

QUANTIFICATION OF MIGRATION

Estimating Unauthorized Mexican Migration to the United States: Issues and Results

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Issues in Estimating Unauthorized Migration to the United States

Estimates of the size and the growth of the unauthorized migrant population in the United States have important and far-reaching public policy implications. Such estimates influence assessments of the impact of unauthorized migrants on local labor markets, public welfare resources, school enrollments, and demand for health services. The size of this clandestine population also affects evaluations of U.S. immigration laws, border enforcement policies and the future impact of U.S. immigration and naturalization law. For instance, reliable estimates made during the early 1980s of the unauthorized population helped to predict the likely number of persons seeking legalization under the provisions of the Immigration Reform and Control Act (IRCA) (GAO, 1993; Passel and Woodrow, 1987). Nevertheless, the unauthorized migrant population is difficult to measure directly. Data obtained from survey items about legal status may be highly questionable if not worthless because unauthorized migrants wishing to escape

detection may be unlikely to reveal their status in interviews and/or questionnaires. However, indirect demographic methods for estimating the unauthorized migrant population have been developed and refined over the past twenty years. These efforts have, for the most part, yielded increasingly reliable estimates.

Our purpose is to provide an overview of the best analytical approaches and estimates of the stock and flow of the unauthorized Mexican migrant population from the late 1970s to the present. In doing so, we describe the prevailing methods used for estimating the unauthorized migrant population, including the unauthorized Mexican migrant population, during the late 1970s, 1980s, and 1990s. We thus show how the methodology and data used for making estimates of the stock and flow of the unauthorized migrant population in the United States in general and the unauthorized Mexican migrant population in particular have changed over the past two decades. We highlight how these changes have led to improvements and, in some cases, to increased inaccuracy associated with estimates of particular components of the unauthorized population. We do not review every individual estimate of the unauthorized Mexican migrant population because many studies have already been summarized and evaluated competently in other reviews (Keely, 1977; Briggs, 1984; Siegel, et al., 1980; Hill, 1985; Bean, King, and Passel, 1986; Bean, Telles, and Lowell, 1987; Edmonston, Passel, and Bean, 1990; Passel, Bean, and Edmonston, 1990; Durand and Massey, 1992; GAO, 1993; Clark, et al., 1994). Rather, we summarize and assess the conclusions of these reviews and describe individual studies where appropriate.

This report is divided into five sections. First, we introduce concepts and define the terms that influence both the selection of approaches to estimation and the interpretation of results that have emerged from various estimating procedures. Second, in order to assess their methodologies and results, we review the approaches to estimation of the stock of unauthorized Mexican migrants that have been used since the late 1970s. Third, we conduct a similar assessment for estimates of flows. Fourth, we introduce and discuss several issues whose lack of satisfactory resolution has plagued the conclusiveness and interpretation of the results of almost all estimation approaches. Fifth, given the information and considerations introduced, we briefly summarize the results of the estimates and present, based on the most recent data available, what we think the most satisfactory figures are for the size of the unauthorized Mexican population as of mid-1996.

Concepts and Definitions

An unauthorized migrant is a person who resides in the United States but is not a U.S. citizen or permanent resident alien or authorized visitor. Various terms have been used for identifying unauthorized migrants, including undocumented,

illegal, or unauthorized immigrant, alien, or migrant, each of which has a slightly different meaning and connotation. We use the term “unauthorized migrant” because it is most inclusive of the population we here attempt to describe. Not all unauthorized migrants are undocumented; some arrive in the U.S. with legal documents but later either stay beyond the expiration date of their visa or otherwise fail to comply with the terms of their entry (such as persons who legally cross the border with border crossing cards but do so to work, which violates the terms of the card). Also, not all unauthorized migrants are immigrants; many are temporary migrants who intend to and do in fact return to their countries of origin within reasonably short periods of time.

The types of data available and the methodology used to obtain estimates of the unauthorized migrant population sometimes depend on the route through which unauthorized status was attained. There are several ways to become an unauthorized migrant. These include entering without inspection, using fraudulent documentation, or violating the terms of border crossing cards. All violators of these types end up in a category the Immigration and Naturalization Service (INS) calls entrants without inspection (EWIs). Another way involves entering legally as a nonimmigrant but subsequently violating the terms of the entrance visa or other terms of entry (usually through failing to leave the U.S. by the time the visa expires). These are often called “visa overstayers.” Still another way involves entering as a legal resident alien but subsequently violating the terms of entry (e.g., through committing a criminal act or using a fraudulent marriage as a basis for entry). Most studies that attempt to estimate unauthorized migrants separately by type of entry focus on the two largest of these groups, EWIs and visa overstayers.

The data and methodology used to estimate the unauthorized Mexican migrant population also depend on whether the estimate refers to the stock of the population or the flow of the migratory stream. Stock refers to the size of the population at a particular point in time. Flow refers to the number of *entrances* into (in-flow) and *exits* from (out-flow) the population during a given time period. Most estimates of the volume of the migratory flow have focused on in-flow. In-flow in turn may be subdivided into *gross* in-flow and *net* in-flow. Gross in-flow is the total number of entrances made during a given time period whereas net in-flow is the number of persons entering during a given time period. Because an individual may enter the country as an unauthorized migrant more than once in a single time period, net in-flow is almost by definition smaller than gross in-flow. In contrast to in-flow, relatively little attention has been paid to the size and components of the out-flow of unauthorized migrants. Persons may exit unauthorized status through death, emigration, deportation, or legalization. Out-flow is a critical component because the majority of entrances are offset by exits, as indicated by estimates of net flow. Observers who fail to account for out-flow risk highly exaggerated estimates of the

rate of growth of the unauthorized migrant population. More attention has been paid to estimating net flow (in-flow minus out-flow). Net flow has typically been estimated as the change in stock as it is estimated at two or more points in time (Passel and Woodrow, 1987; Woodrow, Passel, and Warren, 1987).

Another conceptualization which is related to the idea of stocks and flows but is analytically distinct is the notion of temporary or permanent migrants, or sojourners and settlers, to use the more sociological distinction (Bean, Vernez, and Keely, 1989; Chavez, 1988). Here the reference is to the duration of stay in the destination country, but especially to the migrant's *intended* duration of stay (Roberts, 1995). Such intentions have consequences because the kinds of immigration and settlement policies that might be invoked in the cases of temporary and permanent migrants are not necessarily the same (e.g., see Passel, 1986). Further complicating the situation is that many temporary migrants undergo a transition to permanent migrants over time. Apart from their sociological and policy significance, temporary and permanent migrants may be thought to differ only in duration of stay. At any point in time, estimates of the "stock" of Mexican migrants will include both permanent and temporary migrants, the latter of whom we would expect disproportionately to return to Mexico within short periods of time. From a strictly temporal point of view, of course, the only distinction between these kinds of migrants is their length of stay in the United States. One of the challenges facing the estimation of stocks and flows of migrants, as we note below, is to develop more complete information on the duration of stay distribution of migrants, especially by sex, age at migration, and mode of entry. If such information were available, it would be relatively straightforward to develop estimates of stocks and flows of migrants. Of course, the sociological differences (and their attendant policy implications) between migrants who intend short or long durations of stay would nonetheless remain significant.

Based on the distinctions of mode-of-entry (EWI vs. overstayer) and of intended duration of stay, we may construct a four-fold classification of unauthorized entrants (see Figure 1). The groups represented by the boxes (bottom row) in this classification are important because they have implications for policy. Much of the historical and current debate in the United States about unauthorized migration derives from differences in perceptions about which of these categories dominates the flow of migrants, thus affecting growth in the stock of unauthorized migrants. During the 1970s, for example, many observers confused the concepts of stock and flow, mistaking evidence about large numbers of entrances for a sizable stock of migrants. In effect, their error was to assume that permanent EWIs substantially predominated over temporary EWIs, when at that point in time just the opposite was true. Now immigration analysts debate the relative importance of the EWI versus the overstayer flow, a debate that is not likely to

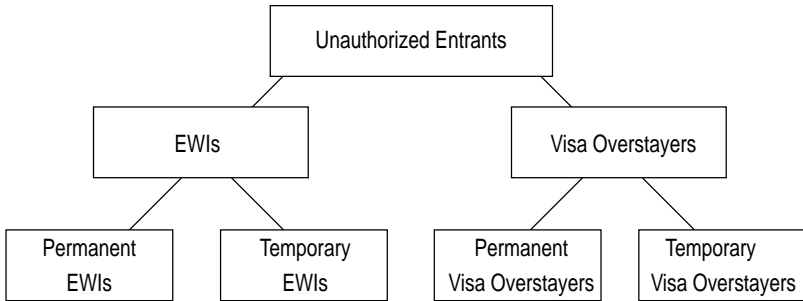


Figure 1. Analytic Typology of Kinds of Unauthorized Entrants Based on Mode of Entry and Intended Duration of Stay

be resolved until we can ascertain the relative size of the temporary versus permanent (or short-term versus long-term) component of *each* flow. Thus, if virtually all visa overstayers were found to return to their countries of origin within a couple of years of violating the terms of their visa, estimates of the stock of overstayers would consist primarily of temporary migrants, however numerous such persons might be at a given moment in time. This scenario would have different policy implications than one in which visa overstayers were generating large numbers of permanent migrants.

Approaches to the Estimation of the Stock

Speculative Estimates

Early efforts to determine the size of the total unauthorized migrant population produced results that were highly speculative, ranged widely, and were usually much higher than analytic estimates (Keely, 1977; Siegel, et al., 1980). Based on a series of “educated guesses” in relation to the number of INS apprehensions of unauthorized migrants, INS Commissioner Farrell (1972) testified that the total unauthorized population exceeded one million in 1972. Three years later, INS Commissioner Chapman (1975) raised Farrell’s estimate to 4 to 12 million largely in an effort to create a public issue about unauthorized migrants and to increase federal funding for the INS (Keely, 1977). Subsequent speculative estimates put the unauthorized population at 8.2 million (Lesko Associates, 1975), 6 million (Chapman, 1976), and 3 to 6 million (Castillo, 1978). Despite improvements in methodology, which produced lower and increasingly reliable appraisals of the size of the unauthorized population, speculative estimates continued to drive the debate about unauthorized immigration as it was played out in the media as well as in Congressional hearings during the 1980s (Bean, Telles, and Lowell, 1987). As

recently as the mid-1980s, Corwin (1982) asserted, based primarily on conjecture, that the Mexican unauthorized migrant population was as large as 8 to 10 million, and Huddle, et al. (1985) selected the middle of Corwin's range as their best estimate.

Early Analytic Estimates

Despite methodological difficulties and persistently large ranges, early analytic studies produced estimates of stock that failed to support the speculative assertions that there were more than 6 million unauthorized migrants in the country. One salient characteristic about the analytic studies of the size of the unauthorized population conducted during the 1970s is that they developed a wide variety of estimation techniques and often made creative use of available data. We list these studies in Table 1. Early analytic estimates of the total unauthorized migrant population were based on a variety of U.S. data sources. For example, Korns (1977) compared CPS employment data with the Labor Department's payroll survey measure of employment. By assuming that unauthorized migrants are not included in the CPS data but are present in the payroll data, he concluded that the number of unauthorized workers grew by 2 million between 1965 and 1969, but did not increase substantially during the 1970s.

