

ALTERNATIVE ENUMERATION METHODS AND RESULTS:  
RESOLUTION AND RESOLVED POPULATIONS BY SITE

Leslie A. Brownrigg and  
Manuel de la Puente  
U.S. Census Bureau  
Center for Survey Methods Research

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## TABLE OF CONTENTS

INTRODUCTION.....	Page 1
<u>History</u> .....	Page 2
<u>Method in Brief</u> .....	Page 2
<u>Census Data</u> .....	Page 3
THE ALTERNATIVE ENUMERATIONS.....	Page 4
<u>Training and Guidelines</u> .....	Page 4
<u>The Ethnographic Sample</u> .....	Page 5
<u>Fieldwork Phases</u> .....	Page 6
Selection and Geocoding of Exact Sites.....	Page 6
Address Listing and Mapping Sites.....	Page 7
<u>Who Were the Alternative Enumerators?</u> .....	Page 7
Residents.....	Page 7
Service and Research.....	Page 8
Enumeration Staffing .....	Page 9
a) The Lone Researcher.....	Page 10
b) The Research Pair.....	Page 10
c) The Integrated Team.....	Page 10
d) The Executive Principal Investigator.....	Page 12
<u>Limitations on Observations in the Fieldwork</u> .....	Page 13
<u>Schedule and Reference Periods</u> .....	Page 14
<u>The Census Source</u> .....	Page 15
RESOLUTION.....	Page 17
<u>Final Match and Resolution Coding</u> .....	Page 17
<u>Key Features of the 1990 "Final Match and Resolution" Codes</u> .....	Page 19
<u>Match Codes</u> .....	Page 20
Household/Housing Unit Links.....	Page 20
Individual Record Matches.....	Page 20
<u>Resolution Codes</u> .....	Page 21
<u>Concept of Disaggregated Coding</u> .....	Page 22

<u>Resolution Fieldwork</u> .....	Page 23
Timing.....	Page 23
Preparation.....	Page 25
Access.....	Page 25
Evidence.....	Page 25
Consistency.....	Page 27
 OUTCOME.....	 Page 28
<u>Measurement of Net Coverage</u> .....	Page 30
Histogram 1 Total Net Undercount or Overcount in the Census Enumeration by Sites of the Ethnographic Sample.....	Page 31
Histogram 2 Male Net Undercount or Overcount in the Census Enumeration by Sites of the Ethnographic Sample.....	Page 32
Histogram 3 Female Net Undercount or Overcount in the Census Enumeration by Sites of the Ethnographic Sample.....	Page 33
 <u>Composition of Net Coverage</u> .....	 Page 33
CONCLUSIONS.....	Page 35
REFERENCES.....	Page 37

APPENDICES

Figure 1: Sample Design

Figure 2: Sample Design with Percent Race/Ethnic

Figure 3: Example of a Match Report Using Dummy Data

Table 1: Other Sources Used in Address Listing, Compilation  
of Enumeration or Resolution

List of Charts for Urban Concentrated Black Sample Areas

Chart A1: Harlem, NY

Chart A2: Orleans County, LA

Chart A3: Flint, MI

Chart A4: Boward County, FL

List of Charts for Rural Concentrated Black Sample Areas

Chart B1: Rural Logan County, OK

Chart B2: Rural Holmes County, MS

List of Charts for Urban/Suburban Heterogeneous Black Sample Areas

Chart C1: North St. Louis, MO

Chart C2: Carbondale, IL

List of Rural Concentrated American Indian Sample Areas

Chart D1: Isleta Pueblo, NM

Chart D2: Rural North Carolina, NC

Chart D3: Rural Okfuskee County, OK

List of Urban Concentrated Asian Sample Areas

Chart F1: Koreatown, LA

Chart F2: Queens, NY

Chart F3: Chinatown, NY

List of Urban/Suburban Heterogeneous Asian Sample Areas

Chart G1: South St. Louis, MO

Chart G2: Chicago, IL

Chart G3: North Beach, CA

Chart G4: Los Angeles, CA

List of Urban Concentrated Hispanic Sample Areas

Chart H1: San Diego, CA

List of Rural Concentrated Hispanic Sample Areas

Chart I1: Rural Santa Barbara County, CA

Chart I2: Rural Marion County, OR

List of Urban/Suburban Heterogeneous Hispanic Sample Areas

Chart J1: Hartford, CT

Chart J2: New Orleans, LA

List of Urban Concentrated Undocumented Sample Areas

Chart K1: Miami, FL

Chart K2: Bronx, NY

Chart K3: Santurce, PR

List of Urban/Suburban Heterogeneous Undocumented Sample Areas

Chart L1: Houston, TX

Chart L2: Long Island, NY

Chart L3: San Francisco, CA

## INTRODUCTION

In this paper, we highlight the Alternative Enumeration (AE) methods used in the Ethnographic Evaluation of Behavioral Causes of Census Undercount Project. We focus on the research phase for "resolving" differences in the match between the AE and Census records. We compare the population counts obtained from Alternative Enumerations to those keyed from census questionnaires and to the constructed "resolved" population of sample areas. Measurements of coverage error further compare the population as enumerated on census forms to the population "resolved" to have been resident on Census Day.

Detection of omissions and other kinds of error that contribute to the differential net undercount was a principal research activity. After cases and patterns of omission and error were documented, we are able to test which demographic, social and behavioral characteristics of neighborhoods, households and people are associated with omissions and errors. The evidence and methodological bases for identifying errors and omissions in the census are discussed in this paper.

More complete and detailed descriptions of exact enumeration methods used at each site appear in the individual ethnographic coverage reports issued by the Center for Survey Methods Research. We refer to these reports to support statements.<sup>1</sup> The authors of the present paper manage and serve as technical representatives for the Joint Statistical Agreement projects that compose the ethnographic coverage evaluation. This paper provides our overview and appraisal of Alternative Enumeration (AE) methods that the independent researchers used in 1990 and how well those enumeration methods overcame identifiable barriers to enumeration. We will discuss the second or "resolution" stage of coding and ethnographic fieldwork in which the matches, non-matches and discrepancies between the AE and Census were reviewed in detail and the Census Day situation for all housing and persons enumerated in both sources was determined. Finally, we will illustrate with bar charts patterns of error, omission and net undercount or overcount discovered through this evaluation method.

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<sup>1</sup> Coverage reports are available upon request from the Center for Survey Methods Research. From the 3 sites of the 1986 test, these are Long 1987; Vigil 1987 and Garcia-Parra 1987; from the 1988 Dress Rehearsal pilots, Ackerman 1989a; Rynearson 1989; Aschenbrenner 1989a; Woodard 1989; Woodard and Mack 1989. Also see Martin, Brownrigg and Fay 1990 for commentary on these ethnographic studies. The following final reports for the 29 1990 Decennial sites are available: Aschenbrenner 1991; Ammar 1992; Bell 1991; Bracken and de Bango 1992; Bunte and Joseph 1992; Darden forthcoming; Dominguez and Mahler 1993; Duany 1992; Durant and Jack forthcoming; Frate forthcoming; Garcia 1992; Hamid 1992; Isberner 1992; Jojola 1992; Kang 1992; Kim 1991; Lerch 1992; Mahler 1993; Montoya 1992; Moore 1992; Rodriguez and Hagan 1991; Romero 1992; Rynearson and Gosebrink 1992; Shaw and Guthrie 1992; Stepick and Stepick 1992; Straus 1991; Sung 1991; Velasco 1992; Wingerd 1992.

## History

During the 1988 Dress Rehearsal Census, the Center for Survey Methods Research (CSMR) in the Census Bureau organized a research and evaluation project entitled the "Ethnographic Evaluation of Behavioral Causes of Undercount." This project built upon prior ethnographic evaluations of Census Bureau enumeration procedures (Valentine and Valentine 1971; Vigil 1987; Long 1987; Garcia-Parra 1987; Hainer 1987). The research project sponsored background ethnography to explore the sociocultural dynamics and behavioral barriers to enumeration in specific "hard-to-enumerate" groups.<sup>2</sup> The research also sponsored ethnography during the 1988 Dress Rehearsal Census to pilot alternative enumeration and matching methods suitable for evaluating census coverage in small sample areas.<sup>3</sup> See the section on resolution, below, for more information about the 1986 and 1988 studies.

## The Method in Brief

The 1990 researchers were selected from among those who answered a call for proposals from nonprofit organizations to work through Joint Statistical Agreements with the Census Bureau.

The evaluation method designed by CSMR staff required that outside researchers follow certain steps and complete comparable products. First, the researchers had to identify an area containing about 100 contiguous housing units with population characteristics corresponding to one of the replicate cells in a sample design (see Appendix Figure I). Sample areas were selected in places where potential barriers to enumeration were identified. Sample areas were contiguous clusters of housing units within specified units of census block geography.

In their proposals, applicants were asked to describe a neighborhood, give reasons why it might be undercounted in the census, and explain their prior relationship with the neighborhood. One criterion for ranking proposals was evidence of strong pre-existing relationships between the researchers and the proposed study area. The project had neither the lead time nor sufficient funds to sponsor in-depth, background ethnographic research, therefore researchers' prior relationship with communities and prior research were substituted. Researchers' relationships with the neighborhoods they nominated

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<sup>2</sup> Ethnographic exploratory reports include: Ackerman 1988; Fleisher 1989 and 1990; Ryneerson 1988; Ryneerson and Gosebrink 1989a and 1989b; Ryneerson, Gosebrink and Gewanter 1990; Bonvillain 1989a, 1989b and 1990; Bourgois 1990; Hudgins, et al. 1990a and 1990b; Kang 1990; Stepick and Stepick 1990; Lobo 1990 and 1992; Sullivan 1990; Elias-Olivares and Farr 1991; Glasser 1991.

<sup>3</sup> See Martin, Brownrigg and Fay 1990. There were five ethnographic evaluations in the Dress Rehearsal sites located in St. Louis, MO (two sites), Columbia, MO (a split site with blocks in two locations), and two sites in eastern Washington State. One of the eastern Washington sites was fully resolved; in the other, an AE was conducted and matched but discrepancies were not resolved.

as sample areas varied considerably.

Researchers made a list of all housing units -- occupied, vacant or boarded up and other living quarters within the boundaries of the sample area. Within three months after Census Day, the researchers began their fieldwork. They assigned to each housing unit a map spot number which was noted on a map of the area. They developed and submitted a complete "Alternative Enumeration" list of all housing and people living in each ethnographic sample area. Simultaneously, they recorded logs of systematic behavioral observations about aspects of the neighborhood, housing units, households and people in the sample area that might have prevented a complete count. These materials were keyed by the Census Bureau.

The Census Bureau matched the Alternative Enumeration (housing and population lists) submitted by outside researchers to the official census enumeration of the sample area as reported on census forms (see below). Discrepancies between the Alternative Enumeration and the census enumeration keyed from forms were resolved in a separate phase of fieldwork. In the resolution phase, links and matches between records in the two sources were confirmed or corrected. AE and census omissions and errors were coded. Records that referred to people who had moved into or out of the site after Census Day were identified. All records from the Alternative Enumeration and the Census were coded by type of match or nonmatch and situation as of Census Day.<sup>4</sup>

### Census Data

Census enumeration data used in this research project were keyed directly from the census forms thus no census records used contained any edits, imputations or substitutions. The census enumeration keyed directly from census forms represents a raw, unedited slice of the census-in-process.

The census file matched to the Alternative Enumerations is an immediate product of mail back and face-to-face enumeration which is not yet the final census count. In some census operations and procedures, data quality is compromised resulting in "head count" type records. One example is resorting to neighbors reporting for residents after three attempts have been made to contact residents. (See United States Bureau of the Census 1992, Chapter 6). Another reason why raw census enumerations lack detail is that it was not provided by the respondent on a mail return and the respondent was not telephoned to supply corrections.

In keying information from census forms, we preserved person records that were demographically undefined, that is, records with missing items in age, sex, race, etc. We did not impute missing characteristics nor did we discard these records as ineligible for matching. We preserved these census records through matching and resolution coding for several reasons: 1) We

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<sup>4</sup> The final Census unedited 100% detail file was merged to the final Census Address Control File to create records which were then sorted to check the disposition of the records keyed from census forms.



could specify that blanks could be skipped when matching variables: no evidence was no evidence for or against a match; 2) we intend to study item response between matched records; 3) population count type records indicate poor quality and we wanted to investigate relationships between census data quality and coverage and 4) the ethnographic sample can be used to test imputation models.

When the Census Bureau processes data from its enumeration, any missing 100% demographic data items are supplied. Certain coverage improvement operations, such as telephone follow-up calls to respondents, correct and supplement data by contacting respondents. In a final, fully automated edit to produce the edited 100% detail file, characteristics are imputed and whole persons are substituted. We theorize that the substitution of characteristics from neighbors for whom demographic data is defined may compound biases of coverage, either toward undercount or overcount. Imputation of census records may increase or decrease sex ratios or age groups or population race groups in the final count. The automated edit of the census obscures the effect of missing data.

We plan to examine whether persons omitted or erroneously included are demographically similar to the population correctly censused at each site (de la Puente 1992). We plan to look for "demographic correlates of undercount" in the census attributable to enumeration. It is appropriate to look at raw, unedited data to find "hot spots" of census error while the census is in process. If such indicators are found, they could be used in the future to deploy enhanced enumeration procedures where undercount was occurring.

## ALTERNATIVE ENUMERATIONS

### Training and Guidelines

At least one participating principal investigator from each site attended a training conference where basic core methods were discussed and the information to be collected in the Alternative Enumeration was defined. All sites were provided with written guidelines for selecting and geocoding the sample area, for identifying housing units and living quarters, and for reporting basic demographic data in a set format called the "A list."<sup>5</sup>

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<sup>5</sup> The guidelines are divided into five parts.

- I. Part one deals with geography and physical space (Brownrigg 1990a).
- II. Part two covers the presentation of the Alternative Enumeration (Fansler and Brownrigg 1990).
- III. Part three deals with behavioral observations (Brownrigg and Fansler 1990).
- IV. Part four provides guidance for writing the coverage report interpreting the match report and coding resolutions (de la Puente, Brownrigg and Fansler 1990).
- V. And part five gives advice for coding records from the Post Enumeration Survey that overlap ethnographic sites (Brownrigg 1992b).

Independent researchers were distributed copies of key Census Bureau definitions and selected census procedures, for example, the turn right rule for listing addresses around a block. All researchers were required to draw and submit site maps showing the relative location of all housing units listed on their Alternative Enumeration.

### The Ethnographic Sample

The ethnographic sample was purposefully situated in areas where minority race and ethnic groups and/or undocumented resident aliens were living in 1990. (See Appendix Figure I and Figure II.) Ethnographic sites were places where identified barriers to census coverage existed. All ethnographic sites were potentially "hard" or "difficult" to enumerate; all were in "high interest areas." Residents of ethnographic sites are in population groups for which differential undercount prior to 1990 either had been documented (Blacks and Hispanics) or were suspected (American Indians, new migrant Asian Americans and undocumented immigrants of any national origin). Evidence for the differential undercount of the Black population was found once again in the 1990 Census by Demographic Analysis (DA)<sup>6</sup>, the Post Enumeration Survey (PES), and evidence for the differential undercount of the Hispanic origin, Asian American and American Indian populations was found by the PES (Department of Commerce 1991; Hogan 1991 and 1992). The PES and DA evaluation studies are larger enterprises designed to produce reliable estimates of census coverage. Our behavioral research was designed to document cases and causes of the differential undercount. The specialization and purposive character of the ethnographic sample needs to be taken into account in reviewing its results.

The ethnographic sample overrepresents poverty pockets, both rural and urban. Participating researchers reported that the income level for the majority of the population fell below the poverty line at 11 sites<sup>7</sup> and noted that a number of households depended on public assistance. At 8 sites, ethnographers reported the majority of the population was low income<sup>8</sup>; at 4 sites<sup>9</sup> the principal investigators reported a mix of low and middle income

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<sup>6</sup> See Robinson 1988; Robinson and Lapham 1991; Robinson et al. 1991.

<sup>7</sup> The guidelines requested that the ethnographers "broadly characterize the income rank of the neighborhood's population" (Brownrigg and Fansler 1990). Characterized as urban poverty sites were in Hartford, CT; Long Beach, CA; Flint, MI; New Orleans, LA; North Beach, CA; Miami, FL; San Diego, CA; Houston, TX; Bronx, NY. At two rural sites, in Holmes County, MS and in Logan County, OK, the population was also characterized as below the poverty line.

<sup>8</sup> The sites characterized as low income were Harlem and Queens, NY; Koreatown and Los Angeles, CA; rural North Carolina; South St. Louis, MO; Ft. Lauderdale, FL; and Hispanic sites in New Orleans, LA; San Francisco, CA; Long Island, NY (Source: Systematic Observations of the Neighborhoods).

<sup>9</sup> North St. Louis, MO; rural Santa Barbara County, CA; Chinatown, NY; and Isleta Pueblo, NM.

residents.

A number of the ethnographic sites were in dangerous neighborhoods where crime was an evident problem. For example, illegal drugs were openly sold within at least four of the sites<sup>10</sup> and there were murders the census year, 1990, within two of the sites.<sup>11</sup> Over 30 languages other than English were spoken by people in the ethnographic sample. A language other than English was more commonly spoken by 20% or more of the sites' residents in 14 of the 1990 ethnographic sites.

### Fieldwork Phases

Field research for the ethnographic evaluation studies were formally divided into four distinct sequential phases: 1) selection and geocoding of the exact site, 2) listing housing units by address, 3) enumeration of households and behavioral observations for 6 weeks and 4) resolution of discrepancies on the match report between the AE and census. At each site, each researcher designed an appropriate strategy based on our guidelines.

#### Selection and Geocoding of Exact Sites

In the context of the ethnographic project, "geocoding" required that Principal Investigators (PIs) identify an "ethnographic site" on census Topologically Integrated Geographic Encoding and Referencing (TIGER) maps. Each site contained about 100 housing units and a population with the characteristics the PI had proposed to study. Principal investigators submitted conventional street or topographic maps and locational descriptions of the area they wished to study. These materials were geocoded to identify on which census Address Register Area (ARA) map the area appeared. This was a crucial process for the project and an important component of its methodology because all sites had to be correctly geocoded before the appropriate census forms could be retrieved. Census TIGER maps were mailed to researchers so each could compare the geographical symbols and block divisions displayed on census maps with features on-the-ground. They became familiar with the census block "geocodes" of the site. The census block geocode is a set of numbers which is used to index groups of census forms and addresses and hence, all subsequent tabulations. Any method to retrieve census forms or census data must refer to the geocode characteristic (Brownrigg 1990a:3). In most cases, Census Bureau geographers were able to identify which ARA map contained the site on the first try.<sup>12</sup>

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<sup>10</sup> These sites were Bronx and Harlem, NY, Fort Lauderdale, FL and Flint, MI.

<sup>11</sup> These sites were Harlem, NY and Flint, MI.

<sup>12</sup> The turn around time for geocoding each site nevertheless took two to six months. In three sites (San Francisco, CA; Miami, FL; and Chinatown, NY), despite clearly specified geographical information down to the detail of address ranges on named streets, Census Bureau geographers did not correctly identify the area. In the first round for the site in Miami, a city divided

## Address Listing and Mapping Sites

In the hindsight of results, an important advantage the Alternative Enumerations enjoyed over the census was their more thorough listing of the housing units. Researchers were explicitly trained on Census Bureau methods and procedures for identifying and listing housing units (United States Bureau of the Census 1989). One set of guidelines on geography and physical space issued to them deals exclusively with Census Bureau address listing conventions, symbols on TIGER maps and instructions to listing enumerators (Brownrigg 1990a). We also passed along advice about how to find hidden or less readily apparent housing units from the 1988 ethnographic studies (Rynearson 1988). The outside independent researchers returned to the basics of listing housing units and addresses whereas the 1990 Census used a variety of sources and methods to compile its Address Control File and Address Registers. The basics proved more accurate and, moreover, more replicable.

Many of the researchers enjoyed the advantage of prior familiarity with the particular areas they selected; this is not always the case for official census takers. Prior familiarity with areas enumerated varied among Principal Investigators. It ranged from long term residence and research immersion in the community containing their respective ethnographic site to the expeditionary research.

### Who Were the Alternative Enumerators?

At the time of the Alternative Enumeration, 24 of the Principal Investigators and nine of the co-Principal Investigators held a Ph.D. in one of the social sciences, most in social anthropology or sociology (de la Puente 1991). Four researchers integrated the ethnographic evaluation into their anthropology dissertation research.<sup>13</sup> All the anthropologists and sociologists had experience in prior research collecting their own primary data in the field. Additional researchers held a PhD either in Geography, Demography, or Urban Planning.

### Residents

Residence among subjects is regarded as optimal for long term participant observation culminating in anthropological community studies, but is by no means intrinsic or standard practice for ethnographic studies of

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into quadrants where streets may have the same name but different designator (NE, NW) Census Bureau geographers sent an ARA map with the same street names as listed for the site but a different directional indicator. In two cases, the Census Bureau geographers supplied several different ARA maps as possible locations for one specific block. Considering problems like these in a geocoding exercise involving large areas, the difficulties of geocoding a single address become apparent.

<sup>13</sup> These PIs were from the following sample areas: rural Santa Barbara County, CA; rural Marion County, OR; Long Island and Bronx, NY.

complex societies. Ethnographers of modern societies usually work within domains and along interactive networks (see Brownrigg 1990b), which may or may not exist in a given U.S. neighborhood. Neighbors in American society may not know each other, let alone interact. Ethnographies focussed on particular U.S. neighborhoods tend to stage participant observation from public arenas such as playgrounds, street corners, or "hang outs" such as bars or pool halls. Applying participant observation or ocular observation to the problem of an enumeration that identifies residents and associates them with particular housing units may or may not be assisted by having the researcher live in the neighborhood. Residence enhances chances to build up a network of acquaintance over the long term, however. Therefore, we ranked highly those proposals where the researchers resided at their AE site.

Principal Investigators resided in, and had been conducting social science research for several years prior, in the New York City neighborhoods of Harlem and Chinatown and the Miami, FL neighborhoods where ethnographic census evaluation sites were located. Two of these PIs lived literally across the street from the sample area each selected for study. The AE site in Houston was in an entire apartment building where one of the PI had formerly resided while conducting a participant observation research for her Ph.D. in sociology. The PI for Isleta Pueblo had grown up and was enrolled in that reservation community, lived a few miles away in the same community, and was the only PI who had relatives living within the site selected. The PI and research assistant in the rural Santa Barbara county were living in the farm worker community. Several principal investigators not previously immersed moved into the neighborhoods of their AE sites in Long Island and Queens, NY; rural Marion County, OR and Koreatown, CA.<sup>14</sup>

#### Service and Research

In addition to the PIs who had resided and researched in the neighborhood selected, several others had personally established an involvement over a long term by conducting research among or providing services to at least some residents in the areas they selected.<sup>15</sup> Several

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<sup>14</sup> These PIs remained temporary residents of their sites for the duration of the AE, a model adopted by one 1988 site as well (see Ackerman 1989a).

<sup>15</sup> Among the services that the various organizations co-sponsoring this research provided to resident/clients of the sample areas were sponsorship of refugee immigration (International Institute of St. Louis), youth recreation (Korean Youth Center), adult education (Native American Educational Services/ Chicago College, United Cambodian Community Inc. and International Institute), social work services (Northside Team Ministry -- a subcontractor to the University of Southern Illinois-- and United Cambodian Community Inc.), subsidized health care in clinics and physician services (Guadalupe Health Center) and maternal health care advice (Boward Community Service Council). In addition, 3 researchers formally sponsored by universities where they are on the academic staff had previously worked (and still work) for tribal councils of the rural American Indians communities providing historical and genealogical documentation requested by the tribe, consulting in tribal

were affiliated with local community service organizations that enjoyed the good will of the community.

In south St. Louis, MO; Long Beach, CA; rural Santa Barbara County, CA; Chicago, IL and Ft. Lauderdale, FL sites, some residents were clients of the nonprofit organizations sponsoring the Joint Statistical Agreements. Within 4 of these AE sites, principal investigators had themselves directly provided services to clients on top of their research agendas.

In eight ethnographic sites, in north St. Louis, MO; rural Holmes County, MS; rural Marion County, OR; Houston, TX; Ft. Lauderdale, FL; San Francisco, CA; San Diego, CA; and Santurce, PR, the principal investigators had conducted prior interviews or participant observations in at least some households within the exact site. Pre-existing relations with at least some key subjects led PIs to chose specific sample areas although they could not be considered ethnographically immersed in those specific neighborhoods.

Sites selected by researchers familiar with the socioculture of its population but previously unfamiliar with the exact area were in the majority and included: the largely undocumented immigrant sites in Long Island and in the Bronx, NY; urban Indians in Chicago, IL; urban inner city Blacks in Flint, MI and New Orleans, LA; the mixed Puerto Rican and Black site in Hartford, CT; the rural Logan County, OK Black site; the Long Beach, CA Cambodian/Mexican site, and the Hispanic sites in New Orleans, LA; rural Marion County, OR and the two Korean sites in Los Angeles, CA and Queens, NY.

Some of the principal investigators without preexisting connections in their exact sites hired current or former residents of the neighborhoods as community consultants or as research assistants. At least one research assistant each in the north St. Louis, MO; Flint, MI; Carbondale, IL; New Orleans, LA; and in the Queens, Long Island, Chinatown and Harlem, NY sites was from the neighborhood.

