).

period for married-couple related subfamilies, shown in Figure 1, was the mid-twentieth century. The growth in such subfamilies between 1880 and 1940 probably does not reflect a change in residential preferences; rather, it can be ascribed to an easing of demographic constraints on multigenerational family structure (Ruggles 1994a, 1996a). The sharp peak in married-couple subfamilies in the CPS for 1947 may be the result of the short-run post-World War II demobilization and housing shortage, and is not inconsistent with the IPUMS for the surrounding census years.

For married-couple subfamilies, the census, the CPS, and the IPUMS track one another reasonably closely. Fluctuations in the CPS series are to be expected owing to small sample size. Considering the high standard errors of the CPS, the percentage of married-couple subfamilies is consistent with that of the IPUMS. The published decennial census tabulations, however, systematically understate married-couple subfamilies for the period 1960 to 1990: depending on the year, the census has a net error between 4 and 17 percent, which is statistically significant in all census years.

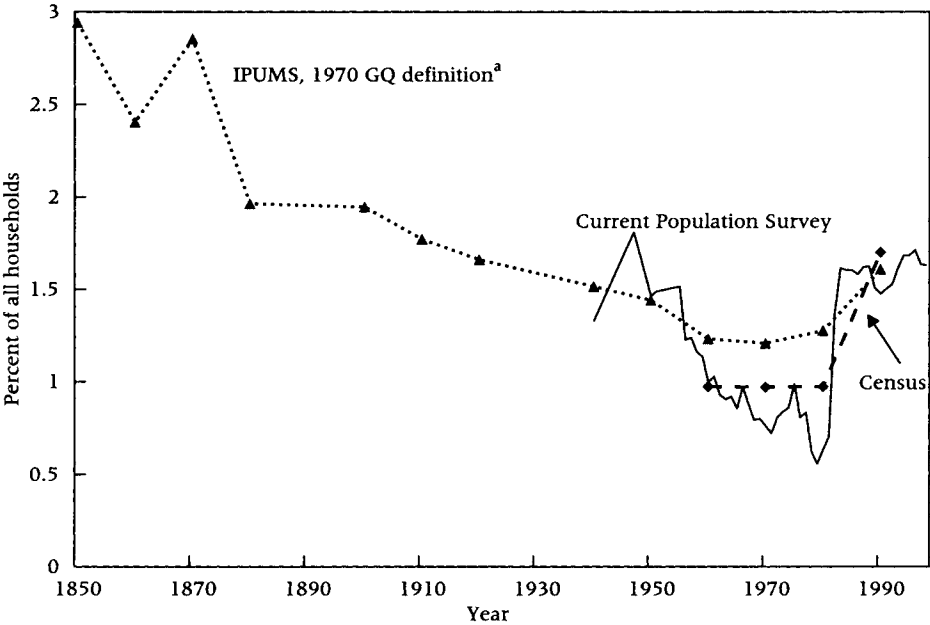
The problem is magnified when we turn to father-child subfamilies, and mother-child subfamilies, shown in Figures 2 and 3. All series show a

FIGURE 2 Father-child related subfamilies: 1850–1998



^aAccording to the 1970 definition, units with five or more persons unrelated to the head are classified as group quarters (GQ).
SOURCES: See Figure 1.

FIGURE 3 Mother-child related subfamilies: 1850–1998



^aAccording to the 1970 definition, units with five or more persons unrelated to the head are classified as group quarters (GQ).
SOURCES: See Figure 1.

drop in the frequency of parent–child related subfamilies until 1980 and an increase thereafter, but the magnitude of the change is considerably smaller in the IPUMS series than in the census or the CPS. From the late 1950s until 1983, the discrepancies are especially pronounced. Even after the aforementioned reforms of 1983, however, the CPS continued to understate the frequency of parent–child subfamilies. In the 1990 CPS, for example, we estimate that mother–child subfamilies are understated by 9 percent and father–child subfamilies are understated by 63 percent. The problem is just the opposite when it comes to the post-1980 statistics derived from the census; under the new automatic coding procedures adopted in 1990, the census now actually overstates parent–child subfamilies by about 10 percent.