Using a more statistically sophisticated approach, Lancaster and Scheuren (1977) matched CPS, IRS, and Social Security records of persons age 18-44 in 1973, and, using a log-linear technique, estimated the number of persons not represented in any of the three data sources. Finally, they compared the sum of the those estimated to be both in and out of the three data sources with the total estimated from the 1970 Census. On the assumption that no unauthorized migrants were enumerated in the 1970 Census—an assumption that has been supported by Census Bureau researchers (Fay, Passel, and Robinson, 1988)—they interpreted the differential as the number of resident unauthorized migrants age 18 to 44. Due to uncertainties associated with the data and the log-linear estimation technique, their estimate ranged from 2.9 to 5.7 million. Robinson (1980) used U.S. death statistics to estimate the male unauthorized population age 20-44 in 1975. Robinson assumed that most deaths to unauthorized migrants are registered in U.S. vital statistics, but that few or no unauthorized migrants are included in the 1970 census. Then, in areas where large unauthorized migrant populations were assumed to concentrate, death rates that were higher than other parts of the country were interpreted as due to "excess deaths" to unauthorized migrants. Robinson's "composite" estimates ranged between 2.6 and 3.2 million, but his more conservative estimates, which allowed for a broader range of underlying assumptions, ranged widely from 0.6 to 4.7 million. The validity of estimates produced by this method was severely weakened because death rates and patterns in cause of death among the

Table 1
Studies with Implications for Underenumeration

Author(s), Date of Publication or Release	Estimation Date	Type or Description	Method	Estimate
Goldberg (1974)	1960-1970	Net unauthorized immigration from Mexico	Projection of 1960 Mexican Census population to 1970	1.6 million
Korns, Alexander (1977)	1960-1970 (?)	Non-ag. unauthorized workers	Comparison of CPS employment and Department of Labor payroll data	Increase between 1965 & 1969 = 2,000,000; no substantial increase in the 1970s
Lancaster and Scheuren (1977)	April, 1973	unauthorized migrants	Comparison of matched CPS, IRS, and Social Security files with 1970 Census population	2.9 to 5.7 million age 18-44 for all ages added 10%
CENIET—García y Griego (1979)	1977	unauthorized Mexican migrant workers	Border interviews w/ unauthorized migrants INS apprehended and returned to Mexico	0.5 to 1.2 million
CENIET—Zazueta and Corona (1979)	1979, and 1974-1979	Legal and unauthorized Mexican migrants workers	Data: National Survey of Emigration. Asked if household member age 15+ currently in the U.S.	519,300 Mex. workers, Jan. 1979; 91% undoc.; 85% male; implies 472,700 undocs.
CENIET—García y Griego (1980)	1978	unauthorized Mexican migrant workers	Data: INS apprehensions; migration histories of 822 Mexican males, 1973, prior to entry	1978: 482,000 - 1,224,000; 1972: 234,000 - 436,000.
Robinson (1980)	1960-1970 and 1970-1975	Male unauthorized migrants age 20-44 in NY, NJ, IL, MI, FL, TX, CO, NM, AZ, and CA	Trends in age-specific death rates. 1975: 577,000 - 4,673,000	1970: 177,000 - 1,930,000 assumptions.
CIENIET: Zazueta (1982)	April, 1978	unauthorized Mexican migrant workers	see Zazueta and Corona, 1979	405,467 Mexican workers age 15+ (346,406 males, 81% age 15-39)
Diez Canedo (1984)	1975	Mexicans in the United States	Total remittances from U.S. to Mexico divided by the average remittance	481,000

unauthorized population were and remain unknown. Also, Robinson's estimates lacked precision because death records contained no information on place of birth until 1983 (GAO, 1993).

Early estimates of the Mexican unauthorized population relied on Mexican census or survey data. Goldberg (1974), using 1960 and 1970 Mexican census data, projected forward the Mexican 1960 population to 1970 by adding births and subtracting deaths and known legal emigration from Mexico to the United States. The difference between the 1970 census population and the projected population—about 1.6 million—was taken as an estimate of the size of the U.S. resident Mexican unauthorized population in 1970. One problem with Goldberg's estimate is that its underlying assumption—that the coverage of the Mexican Census remained the same from 1960 to 1970—cannot be substantiated. This is important because small differences in coverage can lead to large differences in the final estimate (Siegel, et al., 1980).

Another set of estimates were based on Mexican survey data collected by the Mexican Government (CENIET). These surveys were more successful at describing the sojourner than the settler population among Mexican emigrants to the United States. Garcia y Griego (1979; 1980) used migration histories collected from a small sample of Mexican male migrants to estimate that 0.5 to 1.2 million unauthorized Mexican workers resided in the United States in 1977 and 1978. Zazueta and Corona (1979) and Zazueta (1982) relied on data obtained from Mexico's National Survey of Emigration, which asked households about members age 15 and older who were either working or looking for work in the United States. They estimated that 400,000-500,000 Mexican workers lived in the U.S. around 1978 and 1979, 90 percent of whom were unauthorized. This estimate has been criticized as being too low, not because it is implausible for the population it describes (Durand and Massey, 1992), but because it does not include children, adult dependents, or those who do not have household members living in Mexico (Siegel, et al., 1980). Finally, Diez Canedo (1984) estimated that 481,000 Mexican workers were living in the United States in 1975. This estimate was made by calculating the total remittances sent from the U.S. to Mexico and dividing by the estimated average remittance made by migrant workers to their households in Mexico. This estimate is similar to that produced by Zazueta and Corona (1979) and Zazueta (1982), most likely because it describes a similar population, namely Mexican workers in the United States who maintain linkages to households in Mexico.

Stock Estimates Based on Residual Methods

Estimates of the size and growth of the unauthorized migrant population in the late 1980s and 1990s attempted to address some of the shortcomings of previous

work. During the 1980s, the majority of these new studies employed a residual method of one form or another. Residual methods provide an estimate and description of the “enumerated” unauthorized migrant population, that is, the part of the unauthorized population that is enumerated in the Census or represented in a sample such as the Current Population Survey (CPS) (the unenumerated portion of the population must be estimated by other means, as we discuss below). The enumerated unauthorized population is estimated as the difference between the non-citizen population enumerated in the Census or the CPS and the legally resident alien population (enumerated non-citizens—legally resident aliens = enumerated unauthorized resident migrants). This computation may be done separately by national origin, period of entry, age, sex, and, depending on the level of detail available in estimates of the legal population, by state and metropolitan area. Hence, a substantial amount of information about the enumerated unauthorized migrant population may be produced by residual methods. Studies that use a residual method are listed in Table 2. Most of these studies were conducted by the Bureau of the Census. Except in the case of Heer (1979) and Warren (1982), residual methods were generally not employed with data collected prior to the 1980s because the 1980 Census was the first decennial census in which a sizable *enumerated* unauthorized migrant population could be detected through demographic analysis (Fay, Passel, and Robinson, 1988).

Residual estimates of the enumerated unauthorized population are highly sensitive to estimates of their two components, the enumerated non-citizen and the legally resident alien populations. In the series of residual estimates made by Census Bureau researchers, the enumerated non-citizen component was routinely adjusted for errors associated with respondents not reporting country of birth, misreporting citizenship status, and misreporting nativity. The task of approximating the number of legally resident non-citizens presented greater difficulties. Because respondents are not asked about legal status in the Census or the CPS, estimates of the legally resident alien population must be obtained from external sources. Due to changes in the external data sources available and changes in the legal population brought about by the IRCA amnesty program, three different methods have been developed to estimate the size and composition of the legal immigrant population. We discuss each of these below.

The first relies on data obtained from the Alien Registration Program (form I-53) by the INS. We refer to residual methods that uses the I-53 data as *Residual Method 1*. Until 1981, the INS annually collected data on residence and other items from legally resident non-citizens. Because of the discontinuation of the Alien Registration Program after 1981, the only studies that have used Residual Method 1 include an analysis of the 1980 Census (Passel and Woodrow, 1984; Warren and Passel, 1984, 1987; Passel, 1985b) or CPS data pertaining to a year prior to 1980

Table 2
Residual and Other Estimates of the Stock of the Unauthorized Migrant Population in the United States

Author(s), Date of Publication or Release	Estimation Date	Type or Description	Method	Estimate
Heer (1979)	1970 - 1975	Net flow of unauthorized migrants (EWIs) from Mexico	Residual Method 1	82,300 - 232,000 per year; Author's favorite: 116,000 per yr.
Warren (1982)	1979	Unauthorized migrants in 1979 November CPS	Residual Method 1	Total: 1,250,000 Mexican: 734,000
Passel and Woodrow (1984)	1980	Unenumerated unauthorized migrants in the 1980 Census, by state	Residual Method 1	Total: 2,060,000 (CA = 49.8%) Mexican: 1,131,000 (CA = 67.5%)
Warren and Passel (1984)	1980	Unauthorized migrants in 1980 Census	Residual Method 1	931,000 Mexicans
Passel (1985b)	1980	Estimates for SMSAs of unauthorized residents in 1980 Census	Residual Method 1	Sum is consistent with national estimates
Passel and Woodrow (1987)	Nov., 1979 April, 1983	Unauthorized Migrants, total and Mexican, age 14+	Residual Methods 1 and 2	1979: 1,273,000 (Mex.: 917,000) 1983: 2,093,000 (Mex.: 1,422,000)
Warren and Passel (1987)	1980	Unauthorized migrants in 1980 Census	Residual Method 1	Total: 2,057,000 Mexican: 1,131,000
Woodrow, Passel and Warren (1987)	June, 1986	Unauthorized migrants in CPS	Residual Method 2	Total: 3,158,000 Mexico: 2,200,000
Woodrow and Passel (1990)	June, 1988	Unauthorized migrants in CPS	Residual Method 3	Total: 1,906,000

Table 2 (Continued)

Author(s), Date of Publication or Release	Estimation Date	Type or Description	Method	Estimate
Woodrow (1991a)	Nov., 1989 April, 1990	Total and enumerated unauthorized migrant populations	Residual Method 3, and various assumptions about undercut	Total: 3.3 million (1.7 to 5.5 million) 1989 CPS: 2.05 million (1.1 to 2.0 million if SAWs included), 1990 Census: 2.4 million (1.8 to 3.2 million)
Woodrow (1992)	1990	Published version of Woodrow (1991a)		
Clark, et. al. (1994)	1990	Unauthorized migrants in the 1990 Census	Residual Method 3 with different assumptions (include half of SAWs in legal population)	1,975,000
Bean, King, and Passel (1983)	1980	Mexican unauthorized migrants	Sex-ratio, age distribution assumptions Data: Mexican Census	1.5 - 3.8 million (no more than 4 million)
Warren (1995)	1990 and Oct., 1992	Total and Mexican-born unauthorized migrants	Constructive Method based on CPS residual estimates, Visa overstayers, and IRCA non-applicants	1990: Total: 2,600,000 Mexican: 1,009,000 Oct., 1992: Total: 3,400,000 Mexican: 1,321,000
INS (1997)	Oct. 1996	Total and Mexican-born unauthorized migrants	Constructive Method based on CPS residual estimates, Visa overstayers, and IRCA non-applicants	Total: 5 million Mexican: 2.7 million

(Heer, 1979; Warren, 1982). These studies found that about 2.057 million unauthorized migrants and 1.131 million unauthorized Mexican migrants were enumerated in the 1980 Census. The unauthorized population in the Census included more women and children than indicated in apprehensions and Mexican migrant history data. Because residual methods probably identify settlers better than sojourners and commuters, this suggests that the settled part of the unauthorized population includes a greater proportion of families and children than does the commuter and sojourner portions of the unauthorized population (Warren and Passel, 1987, see also Muller and Espenshade, 1985).