#### Enumeration Staffing

The organization, number and characteristics of enumerators/observers varied considerably from site to site. At the height of the Alternative Enumeration field work, 86 people participating in the enumeration research were appointed as Special Sworn Employees of the Census Bureau. The personal involvement of the principal investigator was required. We identify four major variations in the organization of the initial AE field data collection: a) "the lone researcher" who may have employed research assistants for specialized tasks; b) "the research pair", again with or without some limited, specialized assistants; c) "the integrated team" of PI and RAs and d) the "executive enumerator": PI who trained and directed research assistants who in turn did the bulk of the actual enumeration.

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planning or assisting the tribal community to organize projects.

### a) The Lone Researcher

At eight sites, the PI personally collected the lion's share of all enumeration data and observations with limited assistance from unpaid community consultants or part-time research assistants.<sup>16</sup> The assistants performed specialized tasks, such as list addresses, draw detailed maps for the initial listing of housing units, translate or supply information for those households where a foreign language not known by the PI was spoken, or enumerate a segment of the sample area population which was socially apart from the others. Six of the PIs from these sites were anthropologists and all had previously collected primary data in the field. In four of the sites conducted in this manner, English was spoken. Out of the remaining four, Spanish was the dominant language in one site, Haitian Creole was spoken at a second site and the majority of the residents spoke Korean in the remaining two sites.

### b) The Research Pair

Seven sites were conducted by a pair of researchers. The New Orleans and Orleans Parish (both in Louisiana), Houston, TX; North Beach, CA and the Bronx and Long Island, NY sites formerly had co-PIs. A PI and a research associate worked collaboratively throughout the enumeration and resolution at a rural site in Santa Barbara County, CA. The co-PIs (and the PI and his research associate) spoke the same languages as did site residents. Six pairs consisted of a male and female researcher. In Orleans Parish, LA, the Black men who worked as co-PIs hired a female research assistant.

### c) The Integrated Team

We distinguish the "lone researcher" or "research pair" models from the integrated team in which a number of observers/ enumerators including the PI or co-PI divided the work load daily. A total of eight sample areas used the integrated team model.<sup>17</sup> At these sites, Principal Investigators were active in the observations, enumeration and compilation of data but they deliberately deployed specialized observers/ interviewers chosen to match subjects' characteristics. They consciously divided the case load based on knowledge of residents' characteristics and employed local residents. Such team tactics were adopted in areas where the population was more heterogeneous. Some of the mixes addressed by these teams were places where Whites, Hispanics, Lao, Blacks and immigrants from Africa shared a 2 block area (south St. Louis, MO); where Cambodians, American Indians, Alaska Natives, Whites, Blacks and Hispanics shared the same side of the street (Chicago); where neighborhoods were divided between Blacks and Puerto Ricans (Hartford, CT) or among

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<sup>16</sup> These sites were North St. Louis, MO; Fort Lauderdale, FL; Harlem, NY; Koreatown, CA; rural North Carolina; rural Marion County, OR; Logan County, OK and Chicago, IL.

<sup>17</sup> These sites were: rural Okfuskee County, OK; South St. Louis, MO; San Francisco, CA; Hartford, CT; Santurce, PR; Long Beach, CA; San Diego, CA; and Queens, NY.

Cambodians, White Anglo-Americans, and Hispanics (Long Beach, CA) -- to mention the more numerically salient race ethnic groups combinations.

We noted a trait common to several of the sites where this organization was adopted: the PI (or co-PIs) did not personally speak all the languages at the site. Also, in several of these team sites, either tensions within the site among or between the ethnic groups or between age groups required that enumerators with different personal characteristics (age, gender, race) and skills (language) approach individuals from different groups.

The integrated teams can be illustrated by experiences in Queens, NY; South St. Louis, MO and rural Okfuskee County, OK. In the Korean site in Queens, the team consisted of the Principal Investigator, a PhD, male sociologist and native speaker of Korean, 1 graduate student/research assistant, 2 Korean-American high school students with experience as census enumerators in other areas, and 2 bilingual Korean adult women who were residents of the neighborhood. Observers were dispatched to the listing and enumeration tasks in 2 teams of 3 people each. Each team consisted of either the PI or RA, one of the high school students and one of the neighborhood women. The PI alone resolved differences after reviewing the match to census, calling upon his enumeration team for information (Kang 1992).

In south St. Louis where a mix of immigrant refugee Lao, Hispanic, and African immigrant and native born White and Black residents shared the same neighborhood, the enumeration team consisted of 2 PIs, both PhDs, one of whom was a male political scientist and the other, a female anthropologist and three research assistants. The research assistants were deliberately chosen to match some traits of the sample area residents, so one research assistant was an older white female, one was a young White male and the third was a young female who is a native speaker of the Lao language. After updating the address list for this longitudinal <sup>18</sup> site, the enumeration team fanned out matching characteristics of team members to enumeration subjects as best as possible. Each observer contributed daily inputs to a master data base of observations for each housing unit listed. Resolution was carried out by one of the principal investigators, working with a large body of data based field notes (Rynearson and Gosebrink 1992).

In rural Okfuskee County, OK, the team consisted of the Principal Investigator, a male PhD anthropologist who speaks, reads and writes the Muskoke Creek Indian language, a female graduate student research assistant and 2 male Muskoke/English bilinguals. These Creek Indian research assistants were long term residents of the study area and members of the tribal town who had been trained by the PI through their participation in previous genealogical, historical and cultural research projects.

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<sup>18</sup> Longitudinal data are available for the South St. Louis site because an Alternative Enumeration of exactly the same two blocks was conducted in 1988 as part of the Ethnographic Coverage Evaluation of the 1988 Dress Rehearsal Census and again in the 1990 evaluation. See Rynearson 1988 and Rynearson and Gosebrink 1992.



Enumeration observation teams had to be designed to assure their safety and to overcome social barriers created by next door neighbors who were isolated in their White, Indian or Black Creek Freedman communities. Safety precautions were needed due to booby-traps at weekend homes and the remote location of some housing in rough terrain off roads. The social isolation of the White ranchers and part-time residents from the Creek Indians and the Black Creek Freedman full time residents required that Whites interview Whites, Indians interview Indians and that men take a woman along to dampen any perceived threat (Ethnographic Census Evaluation Research Seminar videotranscript 1991; Moore 1992).

The team approach which the ethnographers adopted as socially and culturally responsive to heterogeneous urban and rural areas in the continental U.S. resembles in many regards a special method of field enumeration used for rural remote outlying areas in Alaska. Under the 1990 rural remote method, a Census Bureau team leader was sent in to organize enumeration by local temporary hires for a list/enumerate sweep of conventional face-to-face censusing (United States Bureau of the Census 1990 Form D-579).

#### d) The Executive Principal Investigator

Finally, it is apparent that at half a dozen sites, the PI's involvement in conducting the Alternative Enumeration was minimal. Their involvement was limited to training and supervising research assistants, conducting spot observations and perhaps a few enumeration observations, and preparing and analyzing the basic data that research assistants reported.<sup>19</sup> We call this the "Executive Principal Investigator" model and it most closely resembles the way the Census Bureau conducts field enumerations.

In two of these sites, the PIs spoke the foreign language prevailing at the site, respectively Chinese and Haitian Creole. The PI selected and trained as front line alternative enumerators, research assistants who also spoke that foreign language (Sung 1991; Stepick and Stepick 1992). PIs at these two sites cross checked (for quality control) enumeration data submitted by their assistants and contributed some enumerations, much as did crew leaders in the 1980 (but not the 1990) census field organization (United States Bureau of the Census 1992, Chapter 6). In the other four sites, the executive PIs delegated the original Alternative Enumeration and the later follow up "match resolution" to assistants.

The resolution of discrepancies between the Alternative Enumeration and the Census at the sites conducted by executive PIs was difficult, especially if the original face-to-face enumerators were no longer available for consultation. In Miami, where the co-PIs were updating a previous survey of the area and had well established relationships with their Haitian research assistants, resolution was smooth. Also, in Chinatown, where the PI checked discrepancies personally (in 2 dialects of Chinese) and could review cases

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<sup>19</sup> These sites were: Carbondale, IL; Chinatown, NY; Flint, MI; Miami, FL; North St. Louis, MO; and rural Holmes County, MS.

with one of the original Chinese speaking observers.

In the Flint, MI concentration of Black inner city population in a rundown and dangerous neighborhood, the all Black team consisted of the PI (a male Academic Dean with a PhD in geography), 2 female graduate student research assistants (1 resident and 1 formerly resident in the neighborhood) and 1 male "community consultant" who was a current resident of the site and who was selected with some care (see Darden forthcoming). This community consultant announced the study to the neighborhood before they began their work. The women research assistants took turns going out with either the community consultant or the PI so that a 2 person team of one male and one female observers made all visits. Resolution fieldwork follow up was later accomplished by one of the female research assistants. While the innovative model of a "St. John the Baptist" to announce a coming enumeration is worth noting, the resolution of this site was difficult as only one person from the AE team remained involved in coding.

The sites where principal investigators acted as executives arranging for enumeration and resolution rank furthest away from the intended and contractually required personal involvement of the principal investigator which was at the heart of the ethnographic observational method. At two sites, a rural concentration of Black population and a mixed (Black/White) neighborhood, the PI was remote from the details of the enumeration, was not well acquainted with the people who live at the site, lost access to the actual enumerators and were, consequently, unable to contribute to the resolution of discrepancies.

#### Limitations on Observations in the Fieldwork

Researchers were required to replicate as far as possible the information reported on short forms, that is, address of each housing unit, names of all persons observed in each occupied housing unit, relationship of each person in the household to the first person listed, and the basic demographics of each person: sex, age, race, marital status, Hispanic origin.<sup>20</sup> In addition, national or ethnic origins were noted on the AE to clarify race and Hispanic origin information.

Researchers were also required to follow Census Bureau definitions, but they were not required nor expected to imitate census enumeration tactics. Nor were researchers given an entirely a free hand: they were constrained to use "unobtrusive methods" such as direct observation, participant observation, and ethnographic interviewing techniques. Use of questionnaires (that is, a survey instrument with standardized questions) was prohibited although an Alternative Enumeration data form and check lists for systematic observations were commonly used to record information. Because their enumerations took place after Census Day, researchers were instructed to record persons they observed living in the sample area during a six week period, rather than to reconstruct the situation as of Census Day. As a part of their systematic

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<sup>20</sup> For a complete list see official 1990 U.S. Census Bureau Forms D-61, Q 1a, 1b, 2-7.

observations of each housing unit and, if occupied, of the resident household's sociocultural characteristics, researchers noted names of any persons who had moved in or had been born or had died between Census Day and the period of AE observation, as well as variant names of then-current residents. These observations anticipated that some personal names would differ between the AE and census.

Direct observation was far easier at some sites than at others. As John Moore remarked (Ethnographic Census Evaluation Research Seminar videotranscript 1991), residents of rural areas are identified by their cars and congregate weekly at remote churches. In rural America, there are strategic places and times to cull observations, to gossip and to make face-to-face contact at periodic congregations. Even though housing was relatively more dispersed and spread out in the rural sites selected, residents had dense layers of relationships with many of their neighbors, including kinship: a situation which facilitates proxy reporting and the use of community consultants. Density of neighbor-kin relationships and points of congregation most characterized the American Indian sites but were true of the rural Black communities studied as well.

In other sites, physical and social vantage points for participant observation were all but absent. In several of the apartment buildings, either the management or fear of crime discouraged neighbors from gathering outdoors or in common hallways. Physical and social arrangements, therefore, forced some of the alternative enumerators to adopt door-to-door canvassing as their main mode of initial contact. Chain link fences or security doors at several of the low density urban sites were effective barriers.

At some sites, enumerators had to deal with gatekeepers. In Chinatown, Queens, and the Bronx in New York City, the PIs attribute part of their success to managing successfully relationships with on-site landlords (Sung 1991) or "supers" (Kang 1992; Dominguez and Mahler 1993). In contrast, their identification with the tenants' association sponsoring the research made the co-PI's at the North Beach site targets of tenants' suspicion (Shaw and Guthrie 1992). The Houston PIs managed to distance themselves from social identification with the apartment complex management yet garner its cooperation, too; one of the PIs was herself an ex-tenant (Rodriguez and Hagan 1991). Most dramatically, the exact sample area of the Bronx site was configured to avoid a block of apartments controlled by drug dealers who threatened to kill anyone who attempted enumeration (personal communication, Boanerges Dominguez and Dominguez and Mahler 1993).

#### Schedule and Reference Periods

The Alternative Enumerations record the housing units existing within the sample area and the population observed residing, living or staying there during a six week period. To accommodate the transience at some sites selected, we had to adopt the rule that the first occupant observed living in a housing unit was to be listed on the AE, and that any new housing unit which was built (or moved into the sample area during the AE) had to be listed. Separate and apart from the AE itself, systematic observations submitted for housing units and households noted if AE persons had moved in after Census Day

and other remarks about individual people's residency status, given 1990 Census rules.

Alternative Enumerations and behavioral observations were to begin "within three months after Census Day" (which was April 1, 1990) according to JSA agreements. At all sites, buildings and housing units were identified before the AE began. The date when contacts with local residents first began for the enumeration of persons varied from April 2 (Miami) to mid July 1990 (Isleta Pueblo). The majority of the AEs were underway in June and July 1990. Unfortunately, this meant that AE timing overlapped with the Census Bureau's Follow Up Enumeration operation at most sites.

After the 1990 deadline for receipt of census forms returned by mail, the Census Bureau began an operation to follow up at those housing units from which no form had been received. In Follow Up Enumeration (FUE), Census Bureau Field staff personally verify the existence of housing units at addresses listed and verify the occupancy status of housing units. They try to find who lived in each housing unit on Census Day (United States Bureau of the Census 1992, Chapter 6). Originally, the Census Bureau scheduled Follow Up Enumeration to be completed by June 6, 1990 but in several sites in the ethnographic sample, Follow Up Enumeration continued through July and August, 1990.

As a result, at the majority of the sites, AE ethnographers and Census Bureau FUE enumerators were visiting housing units during the same week. In some sites where this unanticipated overlap in the timing of enumeration occurred, researchers identified its effect on both their work and on the census, attributing "reactivity" (Ammar 1992) to respondents overburdened and unwilling to respond to both. An unexpected benefit of the simultaneous alternative and official enumerations was fewer discrepancies between the two lists arising from residential mobility. Both the alternative and census enumerations described the same households at the same time.

### The Census Source

The majority of the sites were enumerated by the Census Bureau using the mail out/ mail back method with follow up enumeration. Most of the sites in the ethnographic sample were in Tape Address Register (TAR) areas with "city type" addresses including street name, house number and apartment designators. TAR address lists are built up from lists purchased from vendors and updated through a series of checks by the Post Office and Census Bureau enumerators. For the sites where the Census Bureau staff directly listed addresses, we obtained the Address Registers from Field Division. Address registers were consulted in the keying of forms from these areas and were shared with the outside researchers to help them resolve matches. The "Prelist" procedure was applied by the Census Bureau to the rural sites in the counties of Holmes, MS, Santa Barbara, CA, Marion, OR and in North Carolina. In Prelist, Census Bureau workers create lists of addresses for the mail out/ mail back procedure. List/Enumerate was applied in Okfuskee and Logan Counties, OK and in Isleta Pueblo, NM. Census Bureau workers personally listed then enumerated these sites in conventional face-to-face interviews. Descriptions of address listing and enumeration methods appear in the history of the 1990 Decennial

Census of population and housing (United States Bureau of the Census 1992, Chapter 6).

We requested from the Census Bureau's Decennial Operations Division (DOD), the original census forms and periodic downloading of the Address Control File for the ethnographic sample by specifying its census block geocodes and address ranges. The Address Control File is a database containing records for housing units giving address, location expressed in census geography, census unit identification number and, once enumeration is achieved, a control number, population count and often the name of the householder.

Original census questionnaires as completed by respondents or by enumerators were pulled by clerks at the decentralized Census Bureau Processing Offices. Clerks consulted the automated Address Control File (ACF), using its browse feature to identify in which "camera unit" box the forms geocoded to each sample area were stored. In four sites overlapped with the Post Enumeration Survey, original forms kept in PES libraries were copied and sent to Jeffersonville, Indiana on behalf of this research project.

The original forms or copies retrieved by DOD clerks were forwarded to the Special Methods and Quality Control Branch of Data Preparation Division (DPD) in Jeffersonville, Indiana. Clerks in this branch checked-in census questionnaires on a copy of the Address Control File that CSMR staff prepared. If no questionnaire was recovered from an address/census unit identification number appearing on the Address Control File in a sample area, DPD clerks reported the questionnaire as missing from the shipment. Onto the "Missing Forms Report" was transcribed information from the late September 1990 ACF. In some cases, upon receipt of missing forms reports, processing office clerks looked again, located and sent forms. However, the majority of the forms reported as missing from shipments did not appear and the information transcribed from the ACF was keyed in lieu of information from census forms. Records prepared from ACF information alone were flagged on the list. Later on, unfortunately after match reports were prepared, CSMR staff checked to see if additional information ascribed to the census unit identification numbers for which no questionnaires had been recovered appeared on the 100% unedited detail file.

Discrete address elements written on census forms or address labels or from the Address Control File were keyed. In this regard, the census enumeration keyed and matched to the AEs differed from the Address Control File where addresses run on in long character variables. The data keyed from census forms resembles the unedited 100% detail file in that it is devoid of imputations or substitutions. If no response appears written on a questionnaire, if information is missing, blanks or codes for missing data were keyed. Character variables rather than machine language number codes were used to make the resulting census data more readable to human eyes. See Appendix, Figure III, Illustration of Match Report.<sup>21</sup>

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<sup>21</sup> For definition of terms and additional information concerning Census Bureau procedures see United States Bureau of the Census (1992: Chapter 6).

We could not obtain copies of census forms any earlier than October 1990 therefore we established early October as the due date for AEs as well. Census forms for some sites were removed from the processing stream for copying as early as July; other forms were retrieved only after second requests for forms by their census identification number. The preparation, keying and matching of Alternative Enumerations and data from census forms was turned around fairly quickly in a joint operation of CSMR and Data Processing Division at Jeffersonville, Indiana. Yet by the time match reports were sent out to researchers on December 14, 1990, the "trail was cold" for some unmatched records appearing on the census.

## RESOLUTION

### Final Match and Resolution Coding

In the ethnographic evaluation of the 1990 Census, the researchers who conducted the Alternative Enumeration had the final word on whether or not records of individual persons matched or did not match and whether or not a housing unit (with or without a household's worth of person records listed at the housing unit/address) had a link on the opposite file. These determinations were called "Final Match" coding. Participating ethnographers were asked to "resolve" Census Day residence status of persons and the status of the housing unit as of Census Day (whether valid, and if valid whether occupied, vacant or boarded up) and to tag once again records of people who moved into or moved out of the site between Census Day and the AE (see Brownrigg 1991a). Finally, researchers had to code which records should or should not be included in the best reconstruction of the most complete list of housing units and residents in the sample area "as of Census Day."

Any appraisal of whether or not records from two different sources "match," that is refer to the same people or housing units, depends in part on the presence of similar information in the two record sources compared. This is true whether the method of matching is assisted by a computer program, by matching clerks, or by researchers in a position to return to the field and recomb each study area to resolve matches and residency status, to check housing units and recontact the individuals concerned to arbitrate differences between records. This evaluation method was strongest at those sites where the same independent researchers stayed in contact with the reality of the sites throughout the enumeration and the resolution phases.

Our method rigorously separates the coding of links between housing units or matches of either households or particular individuals within households from the "resolution" of the Census Day situation: the residency status of each person record appearing on the Alternative Enumeration or keyed from Census forms and the occupancy status of each housing unit. Our study did this because we regarded matching as only one among several lines of evidence pursued.

This "resolution" phase of additional fieldwork and coding records that appear on the match report is an innovation which distinguishes the 1990 studies methodologically from the earlier "participant observer studies" in

the 1986 Test of Adjustment Related Operations (TARO) and our own pilot ethnographic evaluations in the 1988 Dress Rehearsal. The initial Alternative Enumeration (an ethnographic census of a defined small area) and an ethnographic qualitative report observing reasons for differences between the AE and the census outcome were features of the research method in 1986, in 1988 and in 1990. What evolved was our approach to comparing the AE to the census data.

In the 1986 studies, the AE and census were matched clerically by Census Bureau clerks and then researchers commented on the matched and unmatched people and housing units in coverage reports (personal communication, Catherine Hines; Long 1987). Raw AE numbers were compared to census numbers for the same area in a number of reports (Hines 1987; Long 1987; Vigil 1987; Garcia-Parra 1987). Comparisons using both the raw census and the "cooked" -- imputed, substituted, "final"-- census figures for comparison to the AE were made (Martin, Brownrigg and Fay 1990) but remained mysterious and unexplained. In the 1986 TARO, there had been no systematic coding of in-movers or out-movers despite a time lapse of several months between the test census and the completion of the ethnographic censuses. The reports from Los Angeles reflected only on the matches and non-matches and possible reasons for rates of non-matches. Explanations offered were all after-the-fact and not based on information collected systematically before the match.

In 1988, one site in eastern Washington state (Garcia-Parra and Ehsani 1989) was conducted in a manner similar to the Los Angeles 1986 participant observer studies. At the four other 1988 ethnographic sites, data were systematically collected during the Alternative Enumerations about persons who moved in after Dress Rehearsal Census Day or who spoke languages other than English. The systematic observations on the residential mobility proved so important for resolving the 1988 non-matches that this observation was incorporated into the 1990 AE itself.

In 1988, CSMR staff used GENLINK<sup>22</sup> to match individual records then Brownrigg, Shinagawa and Fansler invented a new Computer Assisted Clerical Match system (CACM). CACM used a (MICROSOFT) split screen to match the two sources keeping in tact the sets of individual records collected at each housing unit/address. First housing units/ household sets of records were linked. Then, within each housing unit/household linked, matches of individual records were indicated. CACM applied Special Match Group rules (United States Bureau of the Census 1990) and experimentally applied observations concerning interfile consistencies in matching variables discovered in the GENLINK attempts. Reviewing the results of Census Bureau's matching, the researchers who had conducted the 1988 AEs discovered more matches than were apparent for CACM, at all sites improving upon the match rates. From four sites, the ethnographers provided explanations for non-matches (omissions, errors, in-movers, out-movers) in the form of texts for each household affected. In 1988, ethnographers' texts and conversations about specific cases were interpreted to develop codes which were applied by

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<sup>22</sup> GENLINK stands for Generalized Record Linkage Program Generator. This is a computer matching program used by the United States Bureau of the Census.

CSMR staff.

In 1990, however, we combined an automated matching program and clerical review to produce match reports. A software program developed specifically for the project, like the CACM, first links the AE and the census versions of housing units/ households. Next, it matches person records within households on the AE with person records within households on the census on the basis of name and demographic data and arrays of names within each household set (see Slaven 1991 for more detail). The result of this process was a match report displaying all matched and non matched housing units and the individual records associated in each housing unit/ household set. The ethnographers reviewed the match report and applied codes following guidelines and definitions. CSMR staff then keyed, reviewed for consistency and, with the researchers' approval, revised codes. (See Appendix Figure III for an example of a match report.)

The ethnographers were asked to review the match report and make final match determinations for each and every record. They were free to overturn any match reported on the match report. They could unlink and relink households and housing units as well as unmatch or rematch person records. These decisions were based on three sources. The first source was the evidence provided by the match report itself. The second was the field notes (including behavioral log data) collected during the six weeks of the AE. And the third source was the follow up field work. Summary reviews of each record were expressed through the "final match and resolution" codes.<sup>23</sup>

#### Key Features of the 1990 "Final Match and Resolution" Codes

Our coding scheme to compare the AE and census records has three key features. First, we distinguish "match" from "resolution" codes. Match codes describe the link of households/housing units or the match of individual records (of people or vacant housing) between the two sources, between the AE and the census. Separate "resolution codes" denote the Census Day situations of housing units or people and changes that occurred between the reference day for the census and the time period of the AE. Second, both match and resolution codes are applied at two levels: (a) the set of records collected at each housing unit and (b) individual records. A third key feature of our match and resolution codes is that they can be viewed as disaggregated codes that can be combined and used as building blocks to express complex housing and household situations (see below). It is important to note that although our codes differ from the match codes used in the Post Enumeration Survey (PES), our disaggregated coding can replicate most of the PES composites.

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<sup>23</sup> As noted earlier, the ethnographers had the last say on the final match status of every record (person and vacant records). However, CSMR staff conducted at least one visit to every site (with the exception of the site in Santurce, PR). Some of these visits occurred during the resolution phase of the project. These site visits provided CSMR staff the opportunity to provide technical assistance. CSMR staff also provided technical support by telephone.



The codes allow us to link matched records on the AE and the census and to refer to the situation of housing units (occupied, vacant, boarded up, non-existent) and individuals as of Census Day. Codes identify housing units and persons correctly enumerated or erroneously enumerated on both the AE and the census. The combinations of match and resolution codes can pinpoint housing units and persons who were supposed to have been enumerated by the census but were not in the AE source, or confirm unique records in the census source. Final match codes permit appraisal of validity of rules and decision trees used in the automated matching program and specified in the clerical review that led to the "draft" match codes.

### The Match Codes

We have six match codes. Three describe links (matches or non-matches) of records between housing units or households: this is the "housing unit/household" level of comparison and comment. The remaining three match codes describe matches or non-matches of individual records of persons or vacant housing.