All things considered, the Census Bureau's measures of related subfamilies are so unreliable and erratic as to be unusable for comparisons across time. We therefore recommend confining measurement of related subfamilies to the IPUMS census years.

Limitations of household-level and family-level measures

Household and family composition is traditionally measured relative to the number of households or families in the population. Thus, under the Census Bureau approach, one might measure the percentage of family households containing related subfamilies. Similarly, if one employed the widely used Laslett–Hammel classification scheme, one might measure the percentage of households containing multiple “conjugal family units” (Laslett 1972).

We are convinced that the general approach of measuring the percentage of households or families containing a specified set of kin or nonkin is usually inappropriate. We identify four main disadvantages to household- or family-level measurement and explain each of these concerns in turn.

The effect of demographic conditions on kin availability

Most household-level or family-level measures of family composition are highly sensitive to prevailing levels of fertility, mortality, and generation length, so that trends and differentials are often merely a reflection of variations in demographic conditions. Households containing related subfamilies, for example, are usually formed by an older parent residing with a married child or with a child and grandchild. Before the demographic transition, such households were necessarily comparatively rare. In nineteenth-century America, life expectancy was short but generations were long. Early death together with long generations meant that most people had reached old age by the time their grandchildren were born. Thus, many adults did not live with their parents, simply because their parents had died. High fertility also

limited the potential number of multigenerational families, because it meant that a small population of elderly people was spread thinly among a much larger younger generation. Under these circumstances, the percentage of households with elderly kin was necessarily small (Ruggles 1994a).

Raw comparisons of Census Bureau household types (or multiple family households in Laslett's classification) over long periods are more likely to reflect variations in demographic conditions than to reveal variations in residential preferences. Estimating the impact of demographic conditions on household-level measures of living arrangements requires elaborate simulation modeling with many assumptions (Ruggles 1986, 1987, 1993). By contrast, well-designed individual-level measures allow demographic analysis through straightforward life-table approaches (Ruggles 1994a, 1996a).

The life course and gender differences in living arrangements

Age and sex are among the most important determinants of residential behavior. We cannot control for age and sex if we measure household composition at the level of households or families. Sometimes analysts control for the age and sex of the householder, but that is inadequate: age and sex are individual-level characteristics, not household or family characteristics, and individuals move between households and families as they age.

Household- or family-level measurement means that we cannot control for age and sex when analyzing change over time or differences between populations. Moreover, such measures do not allow study of the family life course or differentials in the familial experience of men and women; instead, researchers are forced to adopt a life-cycle approach (for discussion of the distinction between life-cycle and life-course approaches, see Elder 1978; Hareven 1994, 1996).

Age and sex patterns of fertility and mortality underlie the standard tools of demographic analysis. No demographer would make long-run comparisons of births and deaths without attempting to control for population composition. Living arrangements are no different from other demographic indicators. Household-level measurement forces us to adopt crude measures that ignore these key determinants of residential behavior.⁹

The conflation of household composition and householder status

A third problem with the conventional measures is that they conflate household composition and household headship or householder status. For example, consider a household containing an elderly widow residing with her adult son and daughter-in-law. Such a household would contain a subfam-

ily if the widow is listed as head, but would contain no subfamily if the son is listed as head. Similarly, if the widow is listed as head, the household is classified as a female-headed household, whereas if the son is head, it is a married-couple household.

Household headship is an interesting and important characteristic in the pre-1980 period, but it should not be confused with family composition (Bose 2001). If we want to assess the importance of headship in a meaningful way, we must differentiate between measures of household and family composition and measures of headship patterns; in too many analyses, the two are intermingled so that we do not get clear estimates of either one.

The meaning of headship is uncertain, especially when we are comparing different cultural subgroups of the population over broad periods of time (Smith 1992; Shammass 2002). Moreover, the householder concept used since 1980 is clearly different from the household-head concept used in earlier census years. Under these circumstances, it clearly makes sense to develop classifications that are unaffected by headship and then address headship as a separate issue.

The principles of demographic measurement

Finally, household- and family-level analysis violates the basic principle of demographic measurement that behavior should be evaluated relative to the population at risk. Whenever possible, for example, demographers restrict the analysis of fertility to women between the ages of 15 and 49, since they are the only people who can give birth. The conventional measures of household and family composition make it impossible to define a consistent at-risk population.