One problem associated with Residual Method 1 is that about 11 percent of legal immigrants were found to be missing from the I-53 data. Therefore, estimates of the legal alien population had to be carefully adjusted for undercoverage (Warren and Passel, 1984; 1987). Another difficulty associated with Residual Method 1 is that it makes the assumption that all legal non-citizens are enumerated in the census or CPS (Woodrow-Lafield, 1995; Woodrow, Passel, and Warren, 1987). If legal non-citizen migrants had a undercount rate as high as five percent, for instance, then the number of legal non-citizens enumerated in the 1980 Census would be overstated by about 300,000, and the number of unauthorized migrants would be underestimated by the same amount. Warren and Passel's (1987) estimate of 2.057 million enumerated unauthorized migrants would then have to be adjusted upward to about 2.357 million.

The limitations associated with Residual Method 1 are small in comparison to its advantages. The availability of Alien Registration data permitted researchers to estimate directly the legally resident population rather than having to construct it from INS immigration records and estimates of mortality and emigration. Also, Alien Registration data allowed researchers to determine at the state and metropolitan levels the size of local legal migrant populations. This level of geographic detail thus permitted the generation of estimates of the unauthorized population by state (Passel and Woodrow, 1984) and metropolitan area (Bean, Lowell and Taylor, 1988; Passel, 1985b). Such studies showed that unauthorized migrants concentrate in areas that have large legal immigrant populations, namely metropolitan areas in California, New York, Texas, Illinois, and Florida. The results also indicated that among all states in 1980, California contained the largest share of unauthorized immigrants, accommodating 49.8 percent of all unauthorized migrants and 67.5 percent of unauthorized migrants originating in Mexico.

After 1981, the Alien Registration Program was discontinued. As a result, estimates of the legal alien population had to be constructed by projecting forward the 1980 adjusted Alien Registration population to the appropriate year. For each year of projection, numbers of new legal immigrants, refugees and other long-term legal nonimmigrants were added and numbers of emigrants and deaths due to the

legally resident foreign born were subtracted. Residual methods that use this procedure are here referred to as *Residual Method 2*. The Census Bureau used Residual Method 2 to estimate the unauthorized population enumerated in the CPS during the 1980s up until the enactment of the IRCA legalization programs in 1988. These studies include analyses of the April 1983 (Passel and Woodrow, 1987) and the June 1986 CPSs (Woodrow, Passel, and Warren, 1987), which were the only CPS data collected before 1988 that included information about nativity. These studies concluded that by June 1986, about 3.158 unauthorized migrants, 2.196 million of whom were born in Mexico, were detected by the CPS. More importantly, by this time the Census Bureau had compiled consistent estimates of the unauthorized population enumerated in the CPS from 1979 to 1986. Assuming that the rate of undercoverage was consistent across the CPS samples, reliable estimates of net growth of the unauthorized population could be made. The studies indicate that the unauthorized migrant population grew during the early 1980s by about 218,000 per year, and the Mexican-origin unauthorized population by about 115,000 per year. Due to uncertainties associated with assumptions about emigration and disproportionate undercoverage, however, the authors conceded that the annual net growth of the unauthorized population could have been in the range of 100,000 to 300,000, with about half of the growth due to growth in the Mexican-origin unauthorized population.

Most of the error associated with estimates that use Residual Method 2 is due to uncertainties associated with emigration rather than immigration or mortality. The INS keeps accurate records of the number and types of legal immigrants. Also, the component due to mortality is small in comparison to the other two components of change, so the proportion of total error due to error in the number of deaths is small (Himes and Clogg, 1992). However, the INS has not collected data about emigrants since 1957. During the 1980s, the Census Bureau routinely used a mid-range estimate of 133,000 foreign-born emigrants per year. This approximation was based on the results of research pertaining to the 1960s (Warren and Peck, 1980) and the 1970s (Warren and Passel, 1987). During the 1980s, attempts were made to update estimates of the emigration component by analyzing special items included in the CPS during the late 1980s that asked respondents about relatives who emigrated (Woodrow-Lafield, 1996). Although the results of this work do not contradict the estimate of 133,000, it also indicates that other estimates of the annual number of emigrants ranging from about 110,000 to 200,000 would be plausible. To the extent that the actual annual number of emigrants during the 1980s were consistently higher than 133,000, the legal migrant population would have been overstated and the enumerated unauthorized migrant population would have been set too low. The opposite would be the case if the actual annual number of emigrants had consistently been lower than 133,000. Because annual

estimates of emigration are subtracted from the legal alien population for each year the population is carried forward, the error associated with emigration increases with each additional year. In other words, the longer the time data sources on the legal migrant population or emigration are not available, the greater the uncertainty associated with residual estimates.

Another source of error in estimates produced by Residual Method 2 relates to assumptions about undercoverage of the legal immigrant population. As does Residual Method 1, Method 2 assumes that all the legal non-citizens are enumerated. In addition, Residual Method 2 assumes that all immigrants who arrived since 1980—regardless of citizenship status—are represented in the CPS. The bias associated with this additional assumption most likely increases over time as the proportion of the immigrant population who arrived after 1980 grows. The error due to this bias is increased even more for the above cited studies because they analyzed CPS rather than census data and the CPS has higher levels of undercoverage than the census (Woodrow, 1991). That is, residual estimates of the enumerated unauthorized population are understated the most when undercount rates of the legal population are the highest. Of course, if the error associated with emigration leads to an overestimate of the unauthorized population, then part or all of the underestimation due to assumptions about undercount of the legal population may be canceled out.

Starting in 1987, about 1.7 million long-term unauthorized migrants and an additional 1.3 million unauthorized special agricultural workers (SAWs) applied for legalization under the amnesty provisions of the 1986 Immigration Reform and Control Act (IRCA). As a result, post-1987 residual estimates of the unauthorized migrant population have to be adjusted to account for this increase in the legal population. In this variation of the residual method, which we refer to as *Residual Method 3*, the legal population is constructed in the same way as in Residual Method 2, only the number of IRCA legalized migrants are added to the estimate of the legally resident foreign-born population. Studies that used this method include analyses of the June 1988 (Woodrow and Passel, 1990) and the November 1989 CPS files (Woodrow, 1990, 1991, 1992), and the 1990 Census (Woodrow, 1991; GAO, 1993; Clark, et al., 1994). The results of these studies show that about 2.3 million (ranging between 1.8 to 3.2 million) unauthorized migrants were enumerated in the 1990 Census, about 80 percent of whom were born in Mexico. This research also indicates that had IRCA not taken effect, the unauthorized population would have grown by roughly 200,000 annually between 1986 and 1990, reaching a size 70 percent larger in 1990 than was observed. Most of this difference was due to the large numbers of Mexicans who legalized under IRCA; Mexicans comprised more than 70 percent of the IRCA legalized population (Woodrow and Passel, 1990).

The limitations associated with Residual Method 3 are the same as those associated with Residual Method 2. In addition, estimates produced by Method 3 may be inaccurate because it is unclear what fraction of the SAW legalized population remained resident in the United States after legalization. Many SAW applicants presumably were seasonal migrant workers who spent a portion of each year in Mexico. Whether to include the SAW population in estimates of the legally resident population is important because each addition to the legal population results in a one-to-one decrease in the estimated unauthorized population. Even though researchers tend to focus on the number of SAWs who were resident in the United States at the time of the Census, it is more important to focus on the number of SAWs who were actually enumerated in the Census. The Census Bureau assumes that an insignificant number of SAWs were enumerated in the Census or CPS. Hence, they do not include the 1.3 million SAWs in estimates of the enumerated legally resident alien population (although they do provide ranges of estimates that result from varying assumptions about coverage of the SAW population).

Clark, et al. (1994) attempt to make estimates based on more plausible assumptions. They assume that in the SAW legalized population, all pre-1984 entrants, all non-Mexicans, and about half of the remaining post-1984 entrants were resident in the United States at the time of the 1990 Census. This amounts to 728,000 or about half of the SAW population. Clark, et al. (1994) include all 728,000 in estimates of the legally resident population, resulting in an estimate of only 1.975 million enumerated unauthorized migrants in 1990 (in comparison, the Census Bureau made a “preferred” estimate of 2.390 million)¹. Although it does seem implausible that no SAWs were resident nor enumerated in 1990, the Clark, et al., estimate of 728,000 could be too high. Even if half of the SAW population were *resident* in the United States in 1990, it is doubtful that more than 40 to 50 percent of this group were *enumerated*. Migrant agricultural workers have the highest rates of undercount among all groups, reaching 60 to 70 percent (Gabbard, Kissam, and Martin, 1993). However, there is evidence that a large number of SAW applicants were not really farm workers, plus there is no guarantee that farm workers in 1988 continued to be farm workers in 1990. Hence, more SAWs may have been resident in the United States in 1990 than many analysts have thought, and since many of the SAWs may have been working outside agriculture, they may have had higher coverage rates than has previously been assumed. We introduce below new evidence about the residency patterns of the SAW population in the early 1990s.

In sum, residual methods provide reliable, consistent estimates of the size and growth as well as detailed descriptions of the resident unauthorized migrant population. In comparison with earlier analytic studies, the studies that used residual methods during the 1980s and early 1990s were more successful at describing, quantifying, and reducing the range of error associated with their estimates.

Unfortunately, the range of error is likely to grow over time as information about emigration and the size and geographical residence of the legal immigrant population become increasingly out-of-date, and as other changes occur in the legal population, such as those brought about by IRCA. Unless other methods for obtaining accurate information about emigration or the legal immigrant population are developed, residual methods will probably dominate the literature to a lesser extent in the future than they did during 1980s. Another important limitation of residual estimates is that they describe a selective part of the unauthorized population, namely the portion that is probably least mobile and most permanently established. As we describe in a separate technical appendix, other methods must be used to estimate the total and unenumerated portions of the stock of the unauthorized migrant population.

Other Approaches to Estimating Stocks

Other approaches to estimating the stock of unauthorized migrants used during the 1980s and 1990s include a sex-ratio based method and a constructed components method. Bean, King, and Passel (1983) developed a range of estimates by examining sex ratios from the 1980 Mexican census. Given that Mexican emigration is age- and sex-selective, and that it occurs almost exclusively to the United States, this research was able to estimate the number of persons “missing” from the age and sex structure of the 1980 Mexican population expected in the absence of emigration. Assumptions were made about differential census coverage by gender, the proportion male among all emigrants aged 15-39, and the proportion of all emigrants aged 15-39. After estimating numbers of Mexican emigrants for various combinations of assumptions, estimates of unauthorized migrants were developed by subtracting the number of I-53 reporting Mexican legal immigrants in the United States, adjusted for underreporting. A major criticism is that the results obtained are highly sensitive to the assumptions used, but a benefit is that the approach does provide estimates of the total size of the unauthorized Mexican population, not just the enumerated part of the population. The figures obtained ranged from 1.5 to 3.8 million, establishing an upper-bound estimate for 1980.