#### Household/Housing Unit Links

At the household/housing unit (HH/HU) level, one match code expresses the ethnographer's review of whether the link between records from the two sources shown on the draft match report is correct or incorrect. Their choices are to validate or to overturn the link shown. Next, the type and degree of the HH/HU link is detailed. Values in this match code identify a range of possible links. For instance, an occupied housing unit and its occupants (i.e., household) on the AE may all have counterparts on the census. In this case, there is a link between both the housing unit and the entire household's worth of records assigned to its address. A link between a housing unit (address) may be determined between the two sources without a corresponding household link. A typical example would be a housing unit enumerated as occupied by the census from which all household members had moved out by the time of the AE. Households are self-evidently not the same, not "matchable" to a housing unit, but the record of a vacant housing unit on the opposite file can be identified. A lesser degree of link just between housing units can be asserted. Partial household links, with or without simultaneous housing unit links, are also possible. In cases where address mix-ups confronted resolution detective work with a choice between linking housing units or linking households, household links were systematically preferred.

The third and last link code at the level of the household/housing unit indicates if the address elements of the linked housing units are totally, partially or not at all similar. This information can be used to evaluate the performance of our own automated matching program and provide information about the reliability of using address variables for matching.

#### Individual Record Matches

Three codes describe the type of match between AE and census records of persons and vacant housing. One indicates the ethnographer's appraisal of

whether or not the draft match code shown on the match report is correct or incorrect. This code has two values: true or false.

A "final match code" is applied by the ethnographer and may either confirm or overturn the match code which appeared on the draft match report. Values of this code indicate whether or not an individual record on the AE has a counterpart on the census and, if there is a match, the type of match. Separate match/ non-match values exist for 1) single person households, 2) households with records of 2 or more people and 3) vacant housing. Another value of this final match code flags records of people who have a match on the opposite file, but in a different household context. Another value flags records of those linked vacant housing units which, on the opposite file, are shown with records of occupants.

A third match code, reserved for person records, distinguishes whether the match or non match occurs within a household where all or only some of the household members match. This information, combined with resolution codes discussed below, can identify whole household misses from within household census omissions.

### Resolution Codes

Before discussing the resolution codes it is important to keep in mind that the match codes are separate and apart from the resolution codes. The match codes indicate if a housing unit or individual enumerated by the AE has a counterpart on the census. While this is useful and necessary information it does not tell us anything about the situation as of Census Day for housing units or individual people. We do not regard the simple fact that records match as evidence of the correctness of the enumeration and our method detects a certain number of matched but erroneously enumerated records.

We have four resolution codes. One examines the Census Day occupancy category of the housing unit itself. The resolution coding of each and every housing unit provides its Census Day occupancy status: occupied, vacant, boarded up, non-existent or misgeocoded. Another of the resolution codes notes for records of people, whether they moved in after Census Day, moved out before the AE began or experienced no residential change between Census Day and the conclusion of the AE, and for records of vacant housing units, whether the unit was vacant or occupied as of Census Day and whether there was a change from vacant to occupied between Census Day and the close of the AE. A third resolution code describes Census Day residency status for all records of people listed in the two sources following Census Bureau rules of residence.

The resolution codes function to confirm or disconfirm the eligibility of each housing unit or person, given Census Bureau 1990 rules of residence and housing listing procedures, to be included in the sample area. The POINTER code summarizes the "resolution" of each record and is critical to our construction of the resolved list of Census Day housing and residents. If records have matched counterparts on both source files, values point to the more complete or more accurate version of the record versus its less complete or accurate match. If the record is unique to one source (unmatched) but is a

correct version of the Census Day situation, it is confirmed and chosen. Conversely, records which should not be included in a resolved best list of housing and residents as of Census Day are noted as erroneous enumerations. Such records are left out of the resolved population. Coded as having moved in, and thereby also excluded from the resolved list, are records of people who moved in well after Census Day. They were correctly enumerated for the later time period of the AE but were not Census Day residents.

### Concept of Disaggregated Coding

We use the following hypothetical case to illustrate how resolution codes are separate building blocks that can be combined to express complex housing and household situations. An occupied housing unit appears on the census and on the AE. Computer and clerical matching determine that the housing units are the same, that is, the components of the addresses of both housing units (e.g., street name, house number, and unit designator) are the same. However, the census does not list the same individuals in the housing unit as appear in the AE occupied housing unit. In this hypothetical case the housing units link but the household members (individuals in the housing unit) do not match at all. Further, in this example, persons in the census household were correctly enumerated by the census but moved out of the ethnographic site after April 1, 1990 and before the AE began. The persons in the AE households moved into the site after April 1, 1990 and before the AE. Thus, one household (the census household) moved out and was replaced by another household (the AE household).

In our study, this situation is expressed by distinct and separate codes which can be pieced together to express our hypothetical situation. First, we have a match code that assigns links to the households/housing units on the AE and on the census. Using the example cited above, our final link status code would be marked "housing unit link in absence of a household link." In order to express the extent to which there is an address match, a second code comments on the housing unit address. Values of this code allow for one of three situations: a total address match, a partial address match or no address match at all. In our hypothetical example this code will be marked "total address match."

A resolution code for the housing unit would mark it as occupied as of Census Day on both the AE and census versions.

We now turn to codes that express the match status and Census Day status of the individual records of persons. Every person in the hypothetical case would be coded, on both the census and the AE, as not having a match since the census and AE persons are not the same individuals. A separate match code showing the type of person match (in this case, non matched person in a completely unmatched household) would be applied to every person in both the AE and census households.

One of the four resolution codes is designed to convey the Census Day residence status of person records. In our hypothetical case, every person in the census household were residents of the site on Census Day and would be so coded. Each person in the AE household would be coded not resident at the

site on Census Day. The POINTER on the census records would show that they were confirmed Census Day residents correctly enumerated although unmatched. The POINTER on the AE records at this linked address would be coded as excluded because the people were not resident on Census Day. A final resolution code would show that the census household individuals had moved out of the site after Census Day and were replaced. Records of the AE household would be coded as having moved into the site after Census Day replacing the other Census Day residents.

Information concerning who moved out of the site after Census Day and before the AE was obtained by the ethnographers during the resolution fieldwork discussed below.

### Resolution Fieldwork

The ethnographers collected a wealth of information on ethnographic site residents and sample areas during the six weeks of the Alternative Enumeration. Using this information, most of the ethnographers were able to successfully resolve many unlinked and unmatched records. However, not all unmatched records could be resolved using these data. In order to resolve the remaining unmatched records additional fieldwork was required. Many of the ethnographers returned to the field beginning in early January 1991. The purpose of this additional fieldwork was to explain why these records were unmatched. Most had completed this additional fieldwork by May 1991.

This "resolution phase" fieldwork had the greatest variability among sites. At least one researcher returned to each field site to complete resolutions. The coding of all records at each site generated by the Alternative Enumeration or keyed from census forms was more time consuming and ethnographically challenging than any one anticipated.

We discuss below five problems of the resolution stage of fieldwork leading to the application of the final match and resolution codes. These are timing, preparation, access, evidence, and consistency.

#### Timing

The delayed beginning of the resolution phase field work posed a timing problem for the coverage research. In order to resolve unmatched cases appearing on the census or to verify the Census Day status of their own unmatched AE cases, researchers had to conduct additional fieldwork.

The trail was cold for timely follow up, due to schedule constraints within the research project, particularly delays in the availability of products from the Census Bureau. One phenomenon we believed related to undercount -- the presence of a segment of the population that changed residences frequently -- was especially difficult to document, given the 6 months or more delay between the AE and the resolution of the draft match to census.

Sites with very high residential turnover included two where college students rented off campus apartments, mobile homes or houses. Names

unfamiliar to the researchers often appeared on the census at the address of housing units listed as vacant at the time of the AE. Although the ages and composition of many of these unmatched households suggested college students - for example, roommates of the same gender both in their late teens or early twenties -- the more stable residents of these neighborhoods had little knowledge of the transitory student tenants. The stable residents of both these sites were Black families; the Oklahoma site was over 90% Black, including or excluding the college age population (Bell 1991); the Illinois site was a more racially mixed neighborhood (Isberner 1992).

Other sites also apparently had high residential turnover that accounted for discrepancies and non-matches between the AE and the census. At the rural Oregon site, many of the migrant Mexican farm workers were housed in rental units. The Alternative Enumeration process itself was complicated by migrants who moved from one housing unit to another within the site, or moved into or out of the site during the six week observation period. In sites in North Carolina, Oklahoma, San Diego and Houston, residents also moved among housing units (and in North Carolina moved mobile homes) within the ethnographic site during the 6 week observation (Lerch 1992). In San Diego, new housing units went up during the AE (Velasco 1992). We had assumed the definition of "in-mover" (moved in after Census Day, but there for the AE) and "out-mover" (there for the Census but not the AE) would be more clear cut. Categorizing the within-site movers was perplexing.

Sketchy or incomplete census information in the rural Oregon sample area complicated the research. The occupants of the "Kitchenette Motel" enumerated by the census on individual census reports during the S-Night (Street and Shelter Night Operation) that swept (among other locales) hotels in the country where rooms rented for less than \$12 a night on March 20-21. The PI maintained that many of the alternatively enumerated unmatched occupants of "Kitchenette Motel" had been living there as of Census Day but may have given false names to the census or to the hotel administration. To resolve this site, we had to obtain the unkeyed original Individual Census Reports (ICRs) for the 44 individuals enumerated by the Census Bureau at the Kitchenette Motel. Using these ICRs we were able to match to the AE a total of 23 of the 44 occupants. Sketchy information on the remaining 21 occupants made matching impossible (Personal communication, Martin Dale Montoya).

In another site with a high proportion of undocumented Central American residents and an above average rate of residential mobility, the census enumeration apparently drew upon the false records of the apartment complex manager to list names (Rodriguez and Hagen 1991). In this case, there were sufficient grounds to identify erroneous enumerations. In Harlem, NY, the urban site with the highest net undercount, residential mobility was high and the ethnographer noted that census enumerators used names on mailboxes of long departed residents (Hamid 1992).

Some households enumerated by the independent researchers unmatched to any census record were easily resolved as missed because the households lived in housing units also unmatched and missed. It was easier, more obvious and replicable to observe that the census had omitted a housing unit.

## Preparation

Preparation for the resolution fieldwork stage varied greatly among the PIs. During the Alternative Enumeration fieldwork, some PIs had created detailed field notes (Hamid 1992; Ryneerson and Gosebrink 1992), systematic (and informative) behavioral observations, genealogies of the larger families of kin relations (Moore 1992; Garcia 1992) or compiled administrative records regarding housing and occupants (Sung 1991; Straus 1991; Ryneerson and Gosebrink 1992). Behavioral logs were a required product and tactics for fieldwork were recommended in the study guidelines that each researcher received. The behavioral logs for each housing unit required notes on previous residents, in-movers and out-movers. These notes were intended to provide systematically the resource of additional names associated with a given housing unit to aid in the identification of additional matches and mismatches. These notes also give more information about residence status to help determine the situation as of Census Day. However, some researchers conducted the behavioral observations cursorily (or not at all) or created no special field note references.

## Access

The familiarity and personal access different PIs had to the sites influenced the efficacy of the resolution fieldwork as well as their original AE.

Researchers who were crossing the street from their homes were obviously in a more enviable position to investigate further and check fine points of ambiguous residence and Census Day situation than were the PIs at five sites who had moved out-of-state between the conclusion of the AE and the initiation of resolution phase fieldwork. For them, and for the two other researchers who moved temporarily to the site for the AE, resolution fieldwork was conducted as a one time short term expedition. The tactics of moving temporarily into a site or hiring a local research assistant which had been useful in the enumeration stage of fieldwork attenuated access in the resolution phase. Most of the PIs had intermediate, continuing access to their site; questions arising from the resolution coding could be and were taken back repeatedly to judge against the situation apparent at the field site or to discuss with respondents.

## Evidence

Generally speaking, it was difficult to find supporting data to confirm unmatched census records. Among some very mobile populations, there was no evidence available to either confirm or disconfirm unmatched census records. At two sites, where college students were housed in the early spring during the census but had left for summer vacations by early summer, about a third of the census records were unmatched. The several sites where very recent immigrants found temporary housing were difficult to resolve because new arrivals quickly moved on and were not known or noticed by neighbors (Sung 1991; Velasco 1992).

At several of the sites during their resolution phase fieldwork, the researchers fairly confidently determined that unmatched records referred to people actually living within the site who had been residents in the site on Census Day. In many cases where the unmatched record came from the Alternative Enumeration, the person was still resident; the researcher could return to discuss and confirm whereabouts on Census Day. Confirmation was also based on researchers' written field notes dated to the period before and after Census Day associating the person with a housing unit and household context and on behavioral logs, a check list of characteristics.

These check lists were useful for confirming unmatched census and unmatched AE records. In some cases, people who had been enumerated by the Census Bureau had moved out before the Alternative Enumeration began, but the researchers were able to confirm that an unmatched census record pertained to a Census Day resident on the evidence of their own systematic recordings of observation of housing units (which recorded prior as well as AE-observed residents of each housing unit in the sample). If the unmatched person could not be located in the site, researchers might confirm records by talking to neighbors who remembered the person. These investigations were especially delicate because researchers were not allowed to reveal confidential information from the census source in these discussions. They had to devise and ask more open ended questions intended to probe for and elicit a specific name they could check. For example, -- for whole household non-matches asking neighbors a question like --"Do you remember the name of the family who lived here last April?" Or for within household non-matches--"Was there anyone else, perhaps a young boy living here before I came by last spring?"

Several researchers referred to some type of administrative record to confirm a name at an address and declared sources flawed (see Appendix Table 1).

The dilemma of evidence was compounded in the cases of the "NN's": records without names or worse yet, without names or demographic characteristics. Records with poor data quality were more common in the census source. However, one AE -- contrary to guidelines for the study--deliberately listed only the name and sketchy demographics for each head of household and gave a population count for each household: relationship to the household head--wife, son, daughter--and gender were usually given. This AE supplied neither names nor complete demographic characteristics for 44% of the people listed. Fortunately, this was not a typical site.

Each PI faced a unique set of problems for determining final match and applying resolution codes. However, as ethnographers, the PIs had the advantage that they personally knew or had interviewed the people to whom the records referred. They were able to interpret partial records better than a clerk or a computer. They could recognize, for example, the reversal of first name and surname or orthographic variation in the spelling of foreign names in the census version and match it with their own record (Sung 1991). As technical representatives, we spent a good deal of time discussing by telephone the researchers' deliberations and strategies for assembling and weighing evidence to support their coding.

"NNs" still posed many problems for resolution. Theoretical issues concerning the treatment of empty records are more commonly discussed in relation to establishing procedural rules for clerical matching or to write programs to automate exact matching. The existence of empty, NN records conditioned decisions about the application of final match codes for the ethnographers as well. Could it be resolved that the 4 NN's on the census were indeed the Jones family of 4 reported at the same address? Some of our researchers took the view that the no name, no demographic information records on the census were intrinsically unmatchable and could not be confirmed. Some (like the PES in its automated GENLINK-based matching program) took the position that the positive matching of such records was indefensible. Other researchers viewed the empty records as neutral and adopted the view (recommended in the study guidelines) that matches could be assumed up to the limit of the highest population count on the more complete and data detailed source so long as there were no internally conflicting or contrary evidence. In this view, since the names and personal demographic characteristics of the people did not appear, the enumerations could very well be "last resort" information about the same people more exactly described as the Jones family of occupants at the same address in the other source. If the only unmatched household left was the Jones family, for example, and on the opposite file at exactly the same address were the NN's, then matches could be declared on the basis of population count and address. In sites where not even address linking was possible, another default mode view of the NN's and address-less housing units was considered linking housing by relative position in address listing sequence alone.

During the resolution phase of fieldwork, the accuracy of some unmatched records unique to the census enumeration could not be verified because no information about possible former residents at the site was available.

Given all these issues, reluctantly, we added a "U" code for unknown Census Day status.

### Consistency

We developed consistency edits for the match and resolution codes after we received and keyed the first batches of resolution coding. Though we had developed a coding scheme in 1988, we had less than a thousand cases from two states and we had expanded upon the codes used then. We had to refine the expressions and definitions in response to questions from researchers about how to code realities of outcome encountered in a larger, more diverse universe. Some situations reported to us by the ethnographers proved difficult to express in codes.

We do not recommend that coding efforts be decentralized, mediated by written guidelines and advice by telephone. In retrospect, we would have saved staff time by bringing the researchers together to train them how to code, to discuss definitions together and to code the bulk of the records in a group workshop. Some of the most experienced ethnographers had little prior background applying codes and were uncomfortable reducing complex situations to codes. The more qualitatively oriented researchers preferred to provide elaborate and exact accounts of events and circumstances. To accommodate some



researchers, technical representatives had to return to the mode of 1988 pilot study mode of "debriefing" the exact situations from researchers in order to suggest appropriate coding.

Researchers and staff were frustrated by the several rounds of consistency edits required at each site until on each record the array of discrete codes applied were internally consistent. Three programs were developed and modified to identify apparent inconsistencies in coding and cases were referred back for more fieldwork. The number of coding rounds per site varied from a minimum of 3 to a maximum of 18.

## OUTCOME

After the final match and resolution codes are applied and edited for consistency, records can be sorted into categories. One sort of the coded Alternative Enumeration and census enumeration records yields what we call the "Resolved Census Day Population" or R population. Since the R population is the best estimate of the population resulting from this ethnographic evaluation method, the R population can be used to measure coverage in the census enumeration. (It cannot be used to measure coverage on the Alternative Enumerations, however, since records are selected in reference to the situation as of Census Day, a time point generally 3 months earlier than the AE.)

The Resolved Census Day population is not based on estimates or formulas as is the case for the dual system estimator used in the 1990 Post Enumeration Survey. The R population is a refined, coded list of who was resident within each sample area on Census Day, applying 1990 Census Bureau rules of residence. In the R population, some AE and some census records are included and some from each source are deliberately excluded.

The resolved or Census Day population includes the following kinds of individual records:

- one record from each pair of records that are matched between the Alternative Enumeration and census enumeration sources. The record coded to be "selected" from each matched pair is that record appraised by the ethnographer (advised by the technical representative) as the more accurate, more complete or better defined with demographic data. The selected record may be from either the Alternative Enumeration or the Census enumeration source.
- unmatched records from the census source coded as confirmed Census Day residents. This population of confirmed unmatched Census records is partitioned into records referring to people who moved out of the ethnographic site (out movers) and nonmovers. Unmatched census records of nonmovers are people who resided in the sample area on Census Day AND at the time of the AE but were omitted from the AE. Unmatched census enumeration records referring to people who were continuously present reflect people missed by the AE's.

- unmatched records from the Alternative Enumeration source coded as confirmed Census Day residents. These records represent people missed by the Census.

Perhaps more interesting than what records are included in the R population are the records which are excluded and how our match and resolution codes allow us to find them. Excluded from the R population are records from the "raw" Census enumeration keyed from forms which, according to the ethnographers' coding, were not Census Day residents of the sample area. Also excluded are the "uncertain" records which the ethnographers could not confirm nor refute as to exact status as of April 1, 1992. Records identified as erroneous enumerations for some other reason than reference to Census Day status are not included. Records of persons known to have moved in after Census Day 1990 are not included in the R population, whether those records appear on the Alternative Enumeration or census enumeration source or match on both sources. Records of in-movers were more common on Alternative Enumerations than in the Census source, although there were examples of people enumerated by the Census Bureau at later dates (May, June, July or August) who had moved in well after Census Day, some of which matched perfectly to the AE. Matched in-movers were nevertheless determined as "incorrect" in relation to the reference date as well.

Records were excluded if they referred to people who could not be considered under Census Bureau rules of residence as residents of any housing unit within the sample area either on Census Day or during the time of the AE. For example, at three sites, some Asian adult children who had moved away to other states or who had long ago established homes and families elsewhere were reported by their parents as residents of their parents' home (Sung 1991; Straus 1991; Shaw and Guthrie 1992).

Records were excluded if the people or the housing unit were not physically located in the sample area as defined by block geocodes and address ranges or if the housing unit (or household) did not exist. Thus, misgeocoded records were excluded. Duplicate enumerations of the same people were excluded.

Since the resolution field work represents a third pass in each sample area, coming a few months to a year after the original AE and the census, a few cases of people omitted on both the census and the AE were, however found and included. (The source of these cases is attributed to the follow up rather than to Alternative Enumeration.) What remains missing from the resolved population is any record for persons who were residents of the site as of Census Day but who were missed by the Census and who were missed by both the original Alternative Enumeration and the resolution follow up phase.

The resolved population is considered as the true population under this method. Resolved Census Day populations can be constructed on a site-by-site basis, across population groups or across site types or subgroups. R populations can be derived for either people (population) or for housing units (housing) or households (occupied housing). Net undercount or net overcount can be calculated by comparing the "raw" census count (site-by-site, for the ethnographic sample as a whole or for any subsample therein) to the comparably

defined resolved or "true" population.

The resolved Census Day population has fewer records with poor data quality, than do either of the raw files from which it is derived, but the resolved population in this evaluation method may still include some confirmed "head count" type records. Selecting the more accurate and complete record of each matched pair and flagging erroneous enumeration records which also have poor data definition improves the data definition of the resolved Census Day version of the sample population.

#### Measurement of Net Coverage<sup>24</sup>

Net undercount or overcount of a specified population constructed from coded records in the ethnographic sample can be measured with the ratio

$$B/R - 1 = \text{TCOVER (net undercount or overcount)}$$

where B represents the census count and R represents the resolved population.

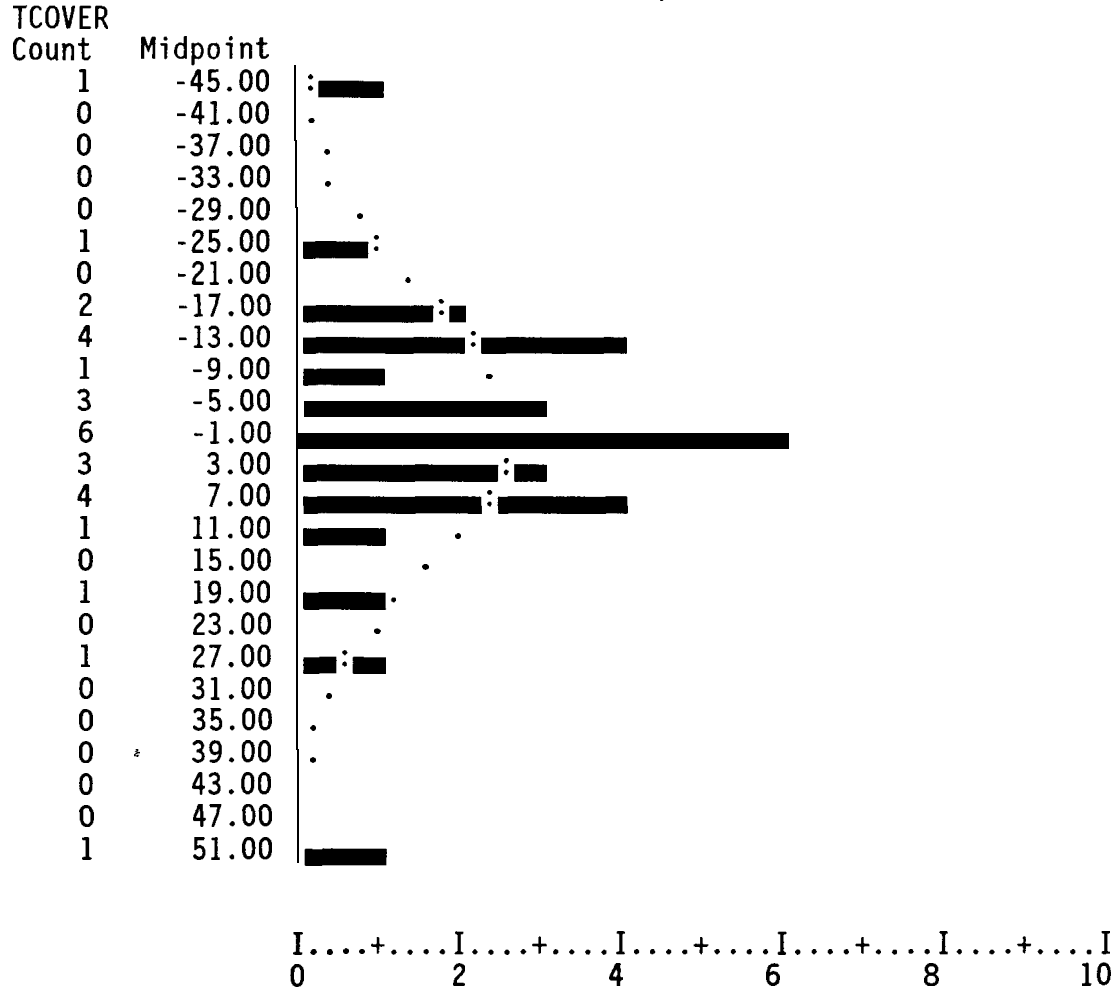
Histogram 1 illustrates the distribution of net undercount or net overcount among the 29 sites of the ethnographic sample. Coverage estimated by this method ran from net undercount (negative values) to net overcount (positive values). The distribution of values of net coverage is close to a normal curve but with outliers. The ethnographic sample as a whole displays a slight census net undercount by this measure. The mean of all sites is -1.634; the median is -.6.

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<sup>24</sup> The data presented in this section and in the sections that follow are provisional and subject to change pending final review of the Principal Investigators that conducted the field work in the ethnographic sample areas.