Consider the percentage of households containing subfamilies. If residence in subfamilies declines, the number of households must increase by roughly the same number, since residing in an independent household is the chief alternative to residing in a subfamily. Thus, when we measure the percentage of households with subfamilies, the number of subfamilies in the population affects both the numerator and the denominator. The number of households is not the population at risk of containing subfamilies, because the number of households is inversely related to the number of subfamilies in the population (Ruggles 1987: 142–147).

The interrelatedness of household type and household size not only makes the conventional measures inelegant, it can also make them misleading. Measurement of the percentage of households of each type can give a distorted impression of living arrangements. For example, in 1990 nonfamily households made up some 30 percent of all households, but the inhabitants of nonfamily households accounted for less than 15 percent of the adult population. The solution is simple: instead of measuring the per-

centage of households that fall into a particular category, we should measure the percentage of eligible individuals who reside in a particular family or household situation.

To avoid these problems, we have four basic recommendations for the measurement of family and household composition:

1. Whenever possible, comparisons across time and between population subgroups should consider the potential intervening effects of demographic factors on the availability of kin for coresidence.
2. As with all other basic demographic indicators, measures of household and family composition should control for age and sex.
3. Family composition should be measured without reference to headship; headship also can usefully be measured, but it should not be confused with family composition.
4. All measures should be taken at the individual level, except where there is a compelling reason to use household-level measures.¹⁰

The standard Census Bureau measures and most other commonly used measures of family and household composition violate all of these injunctions. There are, however, good individual-level alternatives to all the standard measures that avoid these problems with no loss of information. For example, instead of measuring nonfamily households as a percentage of all households, we can assess the percentage of adults residing without kin. Similarly, instead of tabulating the percentage of households containing married-couple subfamilies, we can examine the percentage of married couples residing with their parents, or we can look at the percentage of older persons residing with married children.

Discussion

Despite changes in census concepts, definitions, and enumeration procedures, with reasonable caution the census can provide coherent historical measures of living arrangements in the United States since the mid-nineteenth century. Among many changes in census and enumeration procedures, the following deserve the most careful attention:

1870. Households were distinguished on the basis of a common eating table, rather than on a common means of support. The consequences of this change remain unclear, but it could affect the enumeration of some multi-household dwellings. Because of the abolition of slavery, 1870 is also the earliest census that allows detailed analysis of black family and household composition.

1940. The census microdata sample applies the narrow 1950–70 definition of households, which means that no family relationships can be identified in units with five or more persons unrelated to the head.

1950. College students were enumerated at their college, not in their parental home. This had significant implications for the recorded living arrangements of the college-age population.

1960. Single rooms without cooking facilities were counted as separate units, provided they had direct access to a common hallway. This led to a sharp increase in recorded single-room-occupancy households.

1980. The householder concept was introduced, leading to a pronounced increase in the percentage of married-couple households with a female reference person. This change has implications for the tabulated frequency of recording of in-laws and subfamilies. Using microdata, however, researchers can circumvent these problems. In addition, the 1980 census broadened the definition of household to include units with five to nine persons unrelated to the head.

With appropriate attention to these comparability problems, changes in census definitions and concepts do not pose insurmountable obstacles to the long-run comparison of household and family composition. Nevertheless, researchers focusing on population subgroups greatly affected by changing definitions—such as unrelated subfamilies, boarders, domestic servants, college students, residents of single-room-occupancy housing, and residents of large multifamily dwellings—must take special care to ensure comparability.

Formal definitions and instructions are not the only potential source of incompatibility in census enumerations. Magnuson and King (1995) document continuous improvement in the oversight and training of census enumerators, which may mean that definitions and instructions were more closely followed in the mid-twentieth century than in the nineteenth century. In 1960, however, enumerators delivered long-form questionnaires to every fourth household in urban areas, and respondents were asked to fill out the forms themselves and return them to the Census Bureau by mail. By 1970, most census forms were also delivered to households by mail; this meant that there was usually no face-to-face contact between an enumerator and a respondent. Under these circumstances, the potential for misinterpretation of instructions probably increased. As noted above, the censuses of 1970 and 1980 include many households that do not meet the formal requirements for classification as a separate household. In practice, we suspect that separate mailing addresses have often led to designation of separate households, even where the units do not qualify as independent households under the formal definition.