The most widely known and cited set of recent estimates of the stock of unauthorized migrants has been constructed by the U.S. Immigration and Naturalization Service (1997). Estimates are developed for each of the states in the United States and for each of 99 countries of origin. The approach seeks to take advantage of information obtained after IRCA about the numbers and characteristics of unauthorized migrants legalizing their residence in the United States under the provisions of IRCA. The INS estimate is not predominantly a residual estimate, but rather involves starting with a 1982 estimate and then adding and subtracting

components of change to bring the figure forward to October 1996. The approach combines information about IRCA's legalization applicants with results obtained from using both the residual method to estimate net EWIs and the overstay method (see below) to estimate overstayers. Applying these procedures to construct the components of the unauthorized population results in an estimate of five million unauthorized migrants resident in the United States by October 1996, of whom 2.7 million were estimated to be from Mexico and another 660,000 from El Salvador, Guatemala, Honduras, and Nicaragua. Fifty-nine percent of the total was estimated to have "entered without inspection" and 41 percent to be "visa overstays." Most of the Mexicans were estimated to have entered the country as EWIs.

Approaches to the Estimation of Flows

Speculative and Early Estimates

In comparison of estimates to stock, few speculative estimates have been made about the rate of growth of the unauthorized population. Chapman (1976) guessed that the population grew by 500,000 per year, and Reubens (1980) estimated an annual growth of 600,000 during the 1970s. Despite analytical evidence that the annual growth of the unauthorized population was considerably less than the speculative estimate of 500,000, the media and others continued to cite the number. As Passel (1985: 6) chided, "The figure of 500,000 per year is widely used even though there is no strong empirical support for selecting this figure over any other. It seems to be popular because it is a nice 'round' figure that is easy for the public to accept."

Analytic estimates of the volume of in-flow and net flow of the unauthorized population tended to refer to different parts of the unauthorized population and ranged widely. These studies are listed in Table 3. Garcia y Griego (1980), using Mexican survey data on migration histories, estimated that the annual in-flow from Mexico of unauthorized migrants in 1975 ranged from 75,000 to 284,000. Others used INS apprehensions data as a proxy for general patterns in the level of flow of EWIs from Mexico (e.g., North, 1975; Frisbie, 1975). The difficulties associated with using apprehensions data as a proxy for the flow of EWIs are (1) that apprehensions data do not include those who succeed in evading detection, and (2) that apprehensions data count arrests, not individuals; arrest data are potentially misleading because they include multiple arrests by the same person. The INS (1976) attempted to estimate the component of fraudulent successful entries by conducting field studies at 15 Mexican border entry points and 10 major international airports. Two teams of immigration inspectors were stationed at each entry point and carried out careful inspections of entrants for fraudulent documents and intent

Table 3
Analytic Estimates of the Flows of the Unauthorized Migrant Population to the United States

Author(s), Date of Publication or Release	Estimation Date	Type or Description	Method	Estimate
North (1975)	1960s-1970s	Flow of unauthorized migrants	Apprehensions	Rise in flow during the 1960s, but not in the 1970s.
Chapman (1976)	1974-1976	Non-immigrant Visa-overstays	Matched Visa entrance and departure records of non-immigrants	740,000 failed to leave on time since 1974; over 1,000,000 from before 1974.
U.S. Department of Justice, INS (1976)	1975	Unauthorized migrants entering with fraudulent documents or intents to violate Visa terms	Thorough INS inspections at border points and at 10 major airports, Sept. 1975-Feb. 1976	500,000 successful fraudulent entries
Heer (1979)	1970-1975	Net flow of unauthorized migrants (EWIs) from Mexico	Residual Method 1, CPS data	82,300-232,000 per year. Author's favorite: 116,000 per yr.
CENIET-Garcia y Griego (1980)	1978	Unauthorized Mexican migrant workers	INS apprehensions; migration histories of 822 Mexican males, 1973, prior to entry	Net inflow 1975-1976: 75,000-284,000 problems
Passel and Woodrow (1987)	April, 1980-April, 1983	Annual net flow of unauthorized migrants, age 14+	Residual Methods 1 and 2	100,000 to 300,000 per year
Woodrow, Passel and Warren (1987)	1979-1986 and 1980-1986	Net flow of unauthorized migrants	Residual Methods 1 and 2	1980-86: Total 176,000 per year Mexican 170,000 per year 1979-86: Total 218,000 per year Mexican 115,000 per year

Table 12 (Continued)

Author(s), Date of Publication or Release	Estimation Date	Type or Description	Method	Estimate
Bean, Espenshade, White, and Dymowski (1990)	Nov., 1986-Sept., 1989	Net flow of EWIs (Southern border)	Data: INS apprehensions, controlled for population in Mexico at risk of migration (age 15-34), number of SAWs, and wage and employment ratios	Apprehensions have seasonal pattern, have dropped post-IRCA, and have increased among women and children
Espenshade (1990)	Nov., 1986-Sept., 1988	Gross flow of unauthorized Mexican EWIs (Southern border)	Repeated trials model	Per month: 175,000 unauthorized entries Total: 4,000,000 from 1986-1988
Warren (1990)	1985-1988	Non-immigrant Visa-overstays by country of origin	INS matched arrival and departure records	Annual number: 217,000 to 255,000 (fluctuated by year). Primary country of origin is Mexico
Espenshade (1995a)	1977-1988	Gross flow of EWIs (Southern border)	Repeated trials model	Correlation between apprehensions and flow = 0.9; Flow = 2.2 * apps.

to violate visa terms. Based on this work the INS concluded that there were 500,000 fraudulent entries into the United States in 1975, although these estimates have been severely criticized because of small sample sizes and variable rates of detection depending on the day of the week, the immigration inspector, and point of entry (Keely, 1977).

Chapman (1976) attempted to measure the visa overstay component of the in-flow of unauthorized migrants by matching INS records of nonimmigrant visa entries and departures. He estimated that from 1974 to 1976, 740,000 nonimmigrants (about 250,000 annually) failed to leave the United States on time. These estimates were almost certainly too high because they included nonimmigrants who left the country but whose departure forms were never filed, were lost, or otherwise never successfully matched with an arrival form. The size of this error was probably large. At the time, the INS collected about six million entrance forms from nonimmigrants per year, and departure forms were linked with arrival forms by matching the name of the nonimmigrant (Siegel, et al., 1980).

Summed together, the estimates of in-flow of EWIs and visa overstayers easily matched and even exceeded the speculative estimate that the unauthorized population grew at a rate of 500,000 per year. However, analytic estimates of net flow showed that the out-flow component of the unauthorized migrant migration stream offset much of the in-flow component. Based on an analysis of CPS data, Heer (1979) estimated that the unauthorized Mexican population grew by about 116,000 annually from 1970 to 1975. Although Siegel, et al. (1980) criticized the estimate because of its large sampling error, they concluded on the basis of the study and other evidence that much of the unauthorized migration to the United States appeared to be circular and was offset by return migration to Mexico.

Studies of flow conducted during the 1990s have exploited the availability of new data and new estimation techniques. The INS has long matched arrivals with departures (NIIS), terming arrivals that do not match with departures apparent overstays. The latest research using this data goes one step further by attempting to eliminate system error in the data (Warren, 1990). System error refers to false overstays. INS data for 12 countries which are assumed to have no overstays are used to determine the extent of system error (Belgium, Netherlands Antilles, Norway, Sweden, Kuwait, Saudi Arabia, Switzerland, Australia, New Zealand, Surinam, Singapore and Finland). System error is computed separately by class of admission. First, overstays are estimated for each country using the Nonimmigrant Information System (NIIS). Next, system error is subtracted from the rate of apparent overstay. The remainder is multiplied by the number of expected departures to equal the estimated number of overstays. For estimation by state of destination and age, a calculation was made for each category by state or age. The rate of system error was adjusted to match those of the countries.

Nonimmigrant arrivals increased from 9.4 million in 1985 to about 14.3 million in 1988. The annual number of overstays has fluctuated around 217,000-255,000 (increasing by 12% in 1986 and dropping 7% in 1987 (following IRCA) and increasing 13% in 1988). The level of system error has dropped continually (10.3% in 1985 to 8.1% in 1988). North America has been the primary region of origin for overstayers (with the most growth occurring among those from Mexico). The top five countries of origin (Mexico, Haiti, the Philippines, Poland and India) were also among the leading countries for application for legal residence under IRCA. Looking at the geographic distribution of those overstaying their visa time limits, those states with the largest foreign-born population also attracted the most overstays. Finally, Warren finds that most overstays were between ages 15 and 44.

Two primary assumptions are associated with this estimation procedure: (1) that there are few actual overstays from the 12 benchmark countries selected so all apparent overstays from these countries are assumed to represent system error and (2) that a single point estimate of system error applies to every country within a category of admission. In addition, the estimates exclude immigrant students who overstay and all those who enter the United States without inspection (EWIs). In a modification of the procedure undertaken as a result of a GAO (1995) scrutiny of the approach, system error was re-estimated on a airline-by-airline instead of country basis. While the revision resulted in somewhat higher or lower figures for a few countries, the overall result was nearly identical to the figures obtained using the previous method.

Another way to estimate the flow of unauthorized immigrants to the United States is to use apprehensions data from the U.S. southern border. Apprehensions data have been used as a proxy for unauthorized migration flows (Frisbie, 1975; Jenkins, 1977; Fogel, 1982; Davila, 1986 and Borjas, Freeman and Lang, 1987). Recent studies concentrating on apprehensions data from the Immigration and Naturalization Service (Bean, et al., 1990 and Espenshade, 1990 and 1995a as well as another study by Crane, et al., 1990) avoid many of the problems of previous efforts by converting apprehensions into border crossings by assessing the probability of getting caught and the population at risk of getting caught, thereby controlling for multiple apprehensions in the data (Passel, Bean and Edmonston, 1990). In order to gauge the influence of factors that affect flows across the border, these estimates rely on models with sets of demographic, economic, and behavioral variables (the size of young adult population in Mexico (15-34); the number of legalized SAWs; relative wage and unemployment ratios; dummy variables for months to capture seasonality; the number of officer hours and other measures of enforcement on the border for apprehensions) (Bean, et al., 1990).