### Histogram 1

Total Net Undercount or Overcount  
in the Census Enumeration by Sites of the  
Ethnographic Sample




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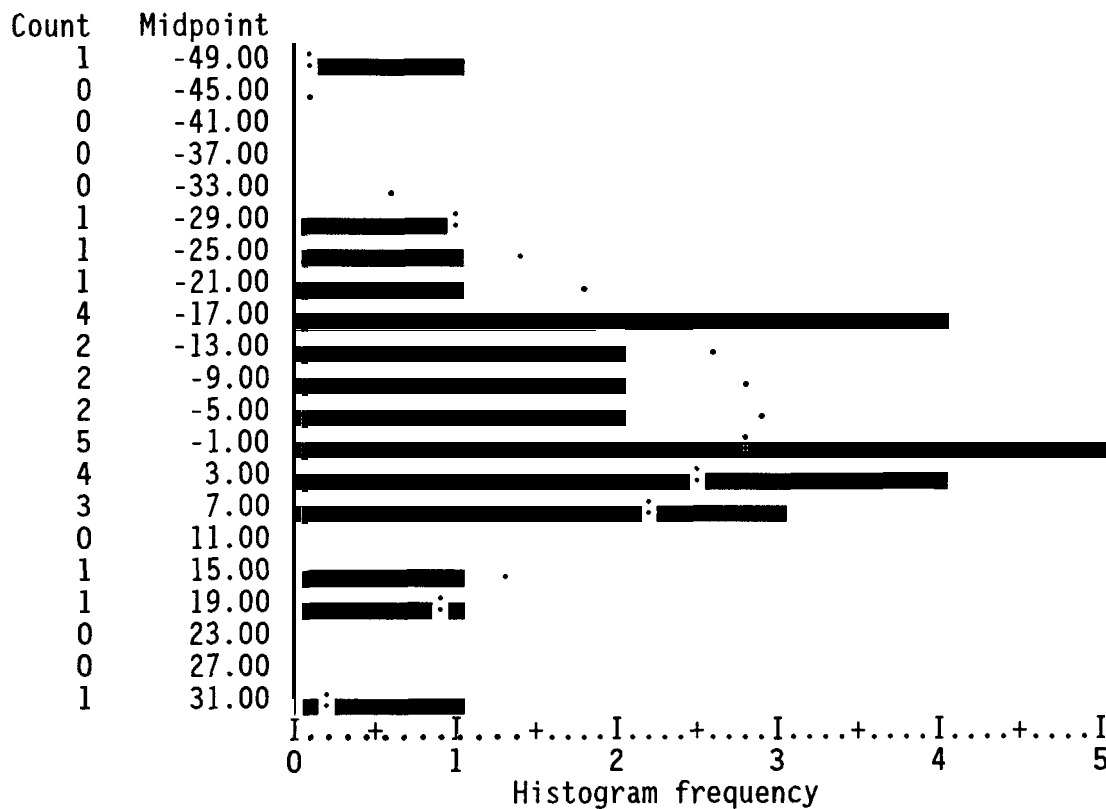
Valid cases            29            Missing cases            0  
Includes records with missing data on age or sex or both

Histogram 2 illustrates net undercount or net overcount for males; Histogram 3 illustrates net undercount or net overcount for females.

### Histogram 2

Male Net Undercount or Overcount  
in the Census Enumeration by Sites of the  
Ethnographic Sample

MCOVER

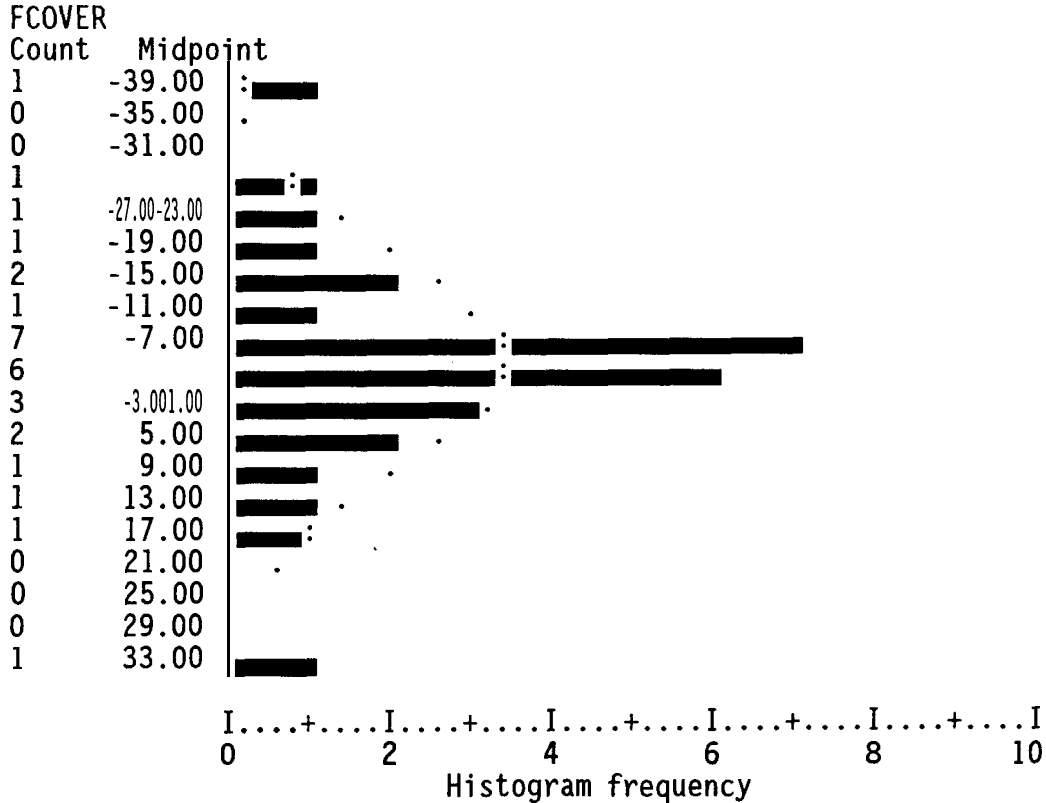


Valid cases 29 Missing cases 0  
Includes only records data defined as male in source files compared

The mean net undercount or overcount in the census enumeration for record data defined as males at sites in the ethnographic sample is negative. The ethnographic sample as a whole registers a male undercount as we would expect from prior studies, since the sample population as a whole is predominantly composed of people who are members of minority race and ethnic groups among which high net undercounts have been demonstrated. The mean of -5.3 and median of -2.7 reflect the outliers-- sites where a high proportion of the Census Day total population data defined as males were either omitted or erroneously enumerated.

### Histogram 3

Female Net Undercount or Overcount  
in the Census Enumeration by Sites  
of the Ethnographic Sample



Valid cases 29 Missing cases 0  
Includes only person records defined as female in the source files.

The mean value, -4.4%, and median, -4.9%, are close for female coverage reflecting fewer outliers, which are less important in their contribution than in male coverage.

#### Composition of Net Coverage

The appended bar charts illustrate the composition of the R population across sites. Each chart is named for the cell in the sample design, for example, A1, F2, etc.

The Charts illustrate different patterns of omissions and other errors that result in net undercount or net overcount. The Charts also illustrate the importance of movers in explaining raw differences between the AE and the census count. The top bar chart labeled "AE" depicts the frequency of population records collected by the original Alternative Enumeration in the

categories described below. The center chart labeled "Census" depicts how records in the census source are distributed in these categories. The bar labeled "Resolved" pulls together records which constitute the true Census Day population as described below.

The categories labeling records Matched/Confirmed, Unique Records, Movers, Errors, and Uncertain Records in each chart need to be interpreted by context.

Matched/Confirmed Records: On the AE and on the census bar, the matched records show the frequency of records which have a match on the opposite file and which were confirmed as correctly censused, Census Day residents. On the R population bar chart, the frequency <sup>of</sup> matched/confirmed pairs is shown. ←

Unique Records: These are unmatched records of persons who were confirmed to have been Census Day residents and who did not move between Census Day and the time of the Alternative Enumeration but who were omitted in the opposite file, not in the source depicted. The frequencies of these records shown on the AE and Census bars are combined in the resolved bar.

Movers: AE records of persons on the AE bar chart which are coded as movers are people who moved into the sample area after Census Day. Although these records may be correct enumerations for the AE time period, AE records coded in the mover category are excluded from the Resolved population because the records do not refer to people who were resident Census Day.

The census bar chart labels as "movers" people who moved out of the sample area after Census Day. They were Census Day residents, but were no longer present by the time of the AE. These census source records are also included in the Resolved population as movers.

Errors: Records (matched or unmatched) of persons included in either the AE or census enumeration by a mistake such as duplicating another record in the same sample area or misgeocoding. Records coded as errors appear in the AE and the Census bar charts but are excluded from the Resolved population.

Uncertain records: Records (matched or unmatched) of persons whose Census Day residence in the sample area cannot be either confirmed or unconfirmed. Like records coded as errors, these appear in the AE or Census charts but not in that of the Resolved population.

We will briefly review four charts; L1, H1, F1 and A1

Chart L1 depicts results from our site in Houston, TX. At the Houston ethnographic site, a net population undercount of -12% was measured by this B/R - 1 = TCOVER method ( -19% of the male population; -21.7% of the female population). Had the straight forward population count of the AE been compared to the raw census count, the incorrect impression of a higher than actual undercount would have registered. The apartment building at this site provided housing for undocumented immigrants entering from Central America. Residential mobility was high. A large number of the people observed in the AE (118) had moved in after Census Day and 48 Census records referred to

people who could be confirmed as having been Census Day residents who moved out. Nine census records were identified as erroneous enumerations; 23 were coded as uncertain because these unmatched records either could not be confirmed or contained too little personal information and so could not be verified (Hagen and Rodriguez 1991). Even if an alternative resolved population were constructed that included all the uncertain, unconfirmable census records, a net undercount would register.

Chart H1 depicts results from the San Diego, CA site: a site overcounted by the census by +25% according to the ethnographic evaluation. Undocumented migrants from Mexico were its main population. The primary reason for the net overcount is the large number of census records coded as either errors or uncertain. Housing at this site was highly irregular (de la Puente 1992; Brownrigg 1991b; Velasco 1992) and a large number of census records were without names and without demographics shown at addresses where the ethnographer knew other people (defined on the AE) lived as of Census Day. The resolved population is calculated is slightly larger than the AE count but smaller than the census count (Velasco 1992.)

Chart F1 shows the Koreatown, Los Angeles, CA site, one of two Korean sites in the ethnographic sample where the Alternative Enumeration and the Census agree closely and confirmed, matched records are predominant. A slight net overcount of .6% was determined because a few of the unmatched census records were identified as errors and a few which could not be confirmed (Kim 1991)

Chart A1 shows the outcome of the ethnographic site in Harlem, New York. This outlier of net undercount was the urban concentration of Black population in the Harlem neighborhood of New York City. The net undercount of -47% at this site was determined by large number of people missed by the census, therefore, a rough comparison between the AE count and the raw census count would produce a similar perspective. Through the resolution coding, the relatively high proportion of census records shown as erroneous enumerations increases the net undercount (Hamid 1992).

## Conclusions

This paper has described how the ethnographic evaluation of the 1990 Decennial Census reached its conclusions and demonstrated net coverage. While a dual system estimator could be applied and a variety of options could be selected to handle and impute the missing data, based on the results of this experimental project, we believe that careful resolution fieldwork is possible. Despite problems associated with data quality on the census, issues in matching decisions and the search for evidence to confirm unmatched records, we believe the method demonstrated could be streamlined, speeded-up and spread to a larger sample to serve as a more exact evaluation of census coverage.

The ethnographic sites display strong variation in their demographic profiles and their net coverage. The census enumeration of some ethnographic sites contain large proportions of records which cannot be confirmed or which are definitely erroneous enumerations. These erroneous enumerations "bouy up"



the census count to bring it closer to and, in several sites, to surpass the actual numbers of persons who can be confirmed as Census Day residents of the sample area.

The method of the 1990 ethnographic evaluation identifies and codes records of persons, households and housing units as either 1) correctly censused, 2) erroneous enumerated or 3) omitted and then links coded records to demographic, social, cultural and environmental characteristics. In future studies we examine how errors and omissions as well as net coverage correlate with the behavioral traits collected in the systematic observations. We are also interested in correlations between site demography, as seen in the census enumeration, with the eventual net undercount or net overcount to flag "hot spots" of census coverage problems.

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# Figure I: Sample Design

## FACTOR 2: RACE/ETHNIC CONCENTRATION (URBAN/RURAL)

		Concentrated		Heterogeneous
		Urban	Rural	Urban/Suburban
<b>FACTOR 1: GROUP</b>				
	<b>Black</b> N - 8	ghetto cell a 4	Deep South cell b 2	cell c 2
	<b>Indian</b> N - 3		Reeervatione & tradltional area8 cell d 3	Urban Indians cell e 0
	<b>Asian</b> N - 7	Chinatowns, Koreatowns, etc. cell f 3		Aelatowne mult. Asian groups) cell g 4
	<b>Hispanic</b> N - 5	barrios cell h 1	rural undocumented (migrant labor) cell i 2	cell j 2
	<b>Undocumented</b> N - 6	cell k 3		cell l 3

TOTAL N = 28

**FIGURE II: SAMPLE DESIGN WITH % RACE/ETHNIC**

RACE/ETHNICITY	Concentrated		Heterogeneous	
	Urban	Rural	Urban/Suburban	
Black.	CELL A		CELL B	
	98 %	88 %	92 %	63 %
	96 %	98 %	98 %	31 %
Indian		CELL D		
		96 %	62 %	
		86 %		
Asian	CELL F		CELL G	
	97 %	73 %	68 %	39 %
	84 %		18 %	44 %
Hispanic	CELL H		CELL I	
	91 %		96 %	24 %
		63 %	61 %	
	CELL K		CELL L	
	94 %	87 %	62 %	70 %
	61 %		83 %	

TOTAL N = 28

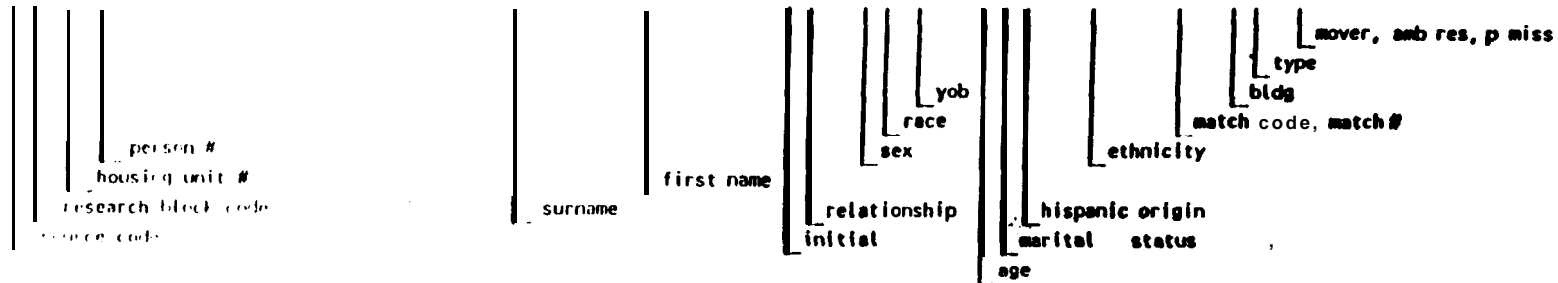
% = Percent of race/ethnic group indicated per the Alternative Enumeration



## FIGURE III: U.S. DEPARTMENT OF COMMERCE BUREAU OF THE CENSUS EXAMPLE OF A MATCH REPORT USING DUMMY DATA

Computer-matched household sets

A01 004 01 4005	BRITON	UPS O BILLINGS		P	FW 1949 040 N Z	U	4 P M GEO	un-matched "A" mnd "B"
B01 571 00 4005	BRITON	API A 0 VACANT			999	U	4 V E J L S LR	record5
A01 005 01 4005	BRITON	API 9 R BISHOP SUSAN		P	FW 1970 018 N Z	U	4 X M GEO	
A01 005 02 4005	BRITON	API 9 LATHROP GINA		NSMT	FW 1968 020 N Z	U	4 P M GEO	
B01 570 01 4005	BRITON	API 9 R FITZGERALD HUGH		P	M W 1955 033 N Z	U	4x MR S	un-matched "A" and "B"
B01 570 0 2 4005	BRITON	API 9 f FITZGERALD MILLICENT		M	FW 1958 030 N Z	U	4 X MR S	records
B01 570 03 4005	BRITON	API 9 FITZGERALD LAURIE		D	FW 1978 006 N Z	U	4 X MR S	
B01 570 04 4005	BRITON	API 9 FITZGERALD DANIEL		D	M W 1985 003 N Z	U	4 P MR S	



ID FIELDS

ADDRESS FIELDS

DEMOGRAPHIC FIELDS

MATCHING FIELDS

Source: de la Puente, Brownrigg and Fansler (1990)

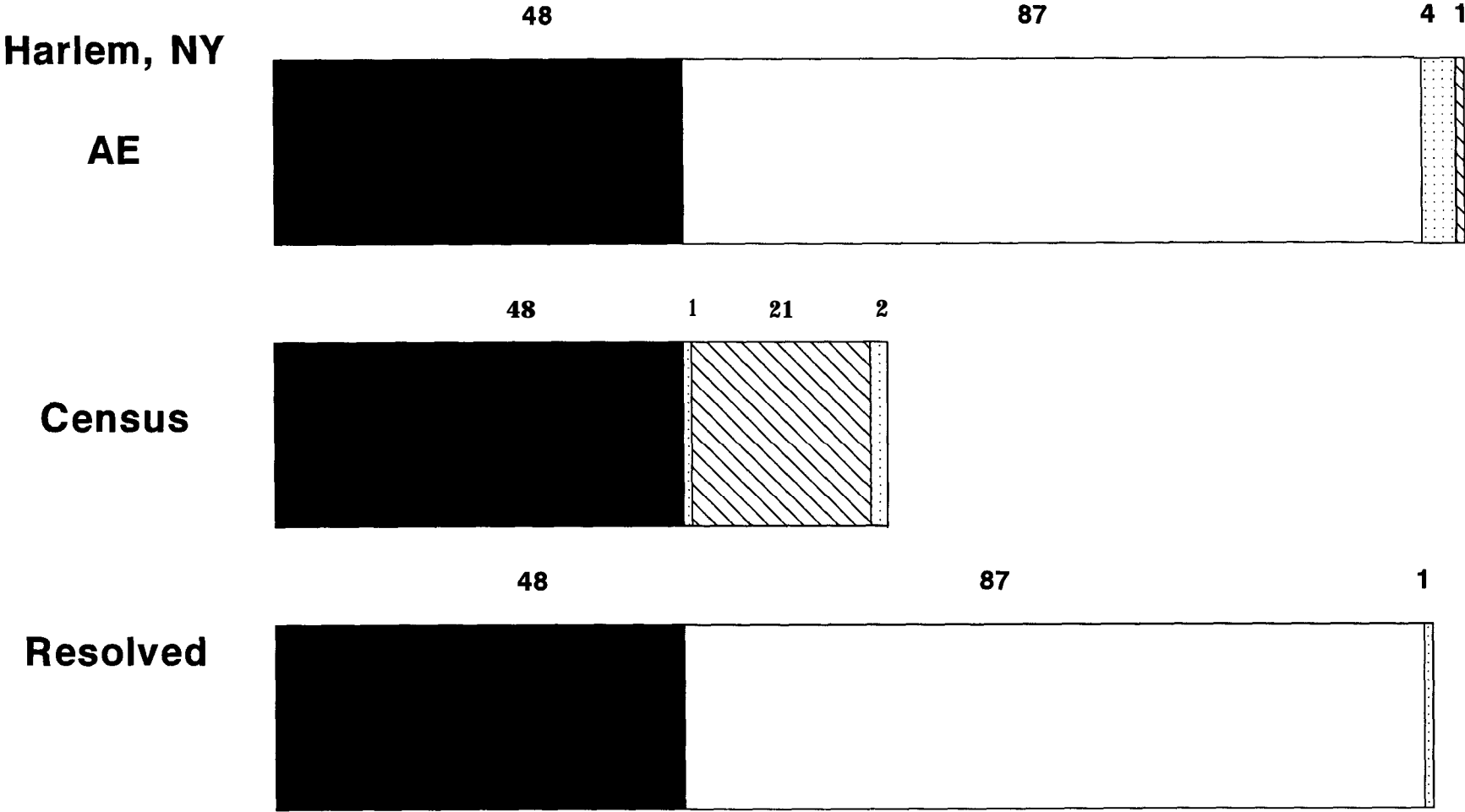
**APPENDIX**

**TABLE 1**

Other sources used in address listing, compilation of enumeration or resolution

Source Used	Ex.	Any good?
Reverse phone books	Chinatown S. St. Louis	Incomplete, uneven quality (many out-of-date historic subscribers)
School Records	Chinatown Carbondale	Contradictory Associated people with formal, rather than actual addresses
Tenants' List	Houston	Incomplete, inaccurate often incorrect, out-of-date
Registry of deeds	S. St. Louis	Important to locate proxies, identify erroneous enumerations on the census
Voter Lists	Chicago	Incomplete, many fictional
HUD Mortgage Records	Isleta	Incomplete, out-of-date
Previous survey or enumeration of whole site or part of site by the PI	S. St. Louis Miami Harlem	Extremely useful-reduced AE time to updating/expanding; identified and provided evidence for erroneous enumerations on census
Tribal Rolls	Isleta rural North Carolina	Accurate but incomplete corroborations
Family genealogies developed by PI Interviewing residents	rural Oklahoma rural North Carolina rural Santa Barbara	Accurate cross references; helped identify non-matches