Changes in the mechanics of data processing and classification have also contributed to incompatibilities. In particular, our analysis reveals substantial Census Bureau processing problems in the measurement of subfamilies. Accordingly, we recommend that all Census Bureau measures of

subfamilies—whether in published statistics or in microdata—be avoided. The family interrelationship variables provided in the IPUMS allow considerably greater comparability over time.

Finally, we recommend that analysts studying long-run change in family and household composition create measures of living arrangements that can control for changing population composition and that do not conflate headship and composition. To maximize comparability, most analyses should avoid the standard Census Bureau classifications of households and families and instead use individual-level measures of living arrangements that are tailored to the specific research questions at hand.

Appendix

Calculation of households and group quarters under 1950–70 and 1980–2000 definitions

To develop estimates of the number of households and group quarters from 1850 to 1920, we began with the official published statistics on the total number of units—including both households and group quarters—in each census year. We then used IPUMS data to estimate the proportion of units that would be classified as group quarters under each definition. We used this proportion to adjust the count of total units downward, yielding an estimate of the total number of households. Because we used the IPUMS only to estimate the proportion of all units that were group quarters, the potential for sampling error was minimized.

Although it was simple to tabulate the percentage of persons residing in group quarters under either definition using the IPUMS samples for the early censuses, it was more complicated to estimate the number of group-quarters units because most group-quarters residents were sampled at the individual level. To maximize precision, we sampled persons in large units in all IPUMS samples as individuals, or in some cases as related groups (Ruggles and Sobek 1997). For example, the microdata samples do not include a sample of prisons, but rather a sample of individuals residing in prisons. The specific criteria for individual-level sampling vary from sample to sample, but all pre-1930 census years can be made compatible with both the 1950–70 and 1980–2000 group-quarters definitions.

The pre-1930 samples include a count of the size of each large unit even if it was sampled at the individual level. This gave us sufficient information to estimate the proportion of all units in each census year that would have been classified as group quarters under any of the group-quarters definitions. We estimated *sgq*, the sample estimate of the number of group-quarters units, as

$$sgq = \sum \frac{perwt}{numperhh},$$

where *perwt* is the person-weight for all individuals in group-quarters in the IPUMS, and *numperhh* is the number of persons in the entire group quarters unit, as manu-

ally counted by the data entry operator. We then used the IPUMS-derived estimate of the number of group-quarters units and the number of households to convert the published figures on the total number of units (including both households and group quarters) into estimates of the total number of households:

$$PHH = \frac{shh}{shh + sgq} \times PUNITS,$$

where *PHH* is the estimated number of households in the population, *shh* is the number of households in the IPUMS sample, and *PUNITS* is the total number of units—including both households and group quarters—from the original published census count. The resulting estimates of the number of households in each census year appear in Table 1.

Accounting for changes in the definitions of group quarters since 1930 was more problematic. Using the IPUMS, we could apply the 1950–70 group-quarters definition to any census year by simply classifying any unit with five or more persons unrelated to the head as group quarters. We could not, however, apply the 1980–2000 definition to the samples for the period 1940–70, since in those samples units with five to nine unrelated members were sampled at the individual level, and all information about household composition for these units was thereby lost.

Notes

The authors thank Catherine Fitch for helpful comments and suggestions. This work was supported in part by NSF SBR-9617820, NSF SBR-9908380, NIH R01 HD34714, NIH R01 HD43392, and NIA training grant T32 AG00221.

1 Recent work on long-run changes in US living arrangements using historical census microdata includes Block 2000; Bures 1998; Costa 1997, 1999; Crowder and Tolnay 2000; Dillon 1998, 2000; Elman 1998; Elman and London 2002; Fitch and Ruggles 2000; Foley and Guinnane 1999; Glick 1997; Goeken 1999; Goldscheider and Hogan 2001; Gutmann, Pullum-Pinon, and Pullum 2002; Hacker 1999, 2001; Kallgren 1995; Katz forthcoming; Lakdawalla and Philipson 2002; London and Elman 2001; McGarry and Schoeni 2000; Moehling 1997; Ruggles 1994a, 1994b, 1996a, 1996b, 1997a, 1997b, 2001, forthcoming; Russell 2000; Schoeni 1998; Shammass 2002; Tolnay 1997, 1998, 1999; U.S. Census Bureau 2001a; Wilson 2001.