Apprehensions data are limited because many unauthorized migrants are never apprehended, others may be apprehended many times, and the volume of

apprehensions depends on the amount of effort expended by INS to apprehend. Researchers compensate by using some measure of the amount of border patrol effort (Bean, et al., 1990; Jenkins, 1977; Fogel, 1982; and Borjas, et al., 1987) and include measures of the population at risk for apprehension (Bean, et al., 1990). Espenshade (1990, 1995a) takes the analysis one step further by using a repeated trials model that “captures the phenomenon that, once arrested by the U.S. Border Patrol and taken back across the Mexican border, most unauthorized migrants are likely to keep trying to enter the United States until they succeed” (Espenshade, 1990:175). Making use of INS data on the number of repeaters to estimate the probability of apprehension, and then using this to convert apprehensions measures to estimates of numbers of crossers, Espenshade constructs a time series on the monthly flow of unauthorized migrants. He arrives at an estimate for the period November 1986 to September 1988 of 175,000 per month, or a total of 4 million unauthorized migrants. In another repeated trials study, Massey and Singer (1995) utilize INS apprehensions data combined with data from a survey of migrants in Mexico. They arrive at an estimate of the net flow by 1989 of 5.2 million.

There are several assumptions that must be made to use apprehensions data in these models. The largest of these is that all individuals, even those apprehended and sent back across the border, will succeed by the end of the month. If some individuals do not attempt to cross again, this assumption will overstate the flow. In addition they rely upon the assumption that the probability of being caught is about 30 percent. A small change in this figure would change the size of the estimated flow. These studies assume that data on previous apprehensions is accurate and they assume that the probability of apprehension does not vary across groups (Passel, Bean and Edmonston, 1990). The model on repeated trials also relies largely on data on repeat crossers which depend on the facial recognition of the border crosser by border patrol agents, a process highly subject to error.

Issues Affecting Estimates

Lack of sufficient data in a number of areas makes difficult the interpretation of results of studies of the size and change of the unauthorized migrant population. These include: (1) insufficient evidence about the extent of underenumeration in official census and survey data of the unauthorized migrant population; (2) insufficient data to develop more accurate estimates of the size of the legally resident population to use in residual estimation approaches; (3) insufficient information and data about duration of stay in the United States among unauthorized migrants; (4) insufficient data to estimate emigration in the case of the legally resident immigrant population; and (5) insufficient evidence on the residency patterns of the SAWs population. In this section, we discuss the third of these issues and

introduce new evidence on the fifth. The first is discussed in a separate accompanying technical appendix entitled “Estimating Underenumeration among Unauthorized Mexican Migrants to the United States: Applications of Mortality Analyses,” and the second and fourth are discussed in a separate accompanying technical appendix entitled “Issues in Estimating Legal Immigration.”

Duration of Stay Issues

The distribution of the length of duration of stay in the United States among unauthorized migrants by mode of entry and the change in this distribution over time are crucial factors in understanding the significance of various estimates of the size of the unauthorized migrant population. If almost all EWIs were circular migrants staying only a short time, and if almost all visa overstayers returned to their countries of origin within a couple of years or so, the policy significance of unauthorized migration would be greatly different than if either EWIs or visa overstayers, or both, contained substantial fractions of long-duration migrants. Similarly, long-duration migrants (say those who stay 10 to 20 years or more) but who then return to their countries of origin are different yet again in their implications for policy from migrants who stay permanently.

At present, very little is known about the distribution of duration of stay of EWIs and visa overstayers (although data on this variable are now available for the subgroup of EWIs who have returned to Mexico from the studies conducted by Massey and his colleagues). Also, information on the duration of stay of visa overstayers has reportedly been calculated but not released by the INS. One of the reasons duration information is important is because different duration migrants exert different demands on public benefits. At the extremes, if the flow of EWIs and visa overstayers were each very large, the stock of unauthorized migrants in the United States at any one point in time would be sizable even if all durations of stay were relatively short (i.e., even if all migrants were temporary). If EWIs were to exhibit typically longer durations than visa overstayers, they would contribute more to the stock of unauthorized migrants on that count alone.

What does the available evidence suggest about the comparative distributions of duration of stay among EWIs and visa overstayers? In the case of EWIs, almost all of whom are from Mexico, several pieces of evidence point to increasing durations of stay over the past 15 to 20 years: (1) increasing proportions of entire families, including women and children in the Mexican flow (Bean, et al., 1990; Woodrow and Passel, 1990; Cornelius, 1992); (2) apparently decreasing rates of underenumeration of the unauthorized Mexican-born population in official U.S. Censuses and surveys, as noted above, a trend that could result from increasing proportions of migrants with long durations of stay, especially given that census

undercount rates in general have not been declining over the same period (Robinson, et al., 1993); and (3) ethnographic studies whose results indicate that Mexican migrants now embarking for the United States show longer intended durations of stay than prior migrants (Cornelius, 1992). Unless a comparable shift has occurred in the duration distribution among overstayers, this would have the effect of raising the proportion of the unauthorized stock attributable to EWIs. In the case of visa overstayers, the only relevant evidence to our knowledge is Warren's (1995) finding that when overstayers were traced for a year or two longer than the one year that is typically examined for purposes of defining an overstay, about 46 percent had either converted their status or returned to their country of origin. This suggests that if they were followed a bit longer, the vast majority would be found to have converted their status or returned.

Even though durations of stay may be increasing among EWIs, many may eventually return to Mexico (a pattern we might term long-term circular migration). Evidence of this pattern would also have significant policy implications. Tables 4 to 6 present information on the extent of cohort succession among Mexican-born persons based on results from the 1970, 1980, and 1990 U.S. Censuses and the 1994/95 CPSs. Does the evidence in these tables indicate that Mexican migrants tend to return to Mexico after having spent time in the United States, a phenomenon we would expect to be more likely among unauthorized migrants? Because there were hardly any unauthorized migrants enumerated in the 1970 Census, we would not anticipate evidence of cohort attrition beyond what we would expect based on mortality in the 1980 data, and this is in fact what we observe. In the cases of 1990 and 1994/95 data, however, evidence of substantial cohort attrition emerges. Since there is no known reason to think this occurs because of migration to some country other than the United States, it is reasonable to think it stems at least in part from return migrations to Mexico among persons in their late forties and fifties. This phenomenon, of course, would reduce the stock of Mexican EWIs compared to the case where long-term circular migration did not occur and most migrants were permanent.

SAWs Residency Patterns

The number of SAWs resident in the United States or Mexico is a crucial element in developing residual estimates, as noted above. To develop a rough estimate of the number of SAWs living in Mexico at any single point in time during the early 1990s, we used data from the Mexican Migration Project (1996) that collected interviews on households in 39 communities in Mexico with a smaller sample of households in the United States. The households in the Mexican sample were drawn from simple random samples of households in the 39 communities. The households

Table 4
Components of Change from 1970 to 1980 in the Mexican-born
Population Due to Immigration, Mortality, and Other Causes

Sex, Age in 1980	Population			Components of Change 1970 to 1980		
	1970 (1)	1980 (2)	Change 1980-1970 (3) = (2)-(1)	Increase Due To Immig'n (4)	Decrease Due To Mortality (5)	Other (6) = (3)-(4)-(5)
Both Sexes, Total	759,711	2,199,221	1,439,510	1,270,246	-90,572	259,836
0-4	-	55,325	55,325	55,325	0	0
5-9	-	119,309	119,309	119,309	0	0
10-14	15,084	148,775	133,691	124,540	-62	9,213
15-19	31,459	214,195	182,736	162,857	-149	20,028
20-24	41,926	312,309	270,383	243,658	-376	27,101
25-34	116,503	547,228	430,725	350,977	-1,374	81,122
35-44	138,300	315,402	177,102	127,323	-2,142	51,921
45-54	118,238	191,476	73,238	50,734	-4,393	26,897
55-64	94,431	128,407	33,976	22,159	-8,582	20,399
65+	203,770	166,795	-36,975	13,364	-73,495	23,156
Males, Total	371,463	1,158,765	787,302	695,567	-53,626	145,361
0-4	-	28,513	28,513	28,513	0	0
5-9	-	61,963	61,963	61,963	0	0
10-14	7,749	75,678	67,929	63,201	-37	4,765
15-19	15,962	117,785	101,823	90,773	-101	11,151
20-24	20,878	177,796	156,918	142,505	-275	14,688
25-34	57,458	300,934	243,476	199,159	-998	45,315
35-44	64,532	162,660	98,128	70,031	-1,340	29,437
45-54	57,683	93,961	36,278	24,478	-2,790	14,590
55-64	48,949	65,546	16,597	9,949	-5,768	12,416
65+	98,252	73,929	-24,323	4,995	-42,316	12,998
Females, Total	388,248	1,040,456	652,208	574,679	-36,946	114,475
0-4	-	26,812	26,812	26,812	0	0
5-9	-	57,346	57,346	57,346	0	0
10-14	7,335	73,097	65,762	61,339	-25	4,448
15-19	15,497	96,410	80,913	72,084	-48	8,877
20-24	21,048	134,513	113,465	101,153	-100	12,412
25-34	59,045	246,294	187,249	151,818	-376	35,807
35-44	73,768	152,742	78,974	57,292	-802	22,484
45-54	60,555	97,515	36,960	26,256	-1,602	12,306
55-64	45,482	62,861	17,379	12,210	-2,814	7,983
65+	105,518	92,866	-12,652	8,369	-31,179	10,158

Table 5
Components of Change from 1980 to 1990 in the Mexican-born
Population Due to Immigration, Mortality, and Other Causes

Sex, Age in 1990	Population			Components of Change 1980 to 1990		
	1980 (1)	1990 (2)	Change 1990-1980 (3) = (2)-(1)	Increase Due To Immig'n (4)	Decrease Due To Mortality (5)	Other (6) = (3)-(4)-(5)
Both Sexes, Total	2,199,221	4,298,014	2,098,793	2,144,919	-146,551	100,425
0-4	-	102,388	102,388	102,388	0	0
5-9	-	155,561	155,561	155,561	0	0
10-14	55,325	203,705	148,380	155,913	-158	-7,375
15-19	119,309	381,253	261,944	255,960	-441	6,425
20-24	148,775	650,539	501,764	495,186	-1,097	7,675
25-34	214,195	1,239,616	1,025,421	657,455	-5,688	373,654
35-44	312,309	749,645	437,336	189,441	-7,594	255,489
45-54	547,228	393,338	-153,890	78,033	-9,267	-222,656
55-64	315,402	209,278	-106,124	33,412	-14,280	-125,256
65+	486,678	212,691	-273,987	21,570	-108,027	-187,530
Males, Total	1,158,765	2,369,514	1,210,749	1,233,235	-83,211	60,725
0-4	-	52,447	52,447	52,447	0	0
5-9	-	78,906	78,906	78,906	0	0
10-14	28,513	105,632	77,119	81,144	-93	-3,932
15-19	61,963	216,179	154,216	151,736	-297	27,767
20-24	75,678	396,386	320,708	314,872	-796	6,632
25-34	117,785	720,819	603,034	387,207	-4,476	220,303
35-44	177,796	405,138	227,342	103,226	-5,548	129,664
45-54	300,934	200,583	-100,351	40,369	-6,109	-134,611
55-64	162,660	99,858	-62,802	14,804	-9,074	-68,532
65+	233,436	93,566	-139,870	8,524	-56,818	-91,576
Females, Total	1,040,456	1,928,500	888,044	911,684	-63,340	39,700
0-4	-	49,941	49,941	49,941	0	0
5-9	-	76,655	76,655	76,655	0	0
10-14	26,812	98,073	71,261	74,769	-65	-3,443
15-19	57,346	165,074	107,728	104,224	-144	3,648
20-24	73,097	254,153	181,056	180,314	-301	10,423
25-34	96,410	518,797	422,387	270,248	-1,211	153,350
35-44	134,513	344,507	209,994	86,215	-2,046	125,825
45-54	246,294	192,755	-53,539	37,664	-3,158	-88,045
55-64	152,742	109,420	-43,322	18,608	-5,206	-56,724
65+	253,242	119,125	-134,117	13,046	-51,209	-95,954