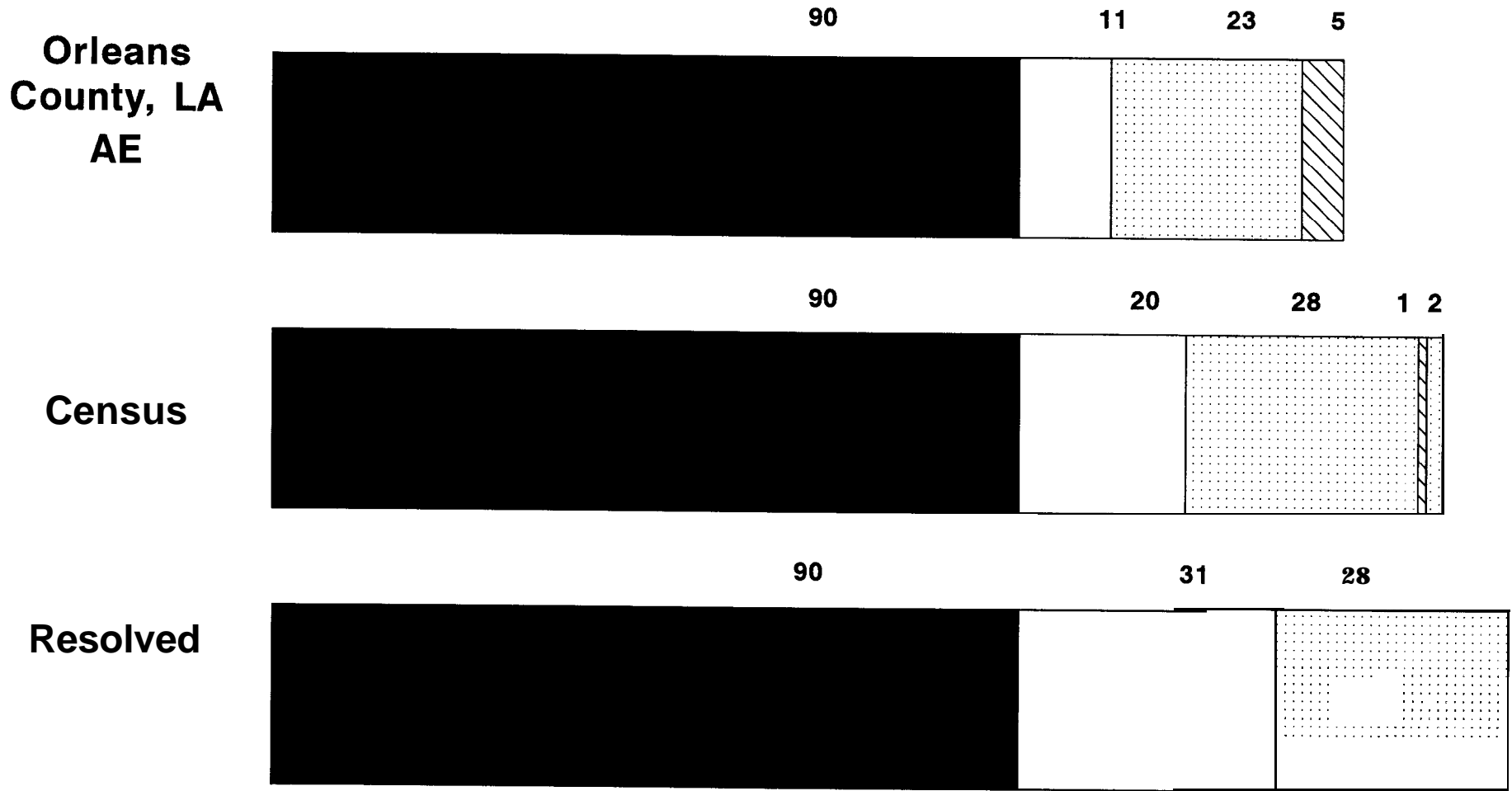
# CHART AI: URBAN CONCENTRATED BLACK



Matched/Confirmed
  Unique Records
  Movers

N Errors
  Uncertain Records

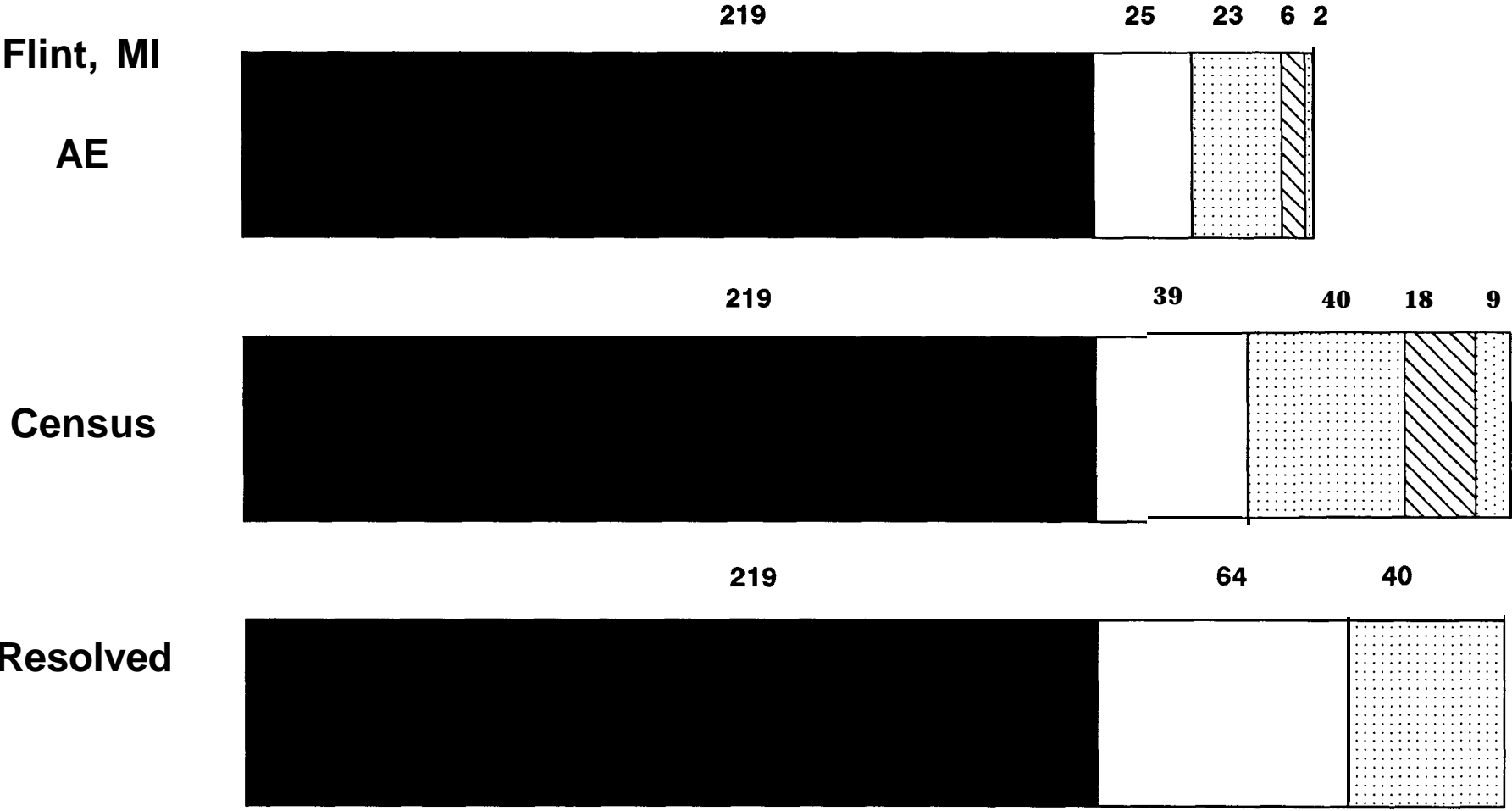
# CHART A2: URBAN CONCENTRATED BLACK



Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records

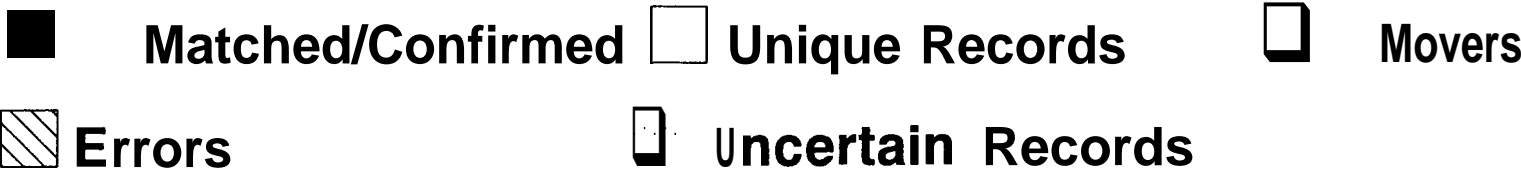
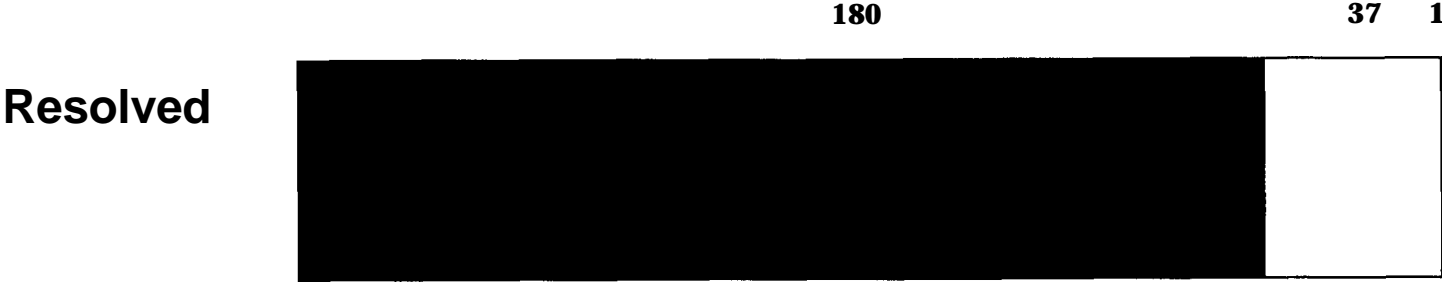
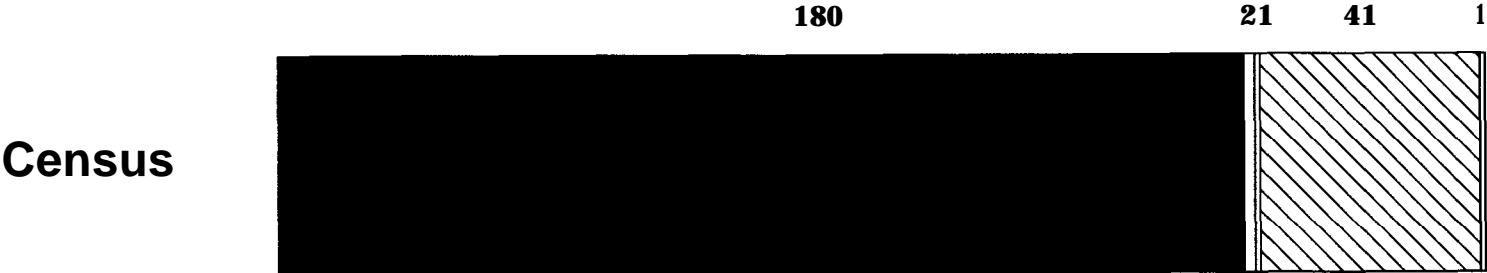
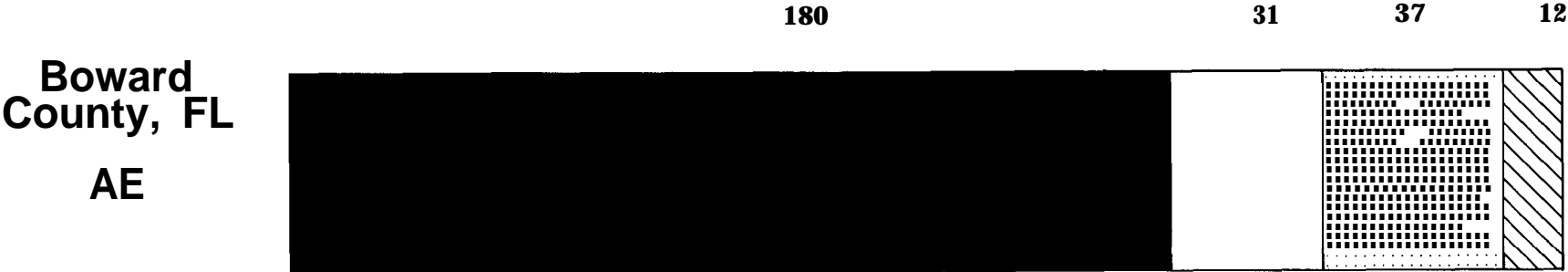
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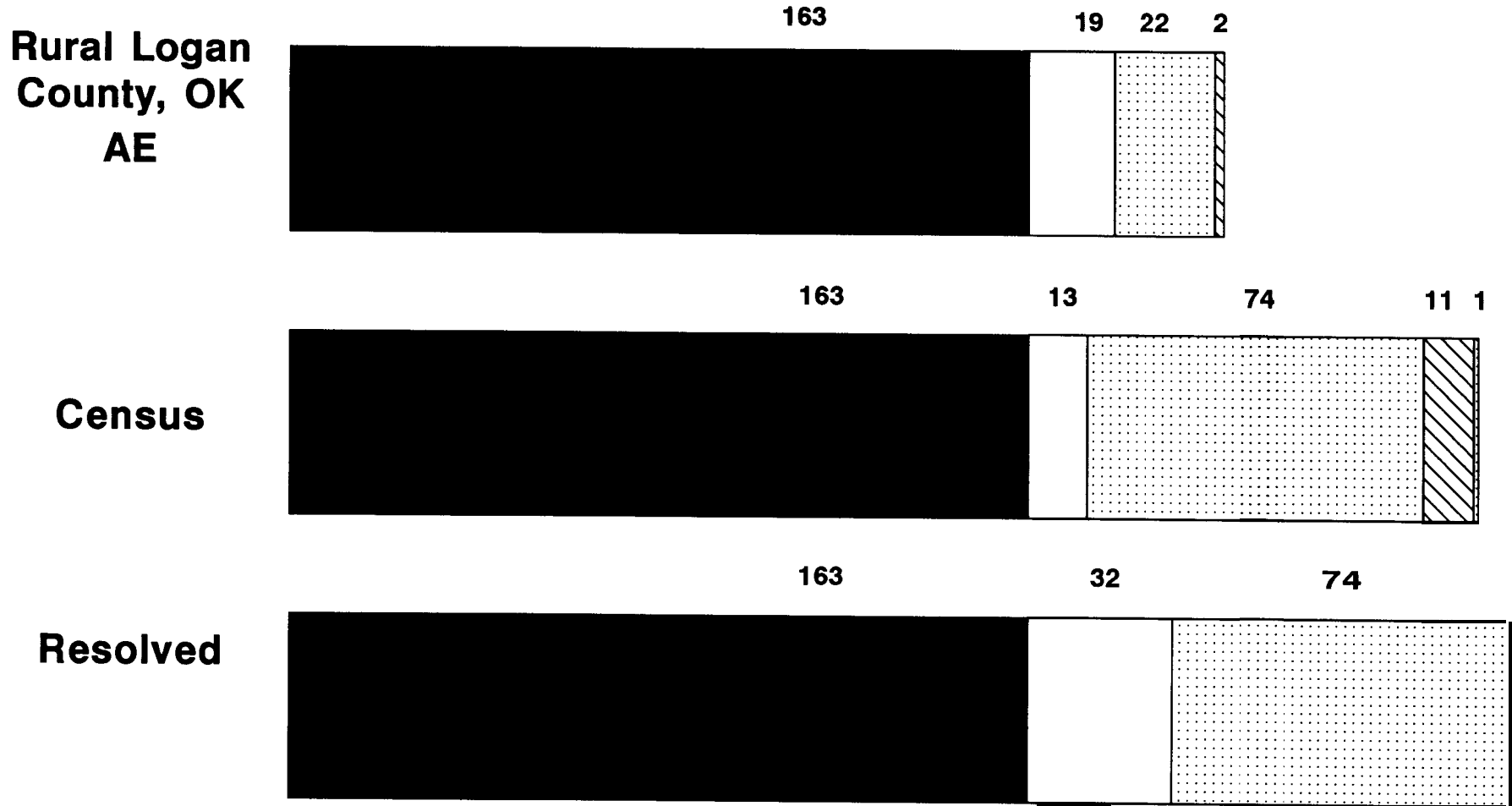
Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records

# CHART A4: URBAN CONCENTRATED BLACK



# CHART B1: RURAL CONCENTRATED BLACK



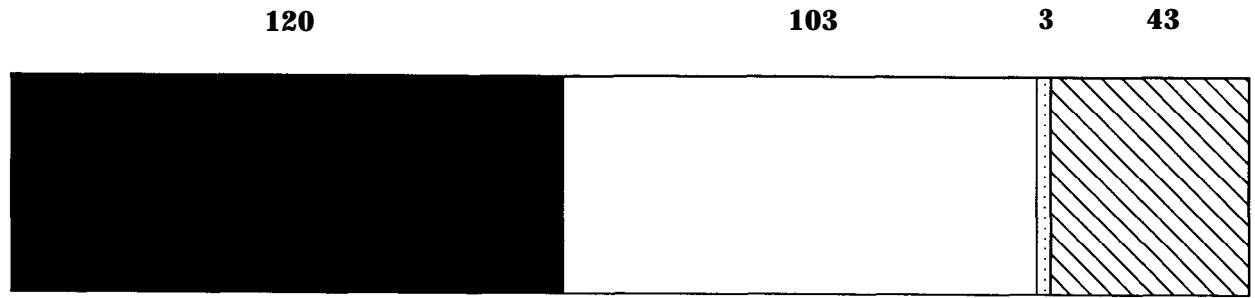
Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records

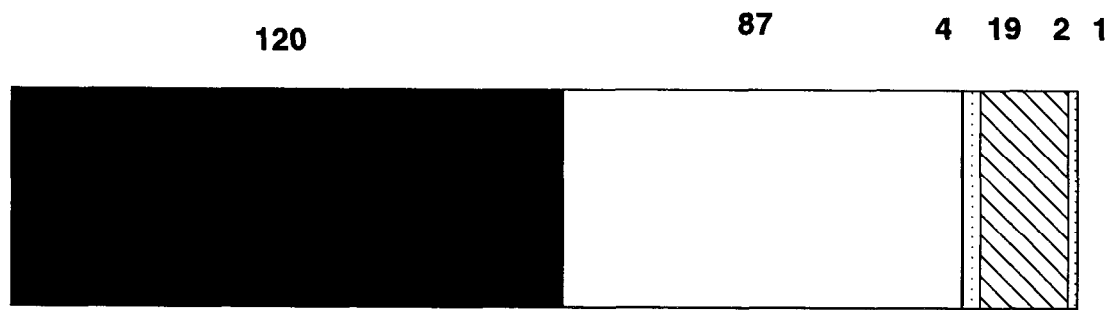
# CHART B2: RURAL CONCENTRATED BLACK

DATE: 4/23/03

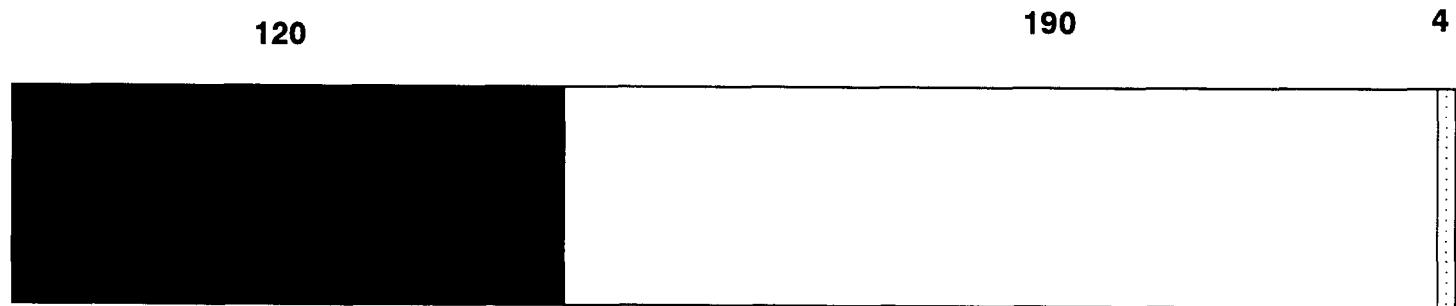
Rural Holmes  
County, MS  
AE



Census



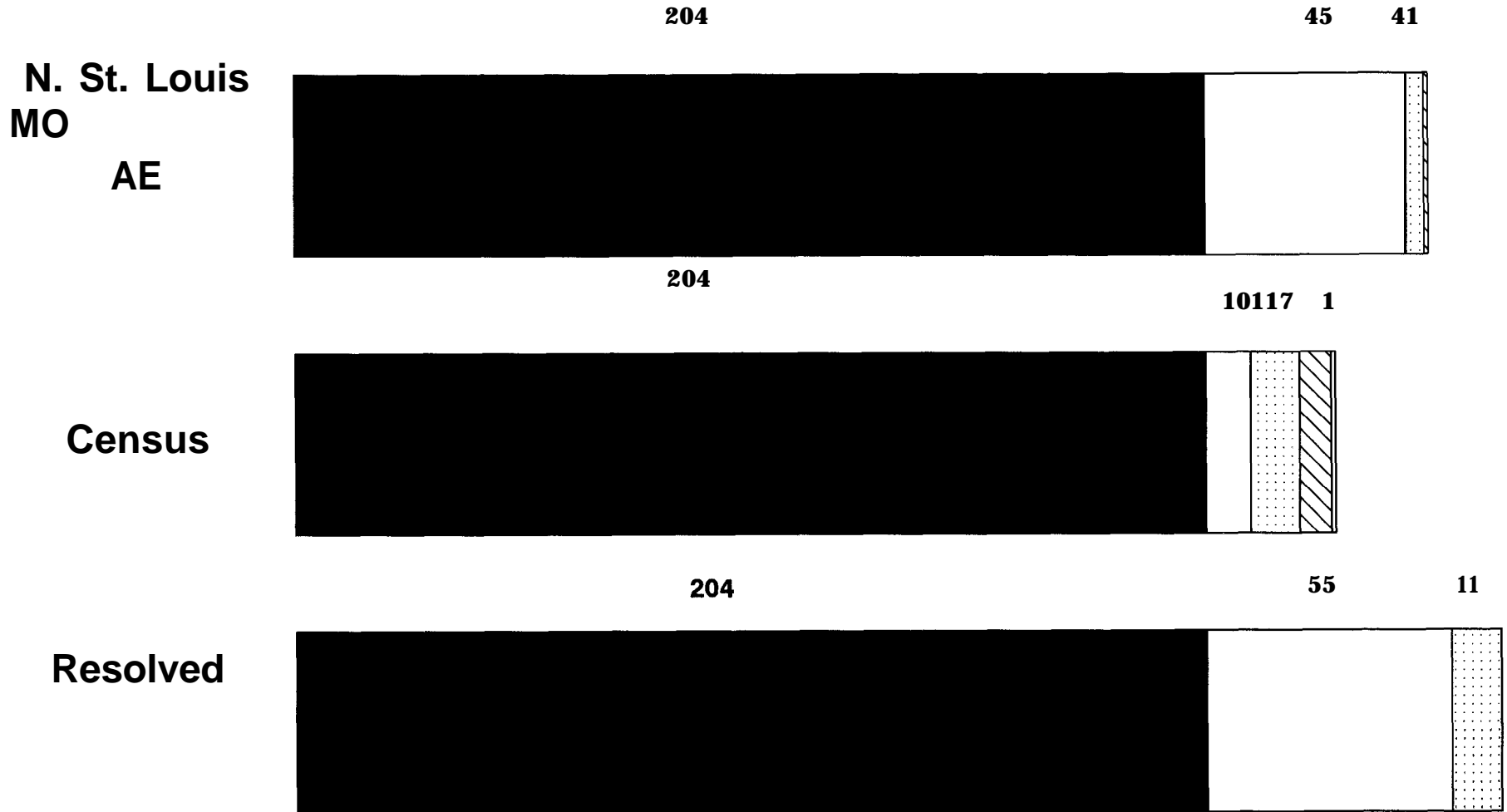
Resolved



- Matched/Confirmed
  Unique Records
  Movers
- Errors
  Uncertain Records



# CHART CI: URBAN/SUBURBAN HETEROGENEOUS BLACK



Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records

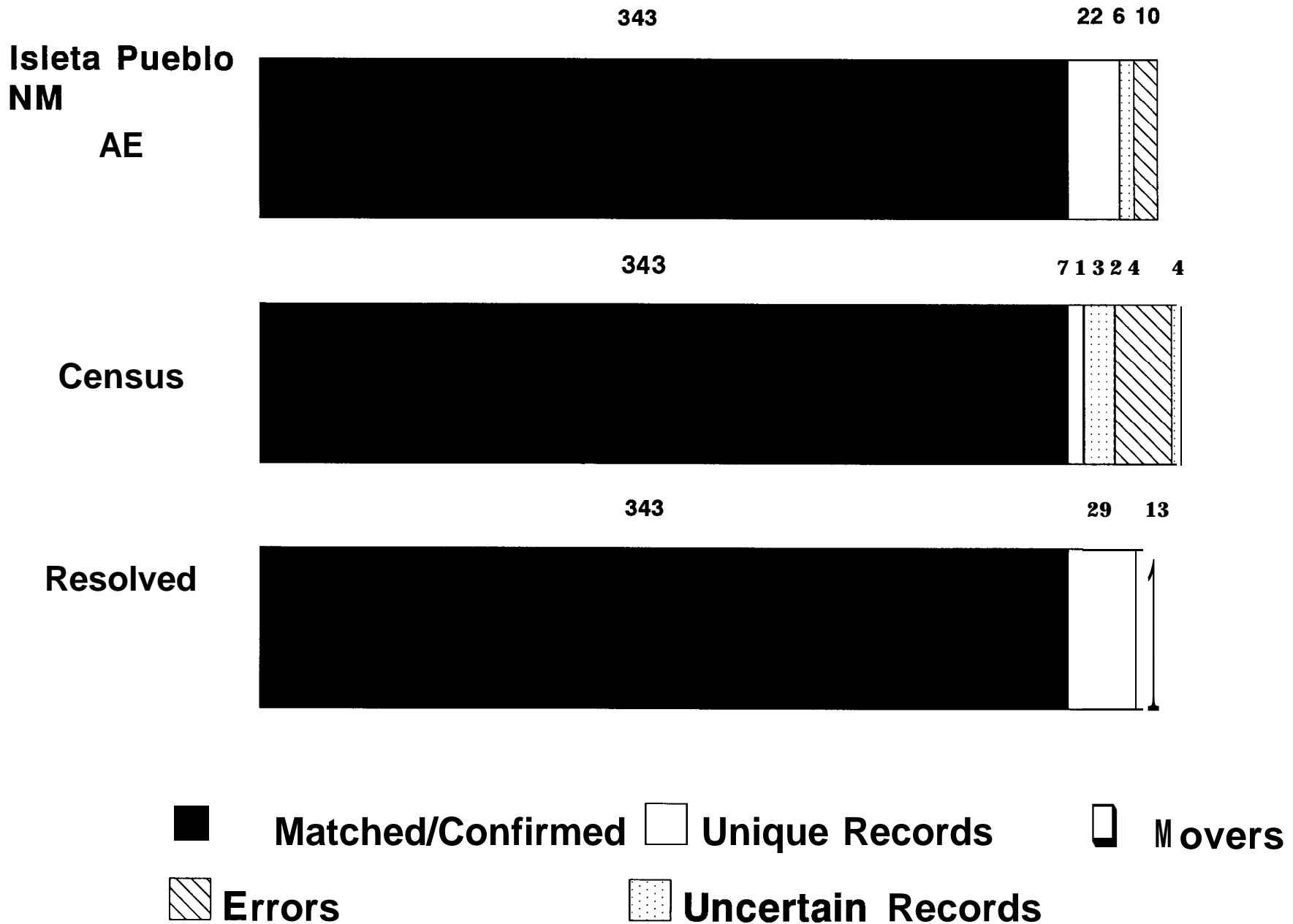
# CHART C2: URBAN/SUBURBAN HETEROGENEOUS BLACK