2 In addition to changes in enumeration procedures, changes in the universe of census coverage have important implications for the

study of changing family and household composition of particular population subgroups. At present, for example, the available census microdata exclude the slave population in 1850 and 1860. Although information on slaves in those census years will soon be added, because the census collected limited information about slaves these data will not permit comparable analyses of the slave family (Alexander et al. 2003). In addition, most American Indians were excluded from the census until 1900 (Seltzer 2000), and the geographic territory covered by the census expanded dramatically between 1850 and 1960 (Ruggles and Sobek 1997).

3 The IPUMS database and documentation (Ruggles and Sobek 1997) are available online at <http://www.ipums.org>

4 Before 1940, these dwelling units were called “census families” rather than households. In this article, we use the term household for all census years to avoid confusion with the modern census concept of “family.” The Census Bureau experimented with an early version of the group-quarters concept in the 1900 census, which excluded the follow-

ing from the count of "private" households: hotels, boarding houses, schools, institutions, work camps, ships, military posts, and "miscellaneous groups of persons lodging together but having no family relationship" (U.S. Census Office 1902: clviii). We have ignored this count of private households because the definition is incompatible with later census years; instead we followed the same procedures for 1900 as for the other early census years. All enumerator instructions for the period 1850 to 1990 are available online at <http://www.ipums.org>

5 We estimate that there were 14,100 persons in households without their own kitchens or direct access in 1970, and 296,300 persons in households without direct access in 1980.

6 In 1850, the enumerator instructions specified that "students in colleges, academies, or schools, when absent from the families to which they belong, are to be enumerated only as members of the family in which they usually boarded and lodged on the 1st day of June" (quoted in Ruggles and Sobek 1997: 3.4.4). Since most colleges were not in session on June 1, however, many of these students were enumerated at their parental homes (Davis 1972). By 1880, the instructions indicated that the "usual place of abode" rule applied to college students, and suggested that for "students at schools or colleges, the enumerator can, by one or two well-directed inquiries, ascertain whether the person concerning whom the question may arise has, at the time, any other place of abode within another district at which he is likely to be reported" (quoted in Ruggles and Sobek 1997: 3.4.17). The variation in instructions had little impact on enumeration before 1950: in every census year from 1850 to 1940, between 7.0 and 10.6 percent of college-age students resided without their parents, compared with 63.7 percent in 1950.

7 See Erickson and DeFonso (1993) for further explanation of census error terms. We could not carry out the same kind of analysis for the CPS, because IPUMS subfamily codes are not yet available for those samples. We did,

however, manually examine several thousand households in the 1990 CPS, and the results were not encouraging. We noted many cases in which the CPS seems to have missed obvious subfamilies for no apparent reason. In other cases, the subfamilies identified by the CPS are implausible. While there is no doubt that the changes in procedure adopted by the CPS after 1983 represent a marked improvement over earlier practice, shifting responsibility for the identification of subfamilies from coders to interviewers has not entirely solved the problem. As part of a National Science Foundation infrastructure project, we are presently converting the March CPS files for the period 1962–2002 into IPUMS format. When that job is complete, we will be in a better position to assess the reliability of subfamily coding in the CPS.

8 These figures are affected by the changing definition of group quarters, described above; like the census, the CPS twice altered its definition of households. Until 1951, the CPS defined households as units with ten or fewer persons unrelated to the head (U.S. Census Bureau 1951, 1952). The threshold was then changed to four or fewer until 1983, when it was raised to nine or fewer (U.S. Census Bureau 1993).

9 A related point is that household-level or family-level measures preclude analysis of the effects of any other individual-level characteristics on residential behavior, such as marital status, educational attainment, or income.

10 In Figures 1 through 3 in this article, for example, we were compelled to use household-level measures because the comparisons rely on published statistics. We are not advocating the abolition of all household- or family-based measures; households sometimes operate as a meaningful unit of production and consumption. When the topic of investigation is the composition of families or households, however, the number of families or households in the population is seldom the best denominator.

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