Table 6
Components of Change from 1990 to 1995 in the Mexican-born
Population Due to Immigration, Mortality, and Other Causes

Sex, Age in 1995	Population			Components of Change 1990 to 1995		
	1990 (1)	1995 (2)	Change 1995-1990 (3) = (2)-(1)	Increase Due To Immig'n (4)	Decrease Due To Mortality (5)	Other (6) = (3)-(4)-(5)
Both Sexes, Total	4,766,014	6,669,468	1,903,454	1,707,618	-99,031	294,867
0-4	-	112,349	112,349	112,349	0	0
5-9	113,537	296,585	183,048	198,907	-151	-15,708
10-14	172,500	302,377	129,877	124,975	-129	5,031
15-19	225,886	447,095	221,209	219,920	-480	1,769
20-24	422,767	895,238	472,471	404,402	-1,676	69,745
25-34	1,463,595	2,022,661	559,067	411,641	-7,525	154,951
35-44	1,119,252	1,285,707	166,454	1,436,578	-8,693	31,490
45-54	600,093	655,699	55,606	552,367	-8,935	9,304
55-64	313,748	336,475	22,727	253,423	-11,354	8,739
65+	334,637	315,282	-19,355	11,187	-60,089	29,547
Males, Total	2,627,524	3,720,895	1,093,371	9,721,378	-58,249	179,482
0-4	-	68,095	68,095	68,095	0	0
5-9	58,158	166,829	108,671	116,356	-88	-7,597
10-14	87,498	163,080	75,582	72,411	-76	3,247
15-19	117,134	259,654	142,520	134,184	-336	8,672
20-24	239,718	530,888	291,169	238,671	-1,313	53,811
25-34	879,166	1,164,056	284,890	210,175	-6,146	80,861
35-44	623,849	715,896	92,047	97,404	-6,581	1,224
45-54	318,102	346,287	28,186	18,442	-6,082	15,826
55-64	154,746	156,329	1,583	8,252	-7,122	453
65+	149,154	149,781	627	8,148	-3,050	22,984
Females, Total	2,138,490	2,948,573	810,083	735,480	-40,782	115,385
0-4	-	44,254	44,254	44,254	0	0
5-9	55,379	129,756	74,377	82,551	-62	-8,112
10-14	85,002	139,297	5,425	52,564	-53	1,783
15-19	108,752	187,441	78,689	85,736	-144	-6,903
20-24	183,049	364,350	181,302	165,731	-363	15,934
25-34	584,428	858,605	274,177	201,466	-1,379	74,090
35-44	495,404	569,811	74,407	46,253	-2,112	30,266
45-54	281,991	309,412	27,421	36,795	-2,853	-6,521
55-64	159,002	180,146	21,144	17,091	-4,232	8,286
65+	185,483	165,501	-19,983	3,039	-29,584	6,562

in the United States were drawn from a non-random sample of 10-20 out-migrants from the Mexican communities (none of the U.S. data was used for estimating SAWs). We selected only those migrants in Mexico who reported that they came to the United States under the Agricultural Workers Program (SAWs). The interviews with this subsample of respondents were conducted between 1987 and 1995. Of the 236 SAWs in the data, 191 were interviewed in Mexico. These 191 cases were then classified by state of residence in Mexico. The number of households sampled in the state and the number of household in the state from the 1990 Mexican census (INEGI, 1990) were used to calculate the proportion of households in each state that were included in the sample. The number of SAWs by state was divided by this sampling fraction and summed across states to arrive at the total number of SAWs living in the Mexican states. Finally, three estimates of the number of SAWs living in Mexico were developed assuming different proportions of migrants from Mexico coming from the seven sampled states. These estimates assume that 25%, 33% or 40% of all migrants from Mexico to the United States come from these seven sending states. The results are presented in Table 7 and indicate that about 240,000 to 380,000 SAWs were resident in Mexico at a single point in time during this time interval. Since 1,050,000 of the SAWs were from Mexico, 670,000 to 810,000 of the SAWs are estimated to have been resident in the United States at any single point in time during the early 1990s.

Summary of Results from Estimating Procedures

As of 1980, stock and flow estimates of the unauthorized migrant population tended to be unreliable due in part to lack of methodologies for correcting for biases in the available data sources. For instance, better methods had to be developed in order to make more valid estimates of in-flow on the basis of INS apprehensions and nonimmigrant entrance/exit forms. Also, early analytic estimates tended to be inconsistent in their assumptions, methodologies, and, consequently, in the populations they described. Hence, the various estimates were difficult to compare and evaluate (Bos, 1984). Finally, reviewers (Siegel, et al., 1980; Hill, 1985) found that most early analytic estimates of stock and flow were highly sensitive to their underlying assumptions. More complete data about the foreign-born and the unauthorized migrant population had to be obtained in order to better support underlying assumptions, such as those made about undercount (Goldberg, 1974; Heer, 1979) and death rates (Robinson, 1980). As a result of these and other problems, Siegel and his co-authors concluded in 1980 that “there are currently no reliable estimates of the number of unauthorized residents in the country or of the net volume of unauthorized immigration to the United States in any past recent period”

Table 7
Estimated Number of SAWs Living in Mexico

Mexican State	Number of Hogares	Hogares in Sample	% of Hogares in Sample	Number of SAWs in Sample	Estimated Total SAWs
Jalisco	1,038,000	901	0.087	18	20,736
Guanajuato	703,000	800	0.114	17	14,938
Michoacan	668,000	1,250	0.187	59	31,529
San Luis Potosi	383,000	402	0.105	3	2,858
Zacatecas	241,000	940	0.390	86	22,048
Nayarit	169,000	400	0.237	7	2,957
Colima	88,000	200	0.227	1	440
Total				191	95,509

Estimated Number of SAWs Living in All of Mexico

If 25% of migrants come from above states 382,040

If 33% of migrants come from above states 286,530

If 40% of migrants come from above states 238,775

Sources: 1990 Mexican Census; Mexican Migration Project (1996).

(1980). Nevertheless, they conceded that the analytic studies supported the view that by the end of the 1970s, 2.5 to 5 million unauthorized migrants and 1.5 to 2.5 million unauthorized Mexican migrants resided in the United States.

The residual studies conducted during the 1980s (see Table 8) obtained results at the beginning of the 1980s that tended toward the lower end of this range, subject of course to considerable uncertainty about the fraction of the unauthorized Mexican migrant population not enumerated in the official U.S. Censuses and surveys on which they were based. The results of these studies also showed the effects of IRCA's legalization programs, which removed substantial numbers of unauthorized migrants from the estimates of stock. They also revealed that the unauthorized migrant population (both overall and from Mexico) continued to grow annually during the 1980s, diminished in total numbers only by the legalization programs of IRCA. By 1992, the INS reported that 3.4 million unauthorized migrants overall

Table 8
Residual Estimates of the Enumerated Legal and Unauthorized
Foreign-born Population, 1979-1990
(Populations in Thousands)

	Total Foreign-born			Mexican Foreign-born		
	Total Enumerated (1)	Legally Resident (2)	Unauthorized (Residual) (1) - (2)	Total Enumerated (1)	Legally Resident (2)	Unauthorized (Residual) (1) - (2)
Nov. 1979 CPS	13,198	11,474	1,724	2,823	1387	1436
April 1980 Census	14,141	12084	2,057	2,531	1400	1131
April 1983 CPS, age 14+	13,633	11,540	2,093	2,850	1428	1422
April 1983 CPS, all ages	15,808 ^a	13,394 ^a	2414 ^a	3318 ^a	1,577 ^a	1,741 ^a
June 1986 CPS	16,936	13,778	3,158	3,852	1656	2196
June 1988 CPS	17,835	15,929	1,906	4,085	2985	1100
Nov. 1989 CPS	18,508	16,441	2,067	4,642	2999	1643
April 1990 Census (projected)	19,090	16,690	2,400	na	na	na

Sources: Warren and Passel, 1987; Passel and Woodrow, 1987; Woodrow, Passel and Warren, 1987; Woodrow and Passel, 1990; Woodrow, 1991; Woodrow-Lafield, 1995, 1996.

^a1983 estimate for those age 14 and older adjusted to include all ages.

na = Estimate not available.

and 1.3 million from Mexico resided in the country, totals that have subsequently been updated to 5.0 million and 2.7 million by October 1996 (U.S. Immigration and Naturalization Service, 1997).

Two broad classes of considerations affect the significance of these (and in fact any) estimates. One, of course, is their accuracy. To what degree can we be confident that the figures reflect the sizes of the populations they are intended to represent? While uncertainties remain (as noted in discussions above), there is no question that the results of research on the magnitude of stocks and flows during the 1980s has narrowed considerably the range of plausible estimates. However, because of data gaps (e.g., the deletion of I-53 registration system, inadequate information on emigration, and the other issues noted above), estimates during the

1990s that rely on residual approaches may be subject to increasing uncertainty, and thus perhaps are increasingly likely to generate broad ranges of estimates (Woodrow-Lafield, 1996).

A second factor that affects the significance of estimates is the context in which they occur. Estimates are most appropriately viewed not in isolation, but in relation to other kinds of changes, including population changes. We discussed above the policy significance of possibly shifting proportions of EWIs and visa overstayers. More broadly, it is of interest to examine how the estimates of unauthorized Mexican migration compare to population size generally in both the United States and Mexico. The estimated enumerated unauthorized Mexican population (1.131 million) in 1980 represented about 51 percent of the total Mexican-born population in the United States, 8.0 percent of the U.S. foreign-born population, 12.9 percent of the total Mexican-origin population, 0.4 percent of the total U.S. population, and 1.7 percent of the total Mexican population (see Table 9).