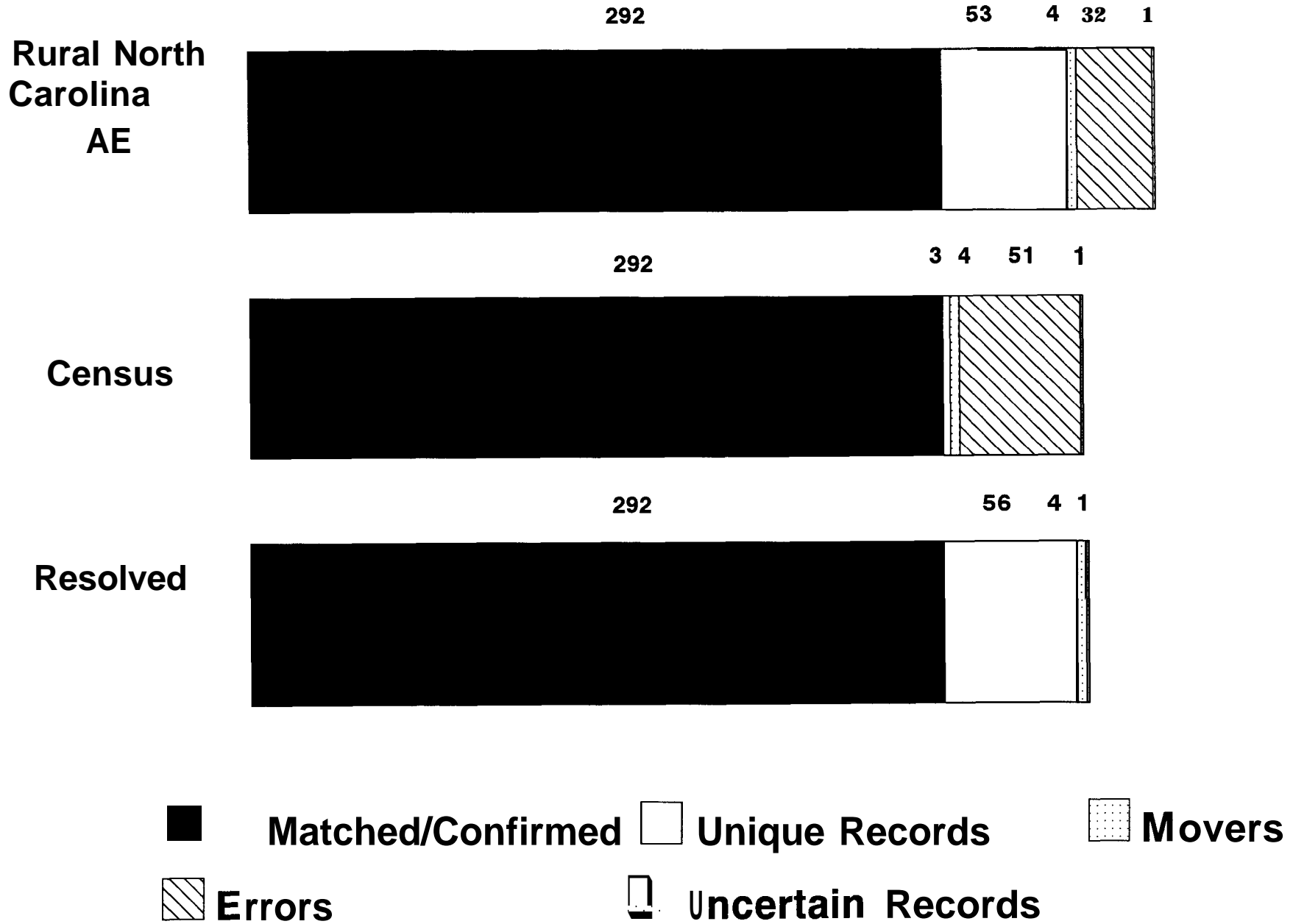
Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records

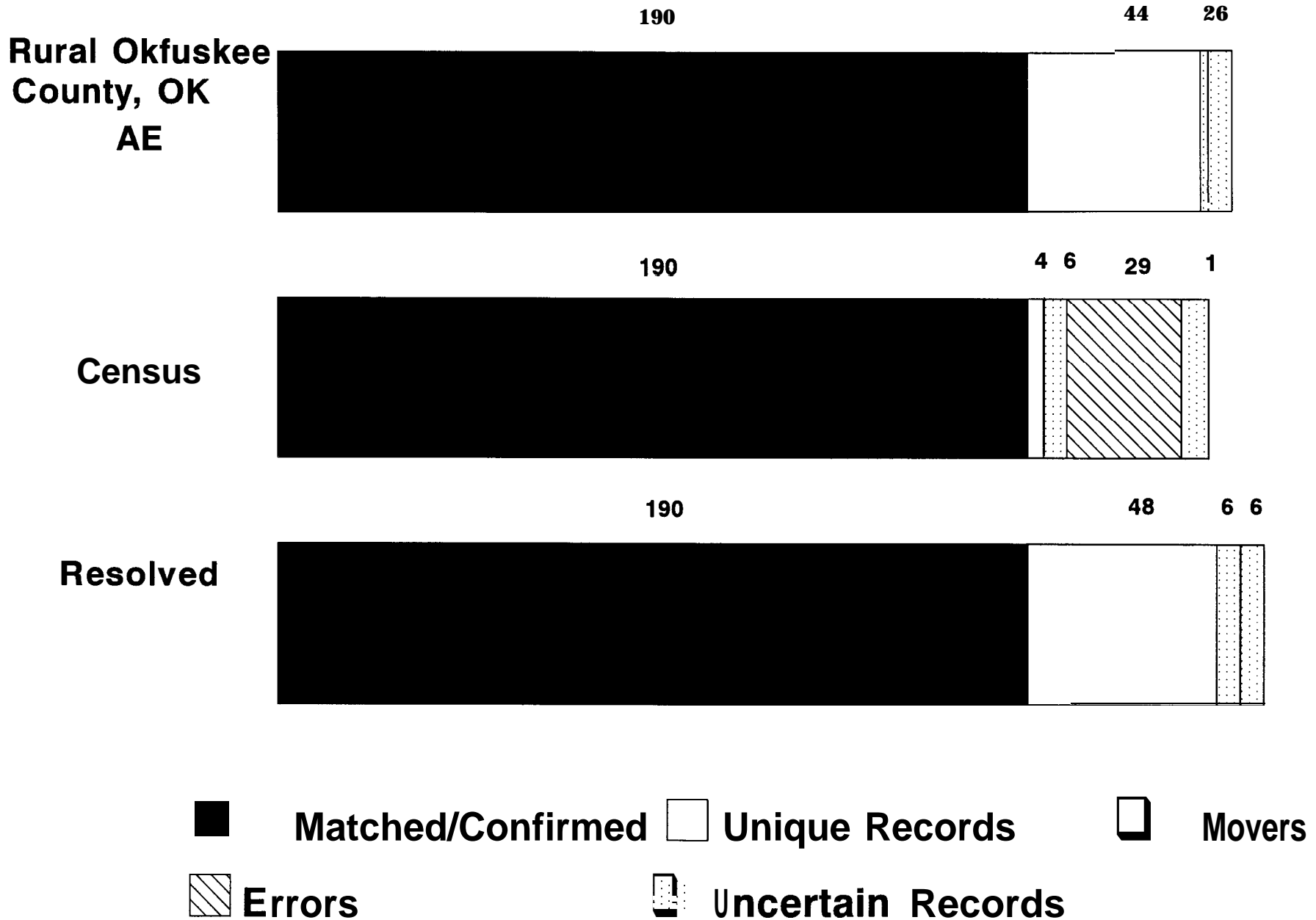
# CHART D1: RURAL CONCENTRATED AMERICAN INDIAN



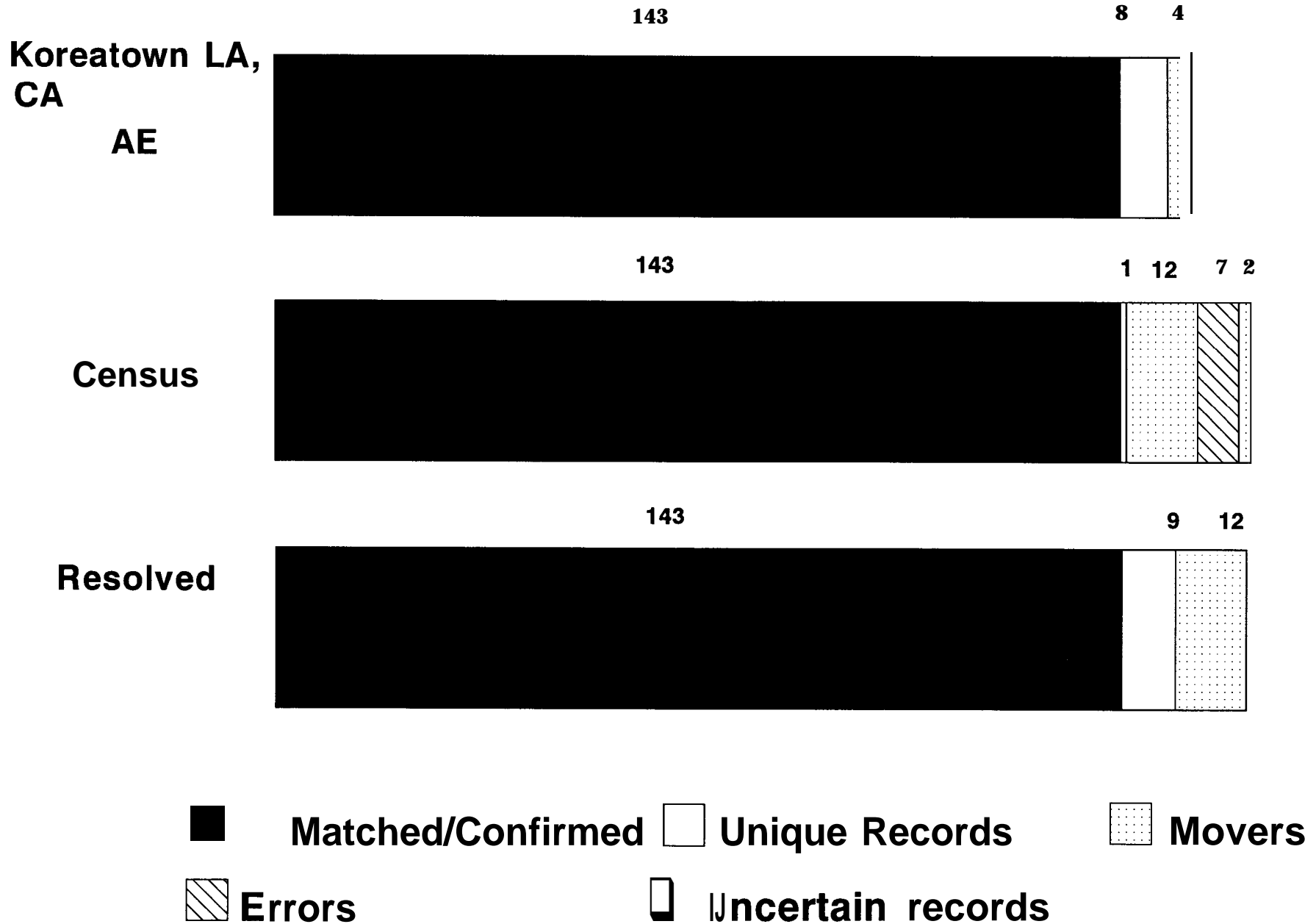
# CHART D2: RURAL CONCENTRATED AMERICAN INDIAN



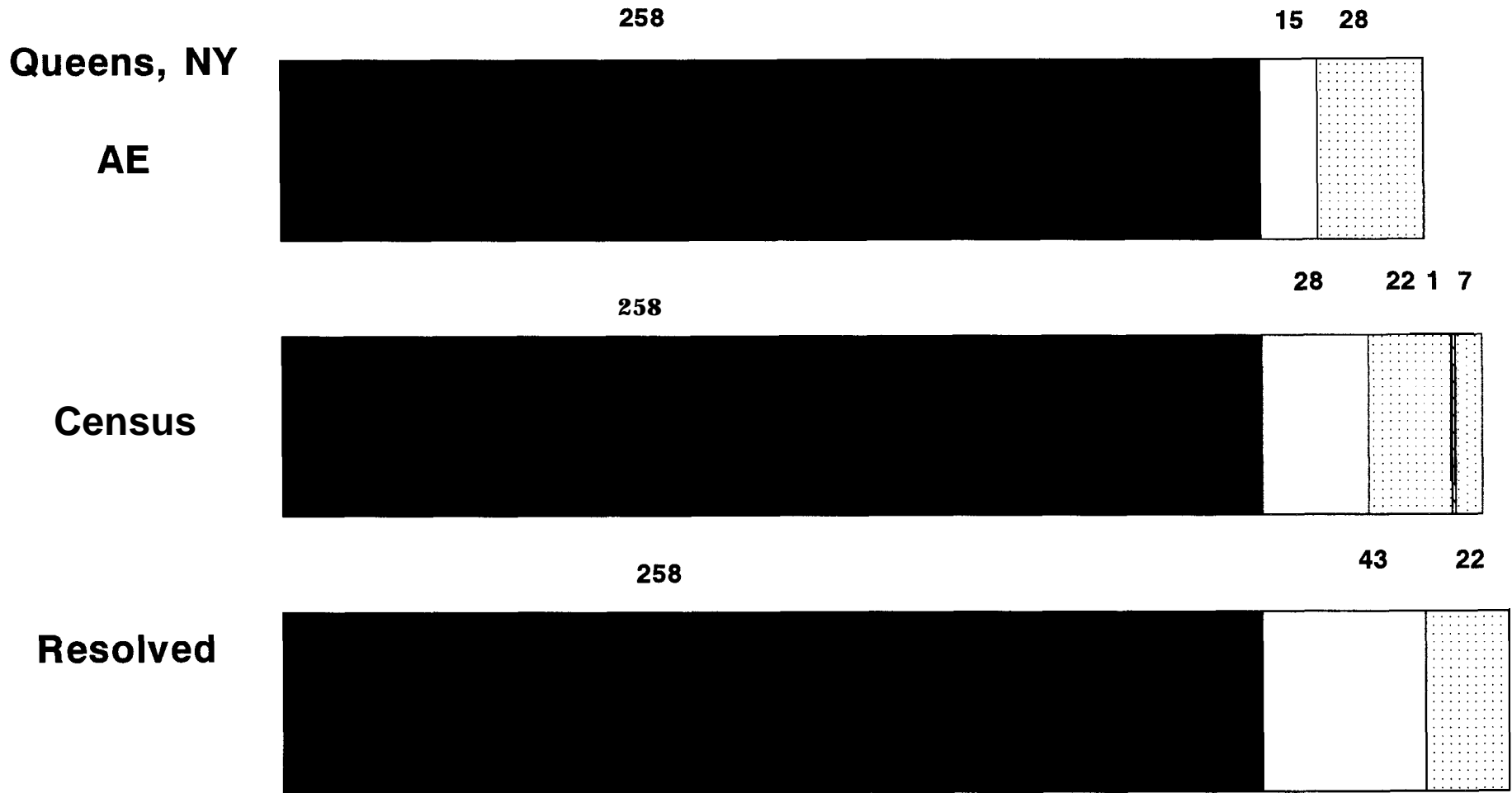
# CHART D3: RURAL CONCENTRATED AMERICAN INDIAN



# CHART F1: URBAN CONCENTRATED ASIAN



# CHART F2: URBAN CONCENTRATED ASIAN



■ Matched/Confirmed

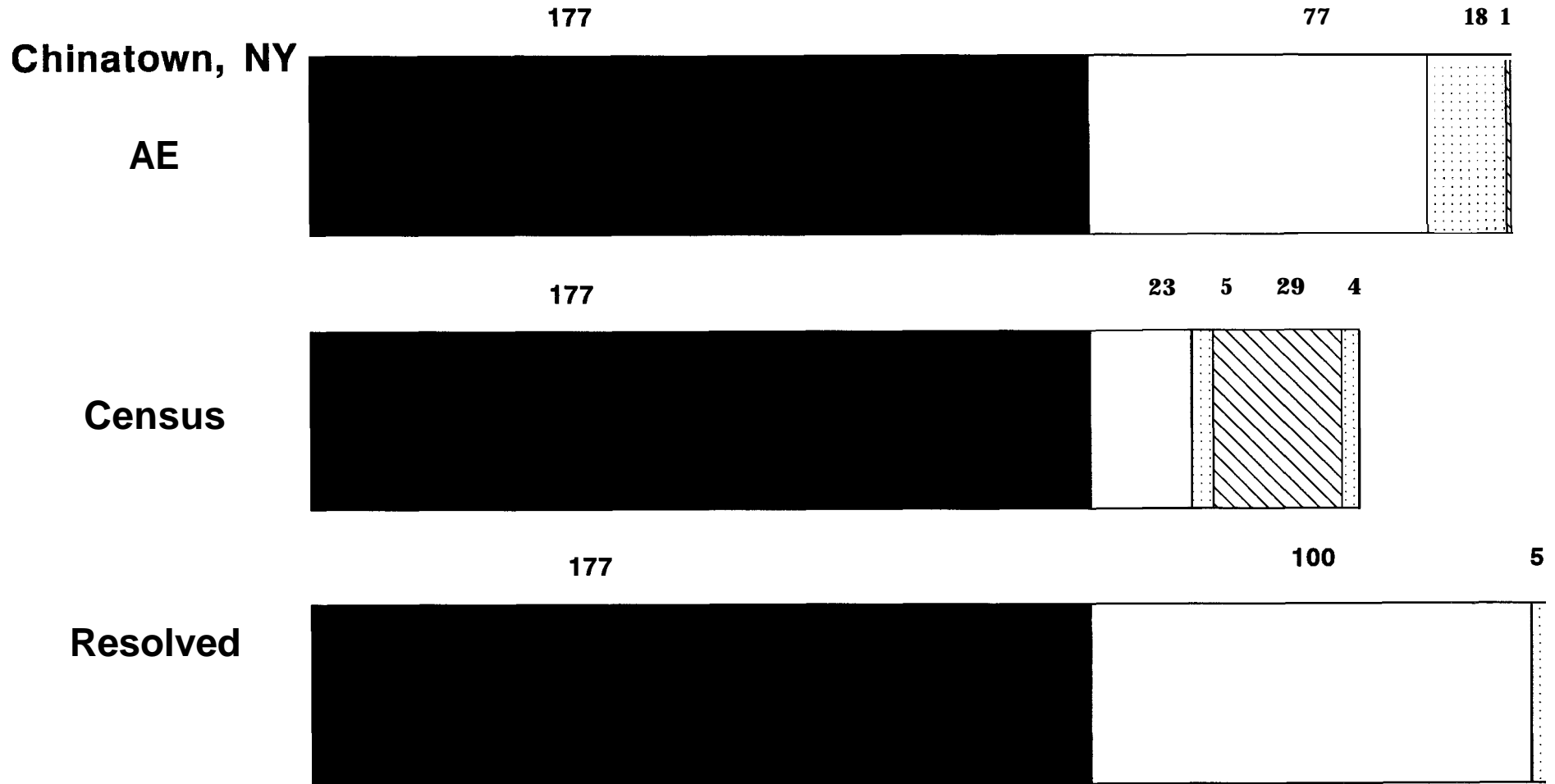
□ Unique Records

▣ Errors

▨ Errors

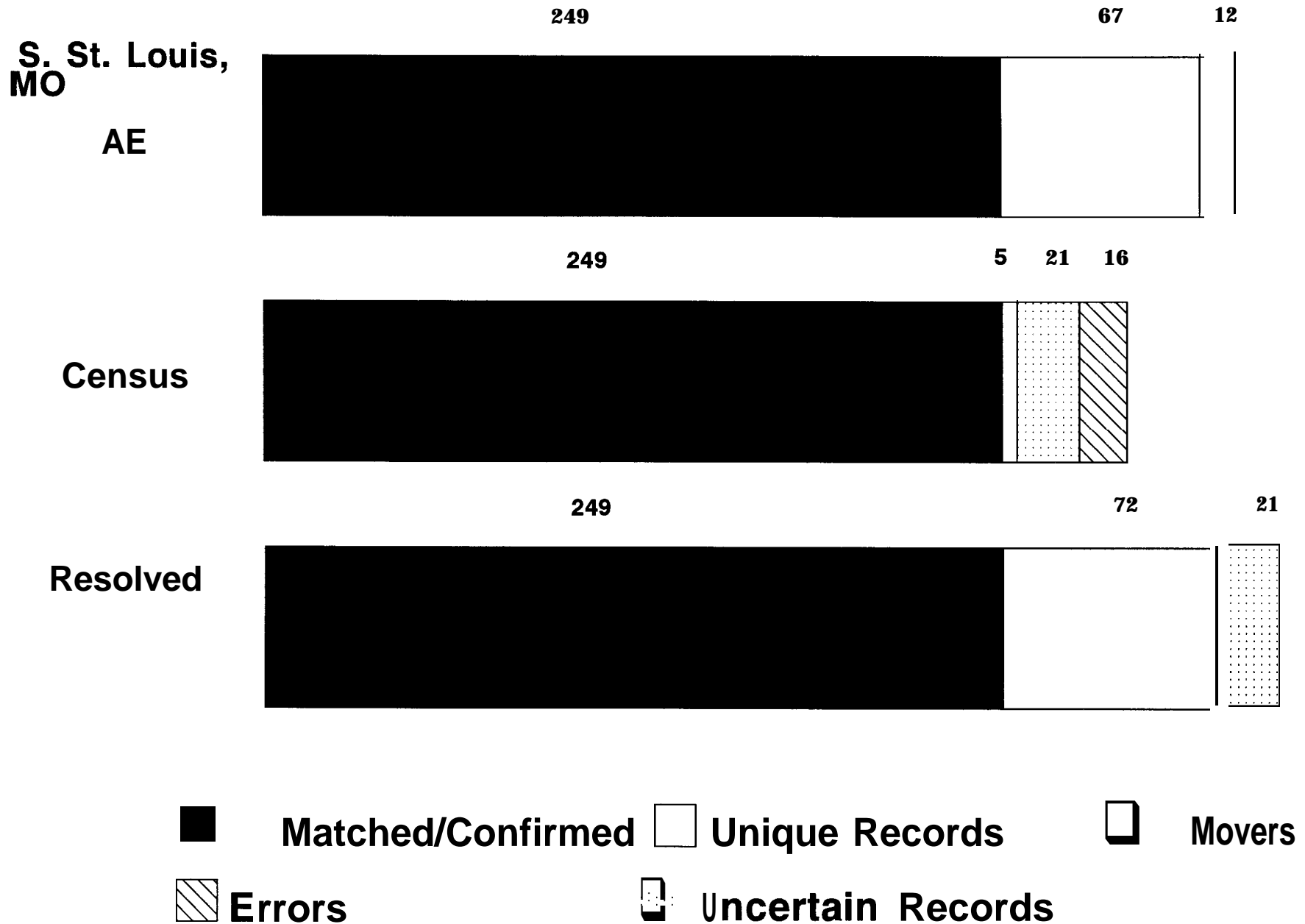
▤ Uncertain Records

# CHART F3: URBAN CONCENTRATED ASIAN

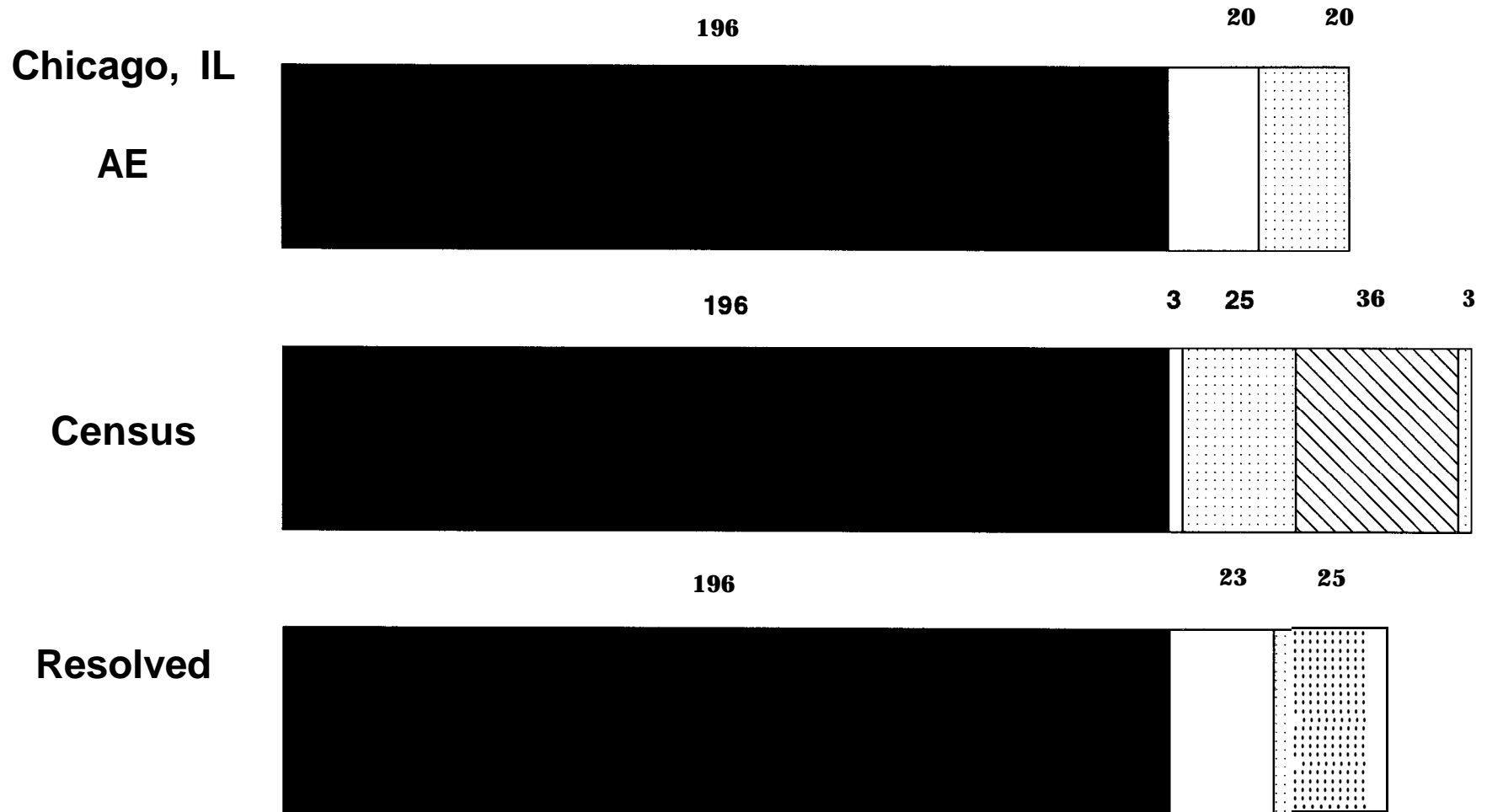




# CHART G1: URBAN/SUBURBAN HETEROGENEOUS ASIAN



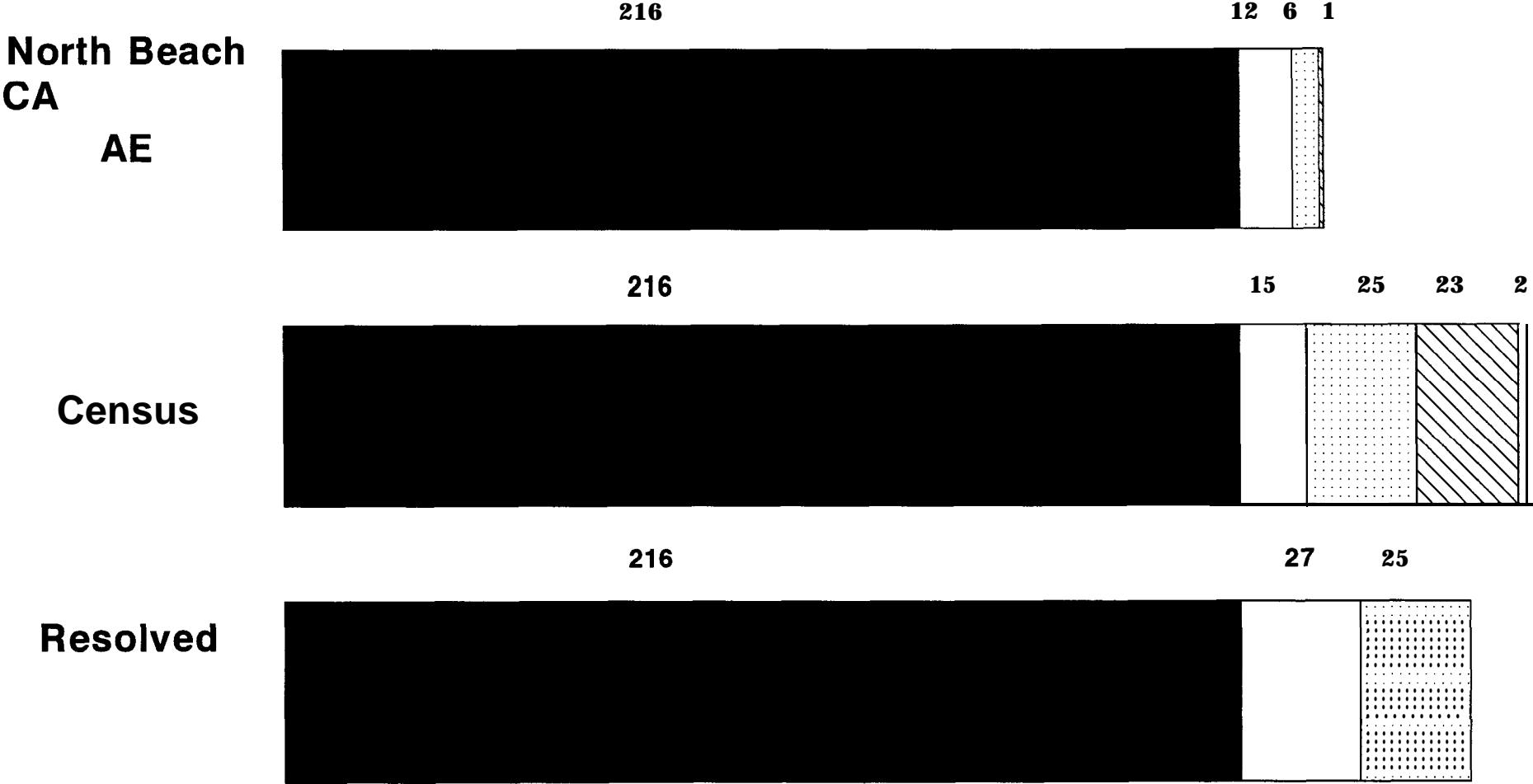
# CHART G2: URBAN/SUBURBAN HETEROGENEOUS ASIAN



Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records

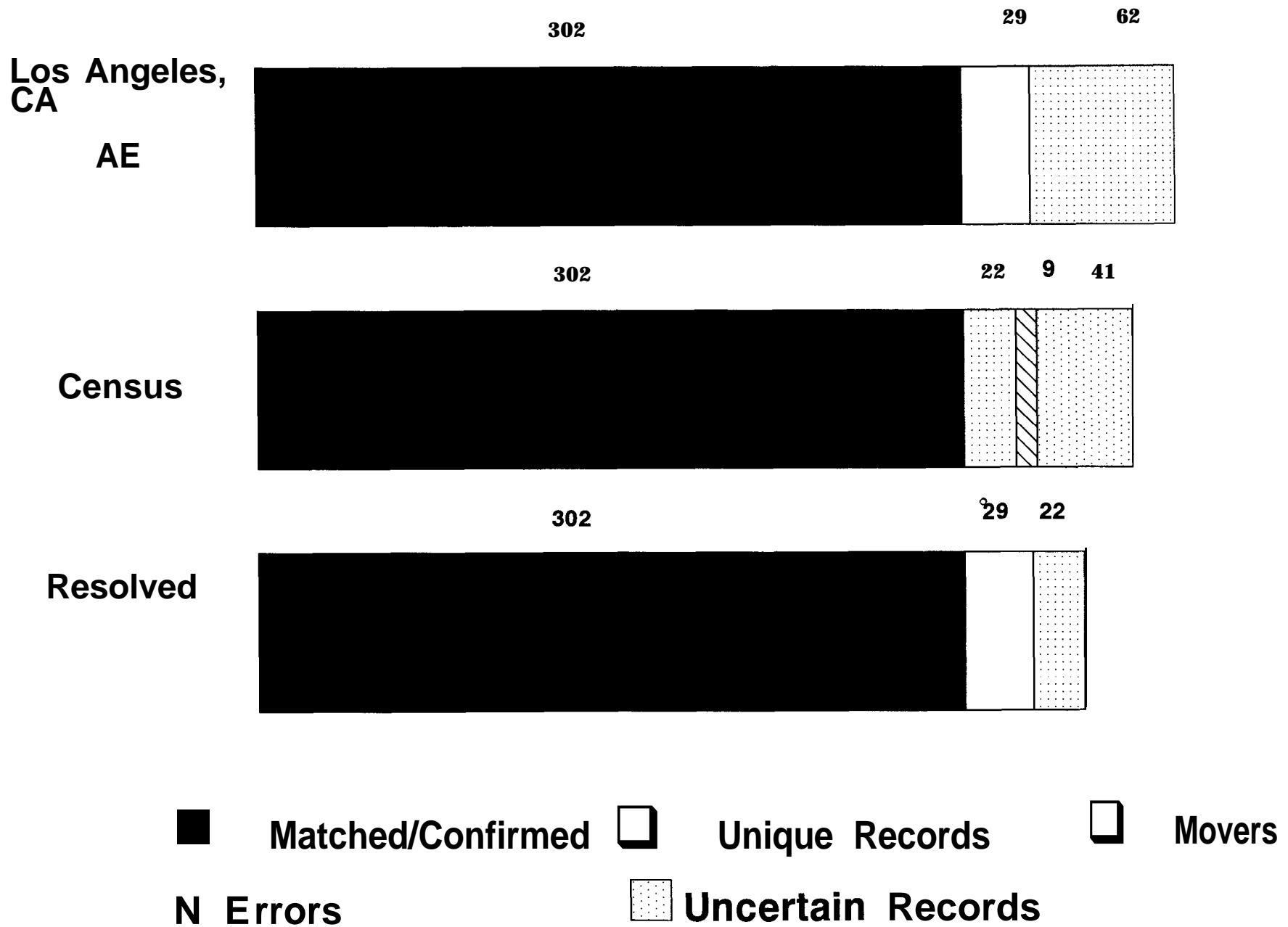
# CHART G3 URBAN/SUBURBAN HETEROGENEOUS ASIAN



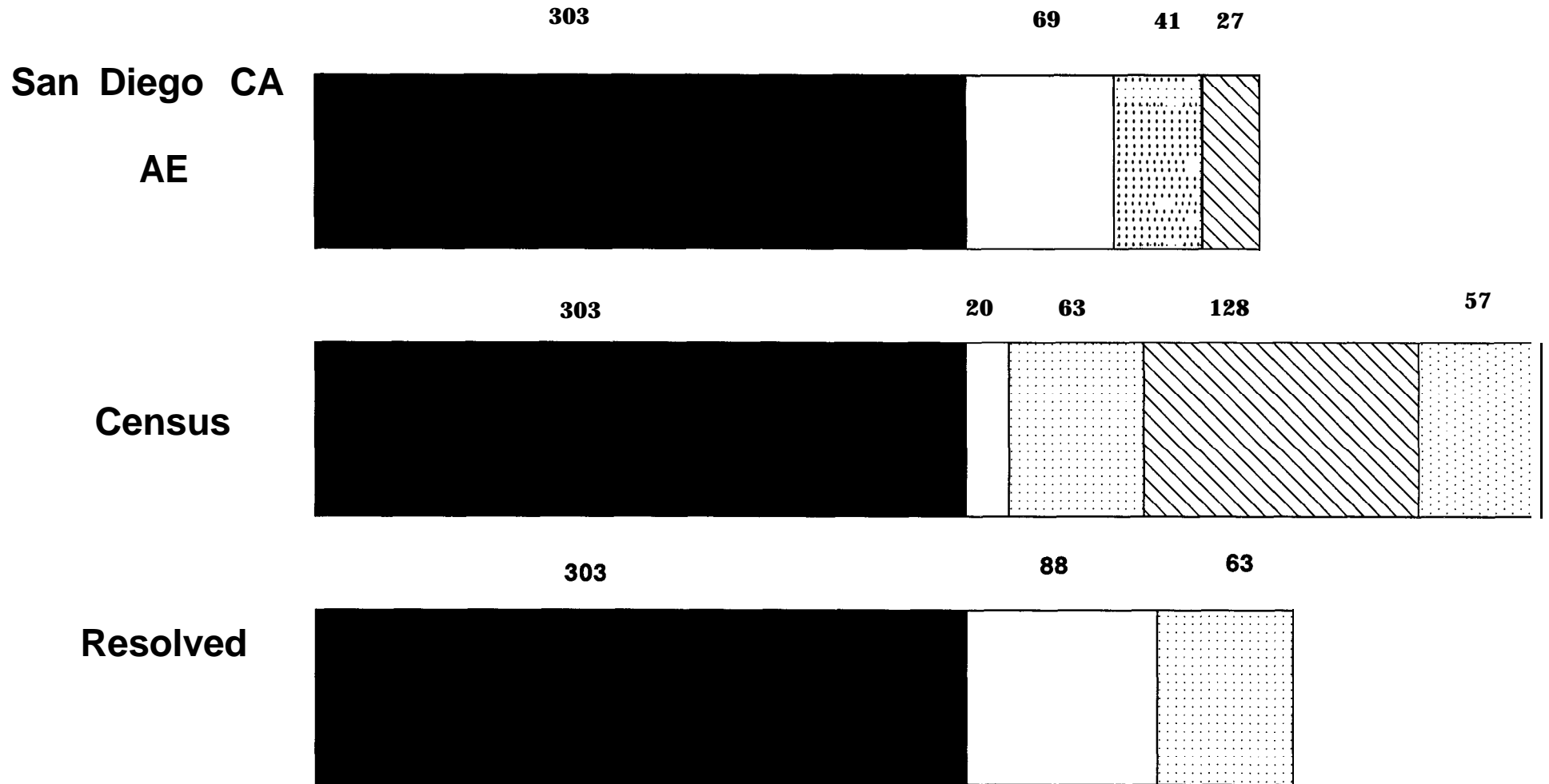
Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records

**CHART G4: URBAN/SUBURBAN  
HETEROGENEOUS ASIAN**



# CHART HI: URBAN CONCENTRATED HISPANIC



Matched/Confirmed
  Unique Records
  Movers
   
 Errors
  Uncertain Records

# CHART 42: URBAN/SUBURBAN HETEROGENEOUS UNDOCUMENTED

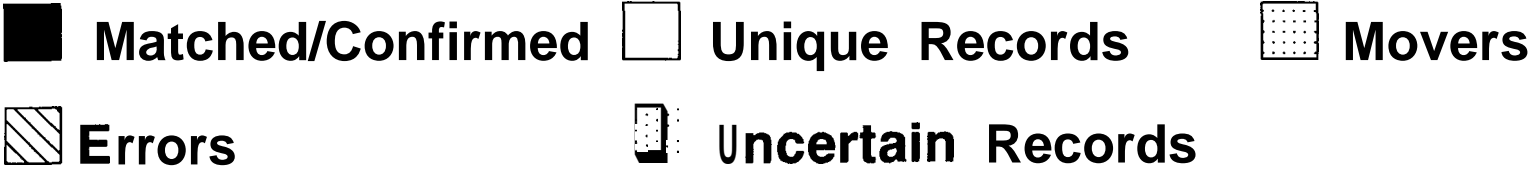
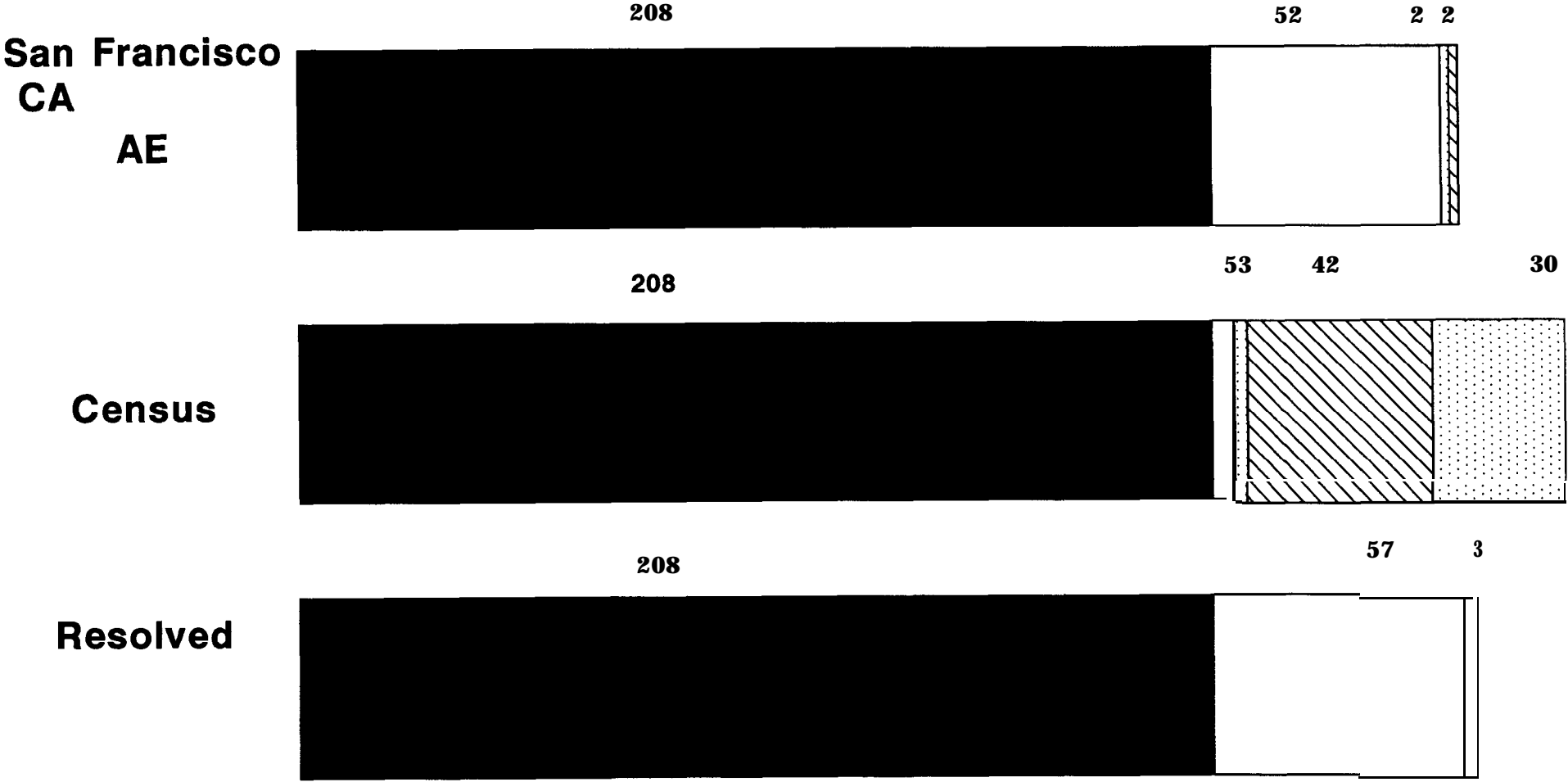
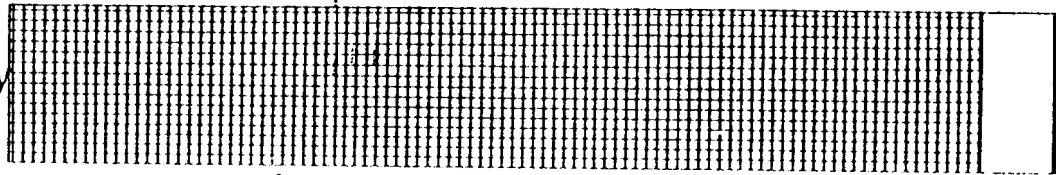
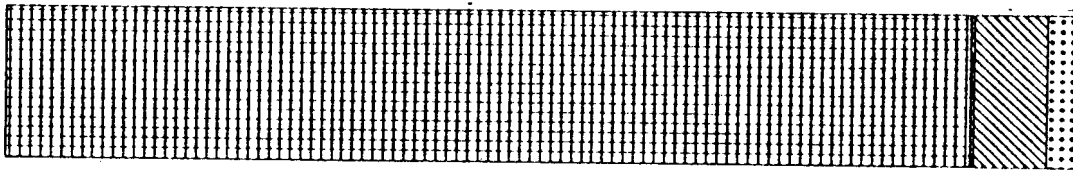