What evidence is there about the size of the unauthorized Mexican migrant population during the 1990s? Estimates of Mexican unauthorized migrants should readily square with evidence about (1) the overall size of the Mexican-born population in the United States, (2) estimated rates of underenumeration in the legal unauthorized populations, and (3) estimates of the size of the legal Mexican-born

Table 9
Relative Size of the Unauthorized Mexican Migrant Population
Expressed as a Percentage of the Mexican and the
United States Foreign-born, Mexican-origin, and
Mexican-born Populations, 1980–1996

Size of Unauthorized Mexican Migrant Population As a Percentage of:	1980	1990	1996
U.S. Population	0.5	0.5	1.1
Mexican Foreign-born	51.4	30.7	49.9
Foreign-born	8.0	6.7	13.4
Mexican Origin	12.9	9.9	15.3
Mexican Population	1.7	1.6	3.1

Notes: Estimates of enumerated authorized Mexican migrant population are: 1980, 1,131,000 (Warren and Passel, 1987); 1990, 1,321,000 (Warren, 1995); 1996, 3,100,000 (constructed by the authors).

population. A figure for unauthorized Mexican migrant stock may be constructed by starting with the overall size of the enumerated Mexican-born population from the March 1996 CPS of 6.68 million. Following the evidence from Hogan and Robinson (1993) and Van Hook and Bean (1997), we set plausible underenumeration rates for the legal and unauthorized Mexican populations at 4.0 and 12.0 percent respectively. Consistent with the evidence that about 700,000 SAWs were in the United States in the 1990s, we also adopt a mid-range estimate of 4.8 million legal Mexican immigrants (Woodrow-Lafield, 1997). Given these values, the *enumerated* number of legal immigrants is estimated as 4.608 million ($4.8 \times 0.96 = 4.608$) and the number of unauthorized immigrants as 2.35 million ($6.679 - [4.8 \times 0.96] / 0.88 =$ the number of unauthorized migrants $= 2.35$). Placing a 90 percent confidence interval around the overall total of 7.15 million (obtained by adjusting for undercount) adds and subtracts about 150,000 from each side of this value, giving an estimated range of 7.0 to 7.3 million total Mexican-born persons in the United States. In 1996, then, the figure of 2.35 million unauthorized Mexican-born migrants represents 37.8 percent of the U.S. Mexican-born population, 10.2 percent of the U.S. foreign-born population, 11.6 percent of the Mexican-origin population, 0.8 percent of the total U.S. population, and 2.3 percent of the Mexican population (see Table 9).

Note

1. The Census Bureau estimate is not 0.728 million larger than the Clark, et al., estimate, but only 0.415 million larger because of differences in assumptions other than those related to the residence of the SAW population.

References

- Bean, Frank D., Harley L. Browning, and W. Parker Frisbie. 1984. The Sociodemographic Character of Mexican Immigrant Status Groups: Implications for Studying Undocumented Mexicans, *International Migration Review*, 18: 672-691.
- Bean, Frank D., Thomas J. Espenshade, Michael J. White and Robert F. Dymowski. 1990. Post IRCA Changes in the Volume and Composition of the Undocumented Migration to the United States: An Assessment Based on Apprehensions Data, pp. 111-158 in Bean, Edmonston, and Passel (eds.), *Undocumented Migration to the United States: IRCA and the Experience of the 1980s*, Washington, D.C.: The Urban Institute Press.
- Bean, Frank D., Allan G. King, and Jeffrey S. Passel. 1983. The Number of Illegal Migrants of Mexican Origin in the United States: Sex Ratio-Based Estimates for 1980, *Demography*, 20, 1 (February): 99-109.

- . 1986. Estimates of the Size of the Illegal Migrant Population of Mexican Origin in the United States: An Assessment, Review and Proposal, pp. 13-36 in H. L. Browning and R. de la Garza (eds.), *Mexican Immigrants and Mexican Americans: An Evolving Relation*, Austin: University of Texas Press.
- Bean, Frank D., Lindsay Lowell, and Lowell Taylor. 1988. Undocumented Mexican Immigrants and the Earnings of Other Groups in the United States, *Demography*, 25:35-52.
- Bean, Frank D., Edward E. Telles, and B. Lindsay Lowell. 1987. Undocumented Migration to the United States, *Population and Development Review*, 13: 4 (December): 671-690.
- Bean, Frank D. and Marta Tienda (eds.). 1987. *The Hispanic Population of the United States*. New York: Russell Sage Foundation.
- Bean, Frank D., George Vernez and Charles B. Keely. 1989. *Opening and Closing the Doors: Evaluating Immigration Reform and Control*, Washington, D.C.: The Urban Institute Press.
- Borjas, George J., Richard B. Freeman, and Kevin Lang. 1991. Undocumented Mexican-Born Workers in the United States: How Many, How Permanent? Pp. 77-100 in J. M. Aboud and R. B. Freeman (eds.), *Immigration, Trade, and the Labor Market*, National Bureau of Economic Research, Chicago: The University of Chicago Press.
- Bos, Eduard. 1984. Estimates of the Number of Illegal Aliens: An Analysis of the Sources of Disagreement, *Population Research and Policy Review*, 3: 239-254.
- Briggs, Jr., Vernon. 1984. Methods of Analysis of Illegal Immigration into the United States, *International Migration Review*, 18: 3 (Fall): 623-641.
- Castillo, Leonard. 1978. Statement Before the House Select Committee on Population, U.S. House of Representatives, 95th Congress, 2d Session, April 6, 497-515. Washington, D.C.: U.S. Government Printing Office.
- Chapman, Leonard F., 1976. Illegal Aliens: Time to Call a Halt! *Readers Digest*, No. 109 (October): 654.
- Chapman, Leonard F., Jr. 1975. Illegal Aliens: A Growing Population, *Immigration and Naturalization Reporter*, 24: 15-18.
- Chavez, Leo. 1988. Settlers and Sojourners: The Case of Mexicans in the United States, *Human Organization*, 47:2 (Summer): 95-107.
- Clark, Rebecca L., et. al. 1994. *Fiscal Impacts of Undocumented Aliens: Selected Estimates for Seven States*, Project Report, September 16. Washington, D.C.: The Urban Institute.
- Clark, Rebecca L. and Jeffrey S. Passel. 1993. *How Much do Immigrants Pay in Taxes? Evidence from Los Angeles County*, PRIP-UI-26, August, Washington, D.C.: Urban Institute Press.
- Consejo Nacional de Poblacion. 1995. Estimacion de la Poblacion Base y Proyecciones de Poblacion 1990-2030, Mexican Population Estimates and Projections—Adjusted for Undercount. July.

- Cornelius, Wayne A. 1992. From Sojourners to Settlers: The Changing Profile of Mexican Immigration to the United States, pp. 155-195 in Bustamante, Reynolds, and Hinojosa Ojeda (eds.), *U.S. Mexico Relations: Labor Market Interdependence*, Stanford, California: Stanford University Press.
- Corona, Rodolfo. 1987. Estimacion del numero de indocumentados a nivel estatal y municipal, Mimeo, Centro de Estudios Sobre Identidad Nacional en Zonas Fronterizas, Universidad Nacional de Mexico, Cuernavaca, Morelos.
- Corona, Vasquez, Rodolfo. Confiabilidad de los Resultados Preliminares del IX Censo General de Poblacion y Vivienda de 1990, *Estudios Demograficos y Urbanos 16*, El Colegio de Mexico, 6:1 (Jan.-Apr. 1991), 33-68.
- Corwin, Arthur F. 1982. The Numbers Game: Estimates of Illegal Aliens in the United State, 1970-1981, *Law and Contemporary Problems*, 45:2 (Spring): 223-97.
- Crane, Keith, Beth J. Asch, Joanna Zorn Heilbrunn, and Danielle C. Cullinane. 1990. *The Effect of Employer Sanctions on the Flow of Undocumented Immigrants*. UI Report 90-8. The Urban Institute.
- Davila, Alberto. 1986. The Seasonality of Apprehensions of Undocumented Mexican Workers, *International Migration Review*, 20:40 (Winter): 986-91.
- Diez Canedo, Juan. 1984. *La Migracion Indocumentada de Mexico a los Estados Unidos: un Nuevo Enfoque*. Mexico City; Fondo de Cultura Economica.
- Durand, Jorge and Douglas S. Massey. 1992. Mexican Migration to the United States: A Critical Review, *Latin American Research Review*, 27: 2: 3-42.
- Edmonston, Barry, Jeffrey S. Passel and Frank D. Bean. 1990. Perceptions and Estimates of Undocumented Migration to the United States, pp. 11-31 in Bean, Edmonston and Passel (eds.), *Undocumented Migration to the United States: IRCA and the Experience of the 1980s*, Washington, D.C.: The Urban Institute Press.
- Espenshade, Thomas J. 1995. Unauthorized Immigration to the United States, *American Review of Sociology*, 21: 195-216.
- . 1995. Using INS Border Apprehension Data to Measure the Flow of Undocumented Migrants Crossing the U.S.- Mexico Frontier, *International Migration Review*, 29:2:545-565.
- . 1990. Undocumented Migration to the United States: Evidence from a Repeated Trials Model, pp. 157-181 in Bean, Edmonston and Passel (eds.), *Undocumented Migration to the United States: IRCA and the Experience of the 1980s*, Washington, D.C.: The Urban Institute Press.
- Farrell, Walter. 1972. Commissioner Farrell's Testimony Before the U.S. House of Representatives, Washington, D.C.
- Fay, Robert E., Jeffrey S. Passel, and J. Gregory Robinson. 1988. *The Coverage of Population in the 1980 Census*, Evaluation and Research Report PHC80-E4, Washington, D.C.: U.S. Department of Commerce, Bureau of the Census.
- Fernandez, Edward W. and J. Gregory Robinson. 1994. Illustrative Ranges of the Distribution of Undocumented Immigrants by State, Population Estimates and Projections Technical

- Working Paper Series, No. 8 (October), Washington, D.C., U.S. Department of Commerce, Bureau of the Census.
- Fogel, Walter. 1982. Twentieth-Century Mexican Migration to the United States, pp. 193-221 in B.R. Chiswick (ed.), *The Gateway: U.S. Immigration Issues and Policies*, Washington, D.C.: American Enterprise Institute for Public Policy Research.
- Frisbie, Parker. 1975. Illegal Migration from Mexico to the United States: A Longitudinal Analysis, *International Migration Review*, 9:1 (Spring): 3-13.
- Gabbard, S., E. Kissam, and P. Martin. 1993. The Impact of Migrant Travel Patterns on the Undercount of Hispanic Farm Workers, pp. 207-246 in *Proceedings of the Research Conference on Undercounted Ethnic Populations*, May 5-7, U.S. Bureau of the Census.
- García y Griego, Manuel. 1980. *El Volumen de la Migración de Mexicanos no Documentados a los Estados Unidos (Nuevas Hipótesis)*. Secretaría del Trabajo y Previsión Social. Centro Nacional de Información y Estadísticas del Trabajo. Mexico City.
- . 1979. *El Volumen de la Migración de Mexicanos No Documentados a los Estados Unidos: Nuevas Hipótesis*. Mexico City: Centro Nacional de Información y Estadísticas del Trabajo.
- Goldberg, Howard. 1974. Estimates of Emigration from Mexico and Illegal Entry into the United States, 1960-1970, by the Residual Method, Unpublished graduate research paper, Center for Population Research, Georgetown University, Washington, D.C.
- Hansen, Kristin A. 1996. Profile of the Foreign-Born population in 1995: What the CPS Nativity Data Tells Us, Paper prepared for annual meeting of the Population Association of America, New Orleans, Louisiana.
- Heer, David M. 1979. What is the Annual Net Flow of Undocumented Mexican Immigrants to the United States, *Demography*, 16: 3 (August): 417-424
- Heer, David and Jeffrey S. Passel. 1987. Comparison of Two Different Methods for computing the Number of Undocumented Mexican Adults in Los Angeles County, *International Migration Review*, 21: 1446-1473.
- . 1985. Comparison of Two Different Methods for Computing the Number of Undocumented Mexican Adults in the Los Angeles PMSA, Paper presented at the annual meeting of the Population Association of America, Boston, Massachusetts.
- Hill, Kenneth. 1985. Illegal Aliens: An Assessment, pp. 225-245 in *Immigration Statistics: A Story of Neglect*, Washington, D.C.: National Academy Press.
- Himes, Christine L. and Clifford C. Clogg. 1992. An Overview of Demographic Analysis as a Method for Evaluating Census Coverage in the United States, *Population Index*, 58: 4 (Winter): 587-607
- INEGI [Instituto Nacional de Estadística Geografía e Informática]. 1990. *XI Censo General de Población Y Vivienda, 1990*. Estados Unidos Mexicanos.
- J. Craig. 1977. Push/Pull in Recent Mexican Migration to the United States, *International Migration Review*, 11:2 (Summer):178-89.