CHART I1: RURAL  
CONCENTRATED HISPANIC

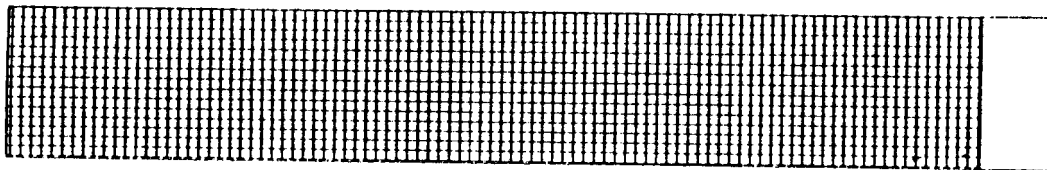
Rural Santa  
Barbara County  
AE



Census

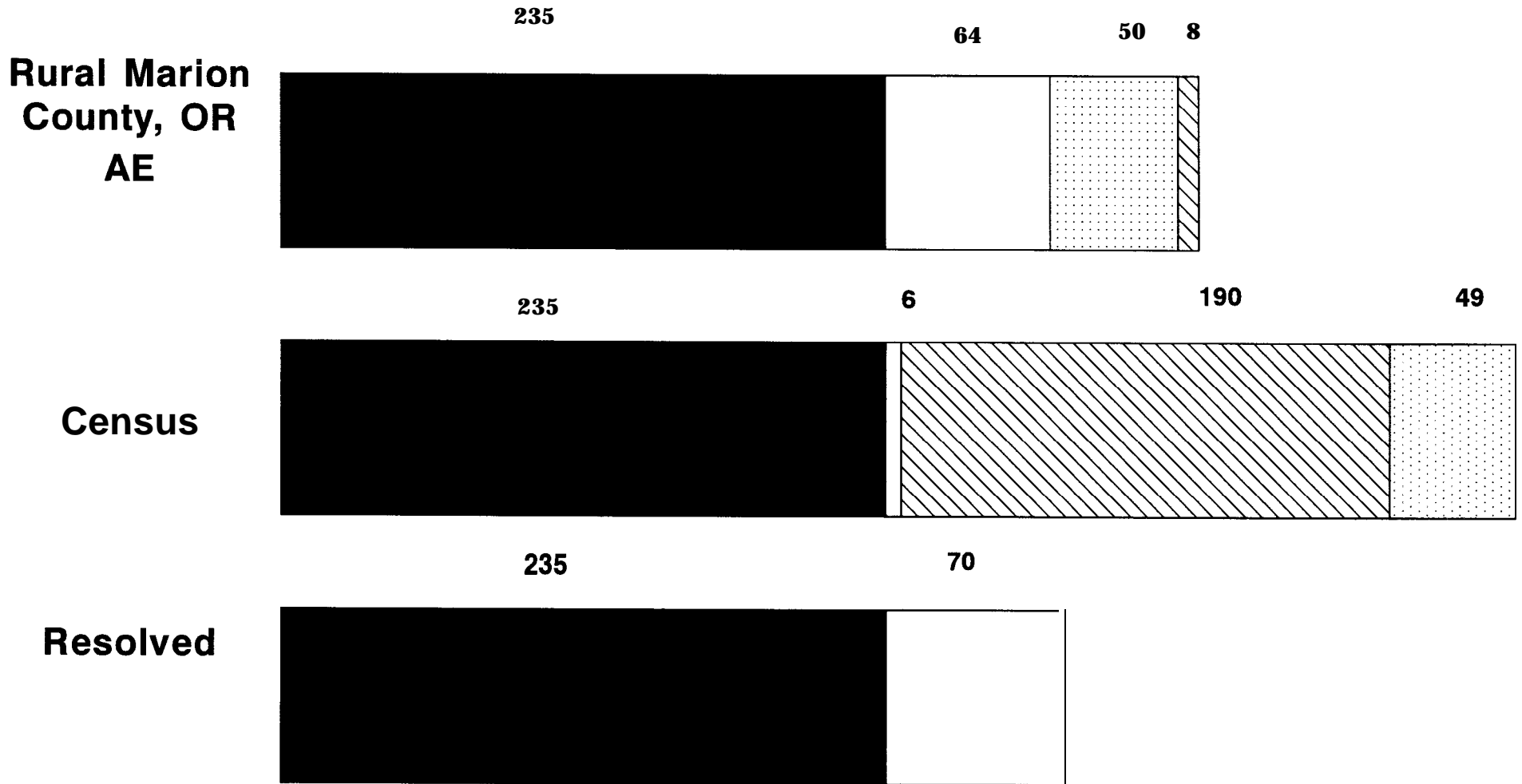


Resolved



MATCHED/CONFIRMED
  UNIQUE RECORDS
  Movers
  Errors
  Uncertain records

**CHART 12: RURAL  
CONCENTRATED HISPANIC**

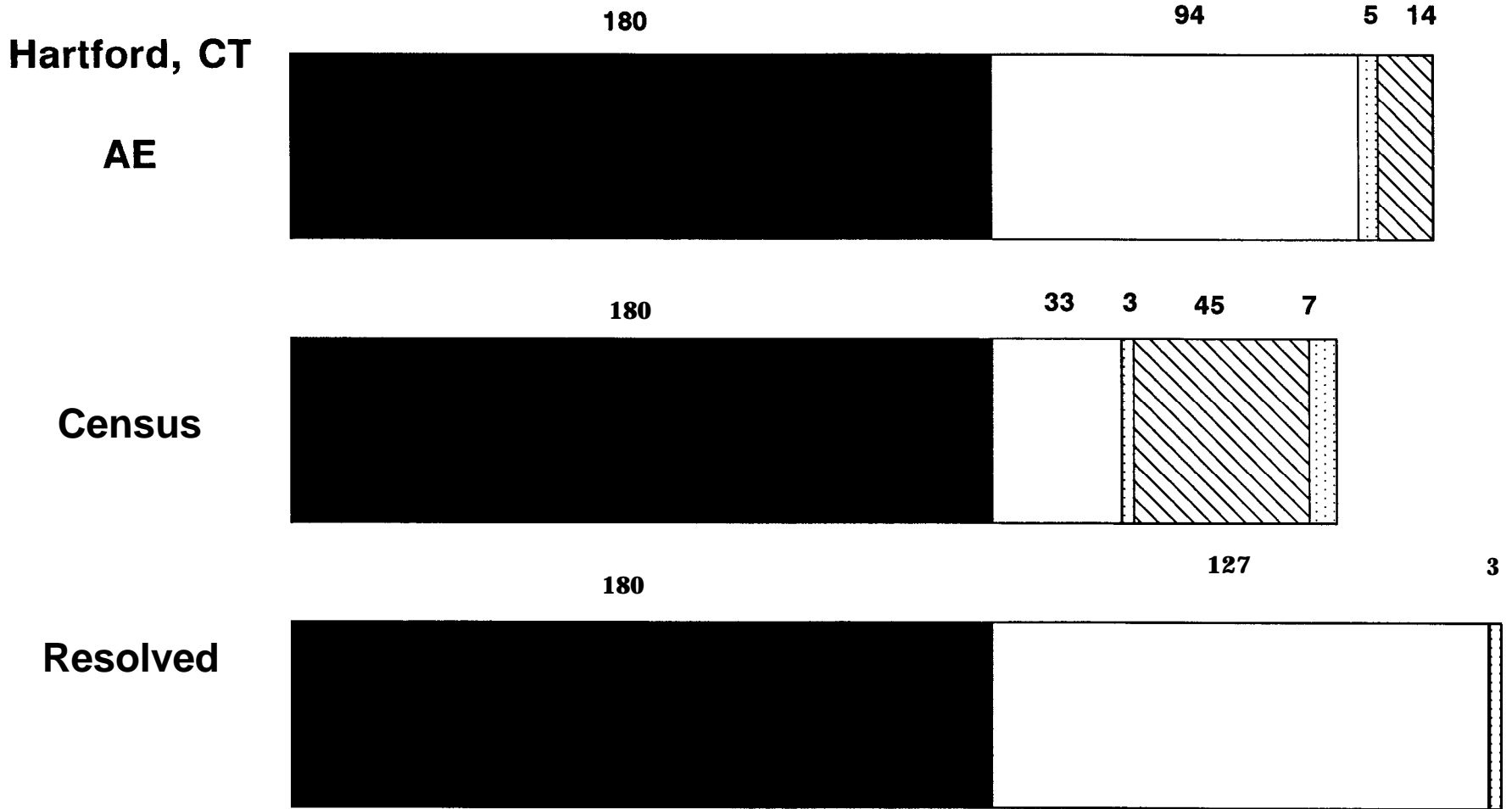


Matched/Confirmed
  Unique Records
  Movers

N Errors
  Uncertain Records



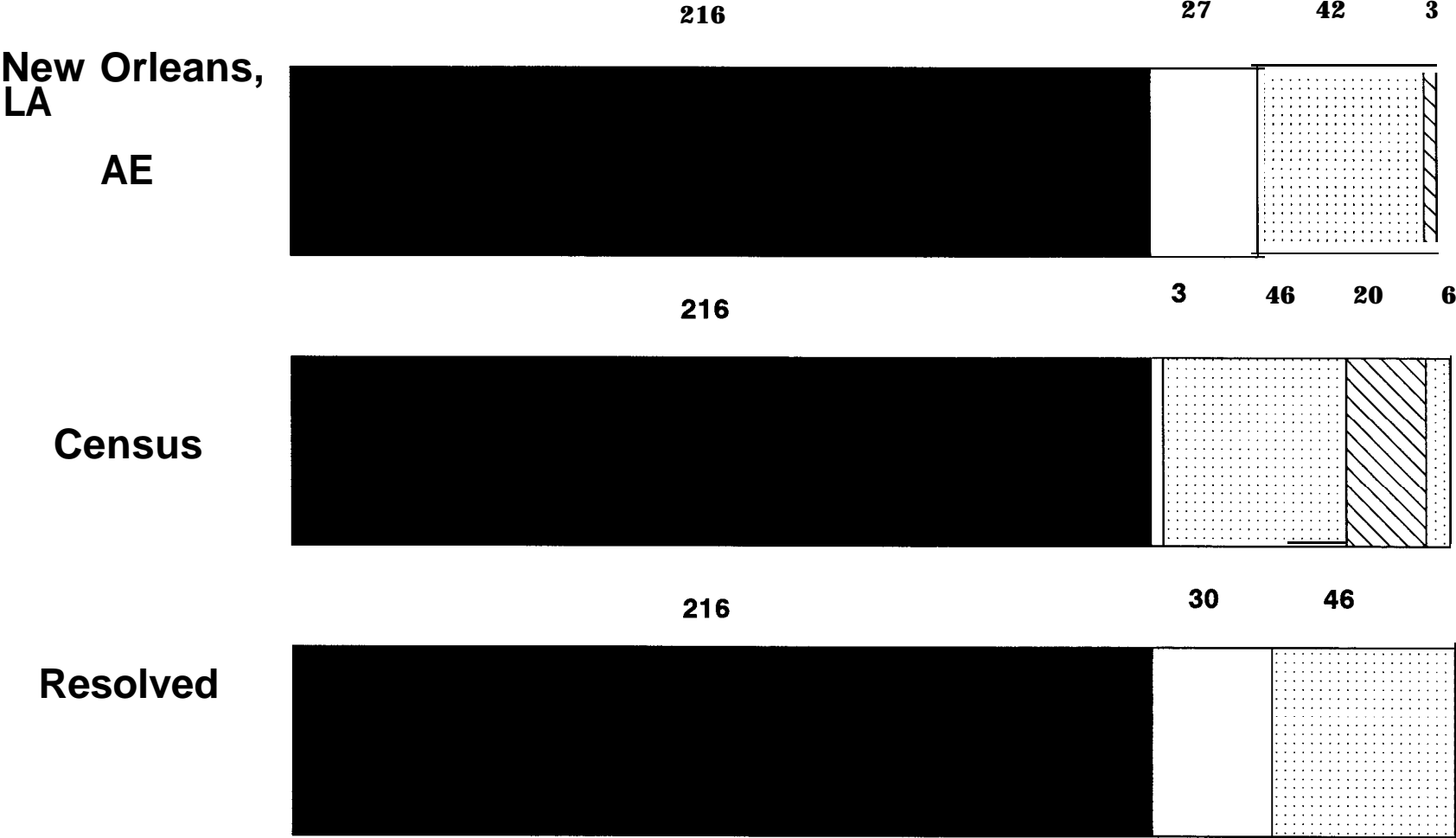
# CHART J1: URBAN SUBURBAN HETEROGENEOUS HISPANIC



Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records

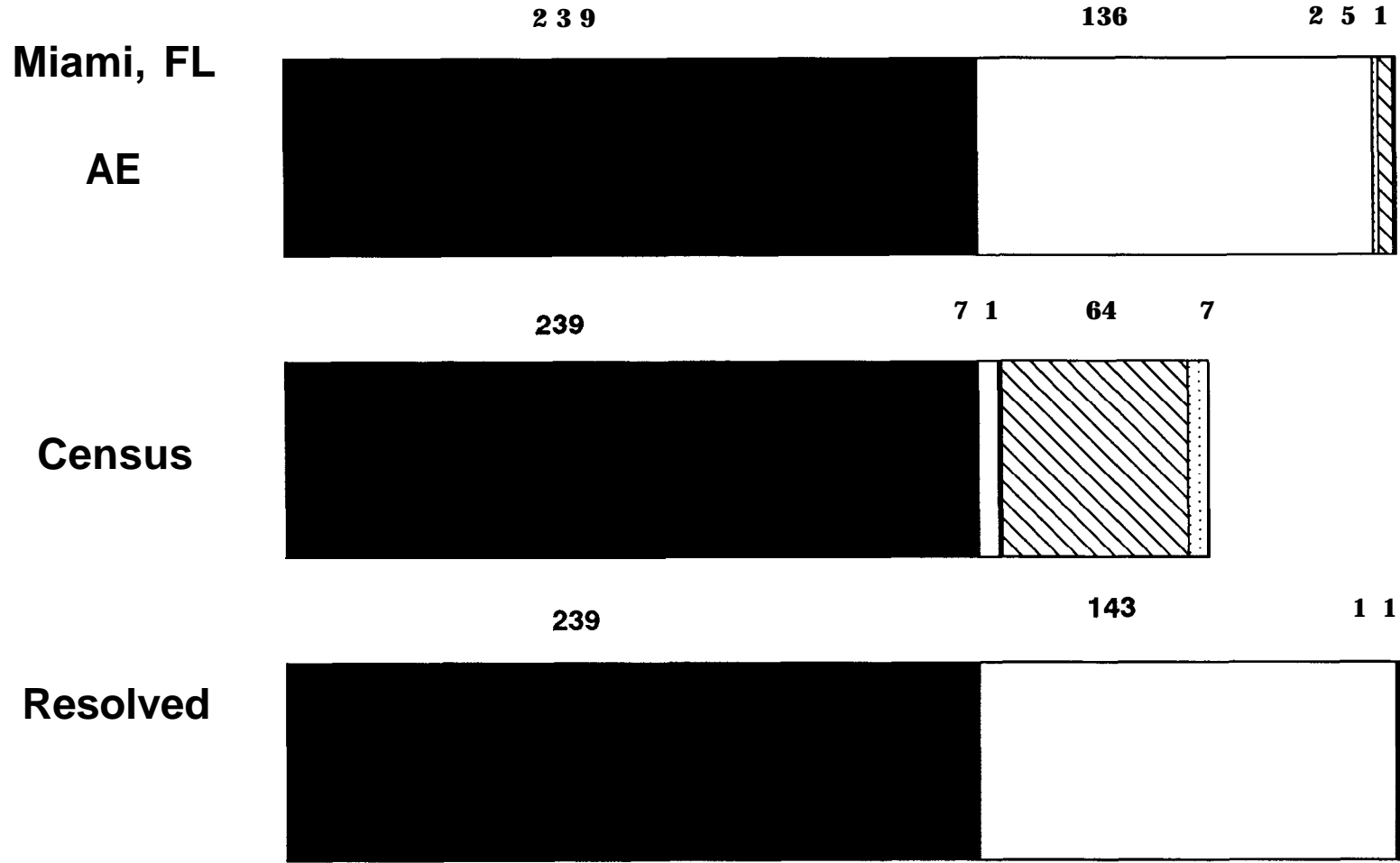
# CHART J2: URBAN/SUBURBAN HETEROGENEOUS HISPANIC



Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records

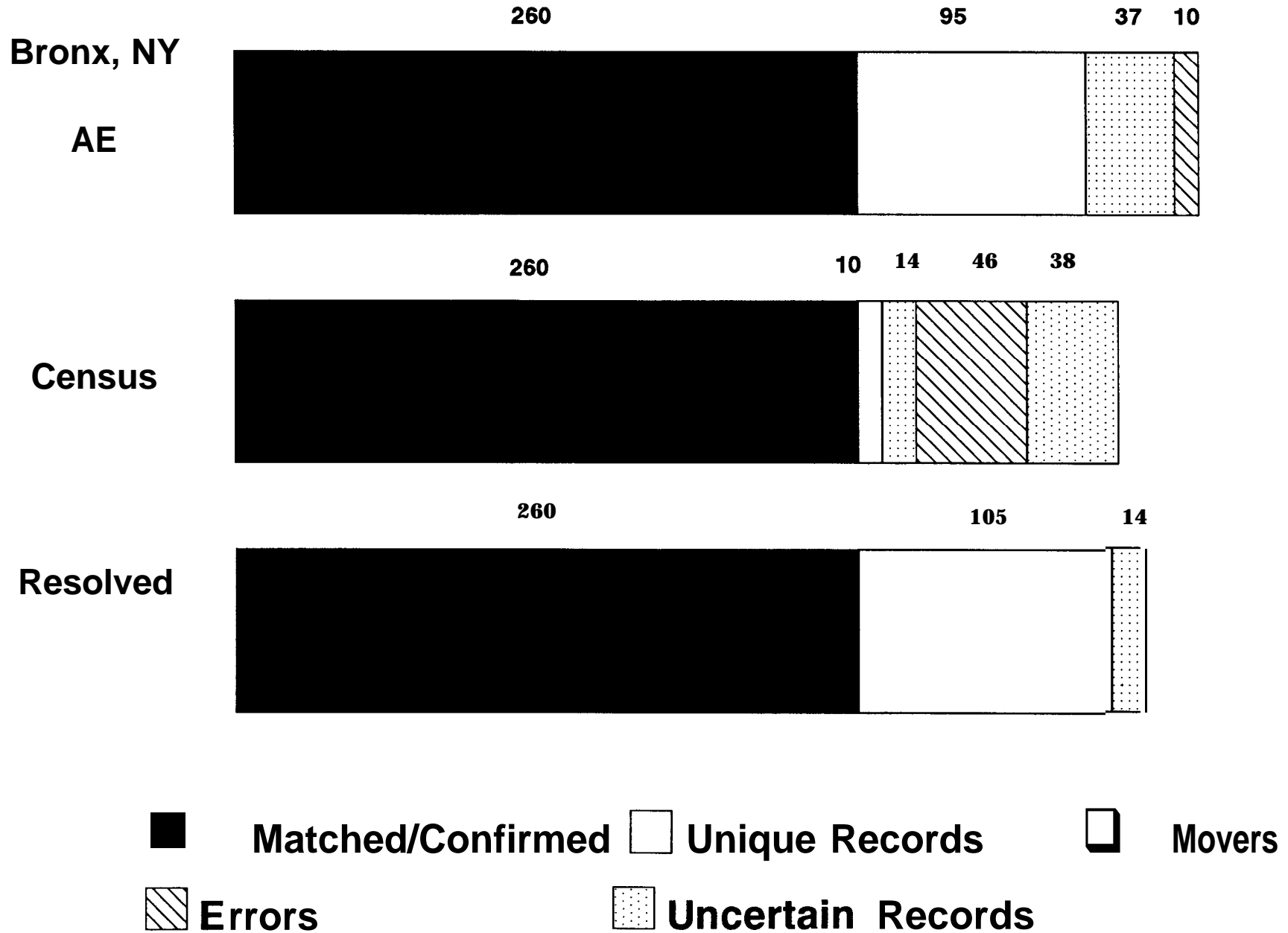
# CHART K1: URBAN CONCENTRATED UNDOCUMENTED



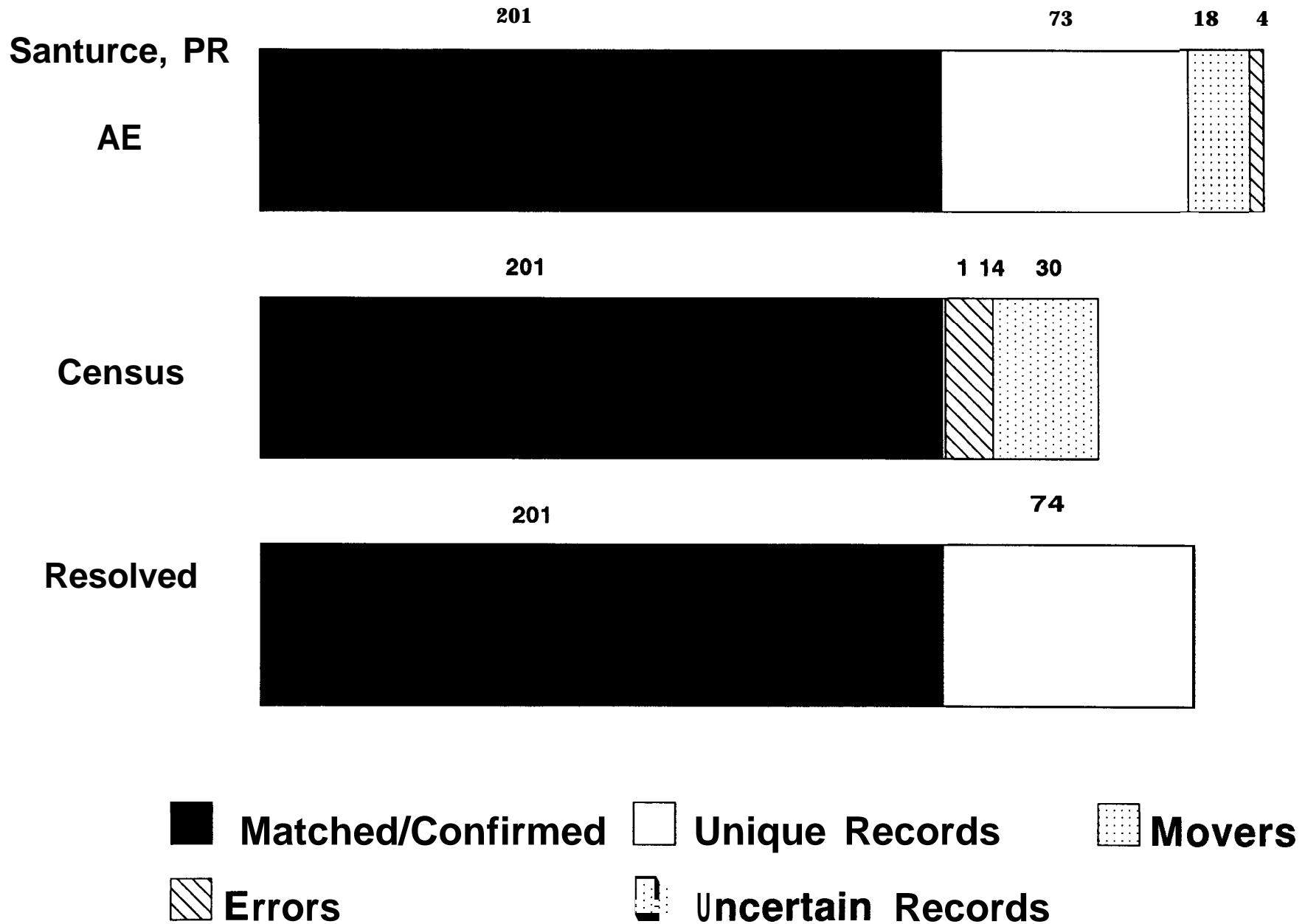
Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records

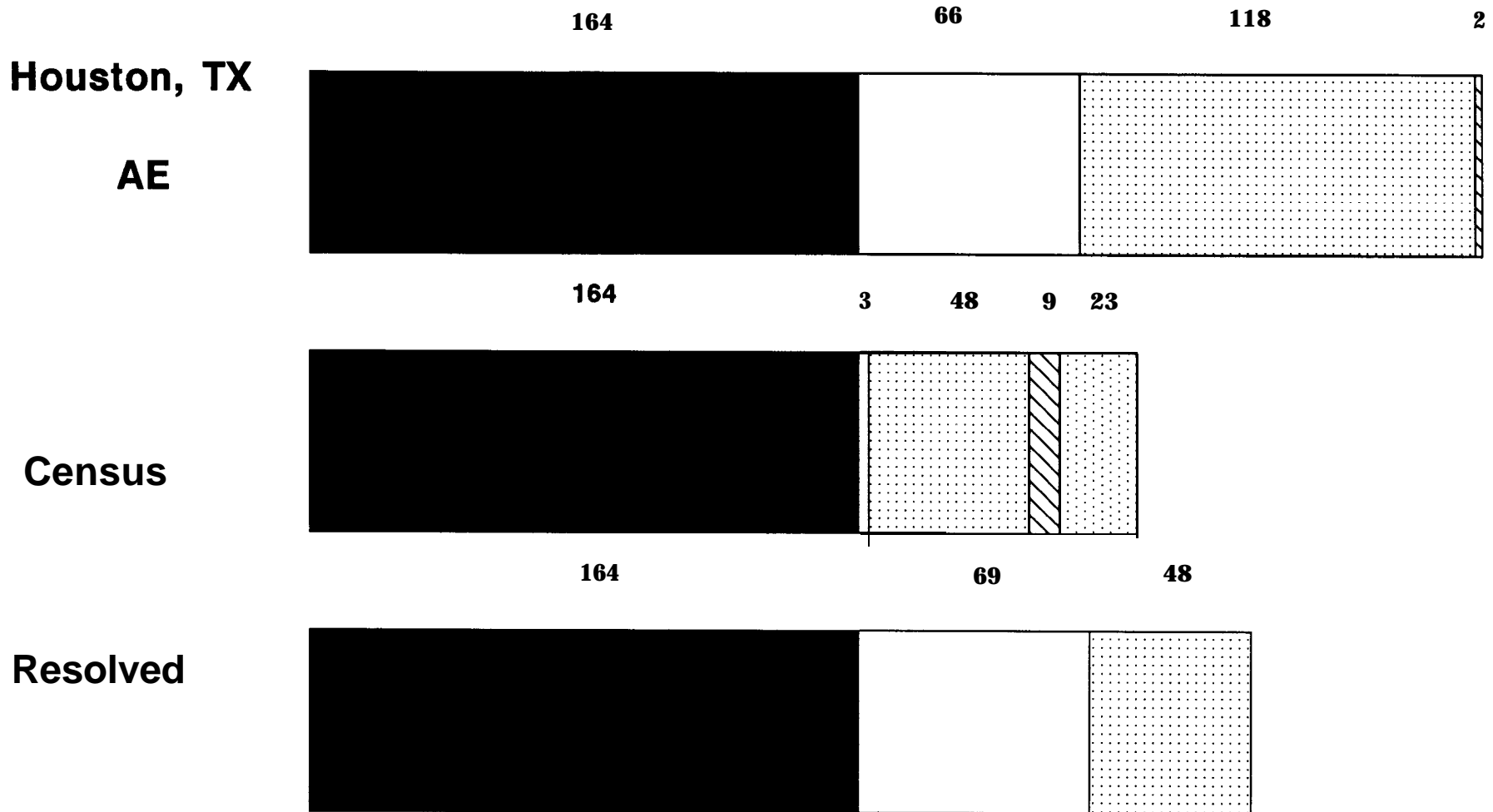
# CHART K2: URBAN CONCENTRATED UNDOCUMENTED



# CHART K3: URBAN CONCENTRATED UNDOCUMENTED



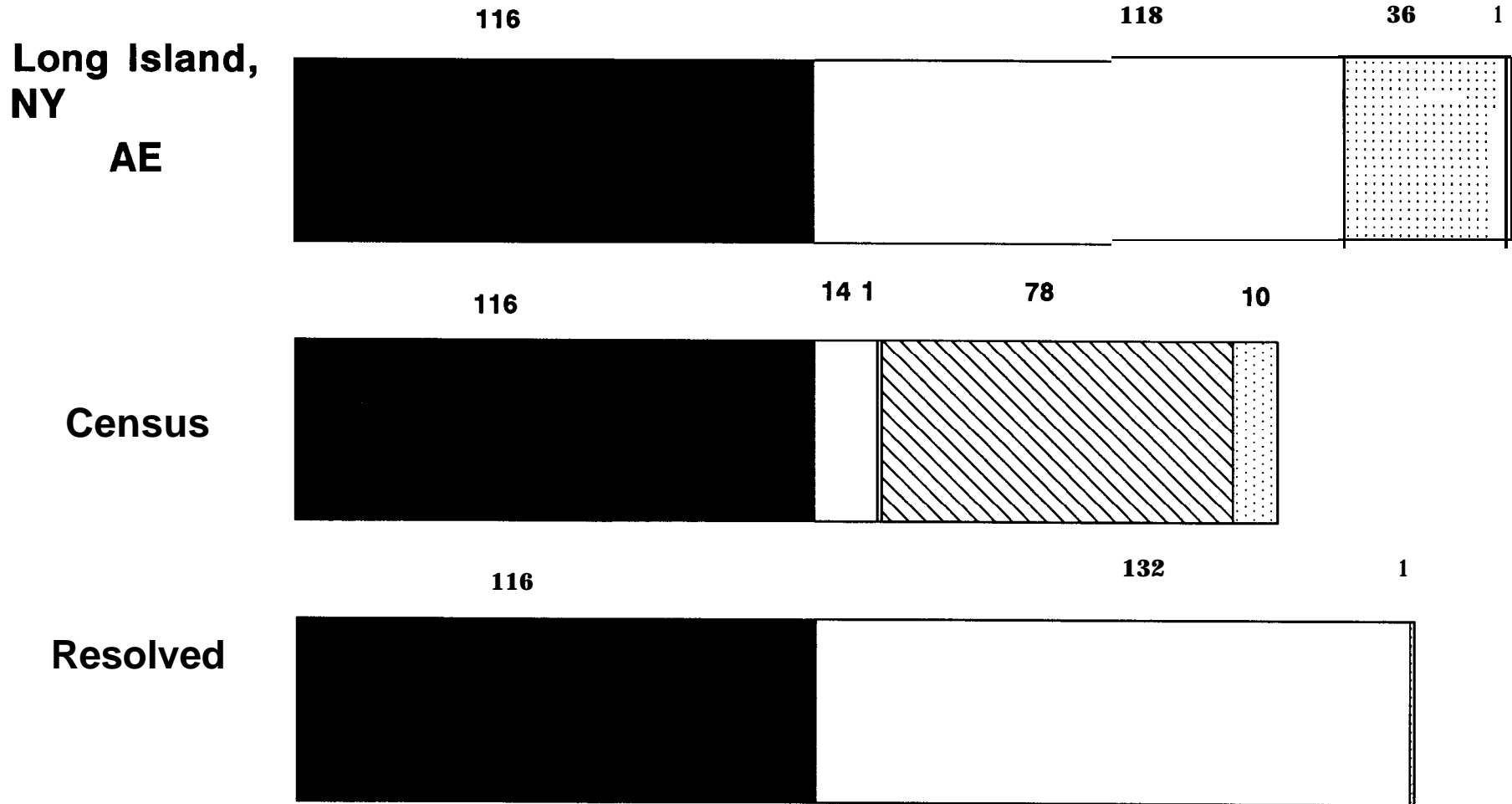
# CHART L1: URBAN/SUBURBAN HETEROGENEOUS UNDOCUMENTED



Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records

# CHART L2: URBAN/SUBURBAN HETEROGENEOUS UNDOCUMENTED



Matched/Confirmed
  Unique Records
  Movers

Errors
  Uncertain Records