- Johnson, Hans P. 1996. Estimates of Annual Net Migration of Undocumented Immigrants to California, Working paper presented at the Annual Meetings of the Population Association of America, New Orleans, May.
- Keely, Charles B. 1983. Affidavit submitted for plaintiffs in Cuomo, et al., v. Baldrige, et al., U.S. District Court, Southern District of New York, 80 Div. 4550(JES).
- . 1977. Counting the Uncountable: Estimates of Undocumented Aliens in the United States, *Population and Development Review*, 3, 4 (December): 473-481.
- Korns, Alexander. 1977. Coverage Issues Raised by Comparisons Between CPS and Establishment Employment, Paper presented at the 1977 meeting of the American Statistical Association.
- Lancaster, Clarice, and Fredrick J. Scheuren. 1978. Counting the Uncountable Illegals: Some Initial Statistical Speculations Employing Capture-Recapture Techniques, *proceedings of the American Statistical Association, Social Statistics Section*, Pt. 1, pp. 530-35.
- Lesko Associates. 1975. *Final Report: Basic Data and Guidance Required to Implement a Major Illegal Alien Study During Fiscal Year 1976*. Washington, D.C.: U.S. Immigration and Naturalization Service.
- Levine, Daniel B., Kenneth Hill, and Robert Warren (eds.). 1985. *Immigration Statistics: A Story of Neglect*. Washington, D.C., National Academy Press.
- Marcelli, Enrico A., and David M. Heer. 1996. Labor Market Effects of Unauthorized Mexicans in Los Angeles County, Working paper prepared for The Demographic Implications of NAFTA Session of the 1996 Population Association of America's Annual Meeting, May 9-11, 1996, New Orleans.
- Massey, Douglas S. and Audrey Singer. 1995. New Estimates of Undocumented Mexican Migration and the Probability of Apprehension, *Demography*, 32:2 (May): 203-214.
- Mexican Migration Project. 1996. *MIGFILE*. [MRDF] November 1996 ed. Philadelphia, PA: Population Studies Center, University of Pennsylvania.
- . 1996. Documentation of Data Files. Philadelphia, PA: Population Studies Center, University of Pennsylvania.
- Muller, Thomas, and Thomas J. Espenshade. 1985. *The Fourth Wave: California's Newest Immigrants*, Washington, D.C.: The Urban Institute Press.
- National Institutes of Child Health and Human Development. 1996. Social and Economic Factors Affecting Undocumented Migration from Mexico, *NICHD Research on Today's Issues*, May 1996.
- North, David S. 1975. *Illegal Aliens: Final Report Outlining a Rationale for and a Preliminary Design of a Study of the Magnitude, Distribution, Flow, Characteristics and Impacts of Illegal Aliens in the United States*, (Contract J-LEAA-015-75 awarded by LEAA, U.S. Department of Justice), Washington, D.C.: Linton and Company, pp. 1-3).
- Passel, Jeffrey S. 1986. Undocumented Immigration, *The Annals*, 487 (September): 181-200.
- . 1985. Undocumented Immigrants: How Many? Paper presented at the Annual Meeting of the American Sociological Association, Las Vegas, Nevada.

- Passel, Jeffrey S., Frank D. Bean and Barry Edmonston. 1990. Undocumented Migration Since IRCA: An Overall Assessment, pp. 251-65 in Bean, Edmonston and Passel (eds.), *Undocumented Migration to the United States: IRCA and the Experience of the 1980s*, Washington, D.C.: The Urban Institute Press.
- Passel, Jeffrey S. and J. Gregory Robinson. 1988. Methodology for Developing Estimates of Coverage in the 1980 Census Based on Demographic Analysis: Net Undocumented Immigration, Preliminary Evaluation Results Memorandum No. 114, Revised September. Washington, D.C.: United States Department of Commerce, Bureau of the Census.
- Passel, Jeffrey S., Jacob S. Siegel and J. G. Robinson. 1982. Coverage of the National Population by Age, Sex, and Race in the 1980 Census: Preliminary Estimates by Demographic Analysis, *Current Population Reports*, P-23, No. 115. Washington, D.C.: U.S. Government Printing Office.
- Passel, Jeffrey S. and Karen A. Woodrow. 1987. Change in the Undocumented Alien Population in the United States, 1979–1983, *International Migration Review*, 21: 4 (Winter): 1304–1334.
- . 1984. Geographic Distribution of Undocumented Immigrants: Estimates of Undocumented Aliens Counted in the 1980 Census by State, *International Migration Review*, 18: 3 (Fall): 642–671.
- Puente, Manuel de la. 1993. Why are People Missed or Erroneously Included by the Census: A Summary of Findings From Ethnographic Coverage Reports, *Proceedings of the Research Conference on Undercounted Ethnic Populations*, May 5-7, Richmond, Virginia, U.S. Bureau of the Census.
- Reubens, Edwin P. 1980. Immigration Problems, Limited-Visa Programs, and Other Options, Appendix F in *U.S. Immigration Policy and the National Interest: Report of the Select Commission on Immigration and Refugee Policy*. Washington, D.C.: U.S. Government Printing Office.
- Roberts, Bryan R. 1995. Socially Expected Durations and the Economic Adjustment of Immigrants, pp. 42-86 in Alejandro Portes (ed.), *The Economic Sociology of Immigration*, New York: Russell Sage.
- Robinson, J. Gregory. 1993. Estimation of Population Coverage in the 1990 United States Census Based on Demographic Analysis, *Journal of the American Statistical Association*, 88:423 (September): 1061-1071.
- . 1980. Estimating the Approximate Size of the Illegal Alien Population in the United States by the Comparative Trend Analysis of Age-Specific Death Rates, *Demography*, 17: 2 (May): 159-176.
- Robinson, J. Gregory and Kristin A. Hansen. 1996. Comparison of Nativity Data from the Current Population Survey with the 1990 Census and INS Data, Paper presented annual meeting of the Population Association of America, New Orleans, Louisiana.
- Rogers, Andrei, Kathy Gard, and Jani S. Little. 1996. Indirect Estimates of the Geography of the Undocumented Immigrant Population Residing in the United States in 1990: An Assessment, Working paper 96-3, Population Program, Institute of Behavioral Science, Boulder: University of Colorado.

- Siegel, Jacob, Jeffrey S. Passel, and J. Gregory Robinson. 1980. Preliminary Review of Existing Studies of the Number of Illegal Residents in the United States, Draft, January. U.S. Department of Commerce, Bureau of the Census.
- U.S. Department of Commerce, Bureau of the Census. 1993. *1993 Research Conference on Undercounted Ethnic Populations*. Washington, D.C.: U.S. Government Printing Office.
- U.S. Department of Justice, Immigration and Naturalization Service. 1994. Duration of Stay of Non-Immigrants Departing the United States, Washington, D.C.: Office of Policy and Planning, Statistics Branch.
- . 1976. *Domestic Council Committee on Illegal Aliens: Preliminary Report*, Washington, D.C.
- U.S. General Accounting Office. 1995. Illegal Immigration: INS Overstay Estimation Methods Need Improvement, *Report to the Chairman, Subcommittee on Immigration, Committee on the Judiciary, U.S. Senate*, GAO/PEMD-95-20, September, Washington, D.C.: U.S. Printing Office.
- . 1995. Information on Aliens Applying for Permanent Resident Status, *Fact Sheet for the Honorable Dana Rohrbacher, House of Representatives*, GAO/GGD-95-162FS, June, Washington, D.C.: U.S. Printing Office.
- . 1995. Border Control: Revised Strategy is Showing Some Positive Results, *Testimony before the Subcommittee on Immigration and Claims, Committee on the Judiciary, House of Representatives*, GAO/T-GGD-95-92, March, Washington, D.C.: U.S. Government Printing Office.
- . 1993. Illegal Aliens: Despite Data Limitations, Current Methods Provide Better Population Estimates, *Report to the Chairman, Information, Justice, Transportation and Agriculture Subcommittee, Committee on Government Operations, House of Representatives*, GAO/PEMD-93-25, Washington, D.C.: U.S. Government Printing Office.
- . 1982. Problems and Options in Estimating the Size of the Illegal Alien Population, *Report to the Chairman of the Subcommittee on Immigration and Refugee Policy of the Committee on the Judiciary United States Senate*, GAO/IPE-82-9, September, Washington, D.C.: U.S. Government Printing Office.
- . 1981. Number of Undocumented Aliens Residing in the United States Unknown, *Comptroller General's Report to Congress of the United States*. GGD-81-56, April, Washington, D.C.: U.S. Government Printing Office.
- Van Hook, Jennifer V. W. and Frank D. Bean. 1997. Estimating Underenumeration among Unauthorized Mexican Migrants to the United States: Applications of Mortality Analyses. In E. Loaeza and S. Martin (eds.), *Mexico-U.S. Migration Patterns: Research Papers*. Washington, D.C.: U.S. Commission on Immigration Reform (forthcoming).
- Vining, Jr., Daniel R. 1982. Net Migration by Commercial Air: A Lower Bound on Total Net Migration to the United States, *Research In Population Economics*, 4: 333-350.
- Warren, Robert. 1995. Estimates of the Undocumented Immigrant Population Residing in the United States by Country of Origin and State of Residence: October 1992, Washington, D.C.: U.S. Department of Justice, Immigration and Naturalization Service, April (Draft).

- . 1990. Annual Estimates of Nonimmigrant Overstays in the United States, pp. 33-75 in Bean, Edmonston and Passel (eds.), *Undocumented Migration to the United States: IRCA and the Experience of the 1980s*, Washington, D.C.: The Urban Institute Press.
- . 1982. Estimation of the Size of the Illegal Alien Population of the United States. Paper presented at the annual meeting of the Population Association of America, San Diego, California.
- Warren, Robert and Jeffrey S. Passel. 1987. A Count of the Uncountable: Estimates of Undocumented Aliens Counted in the 1980 United States Census, *Demography*, 24: 3 (August): 375-394.
- . 1984. A Count of the Uncountable: Estimates of Undocumented Aliens Counted in the 1980 Census, Revised version of paper presented at the 1983 Annual Meetings of the Population Association of America, Pittsburgh, Pennsylvania, April.
- Warren, Robert and Jennifer Marks Peck. 1980. Foreign-Born Emigration from the United States: 1960 to 1970, *Demography*, 17: 1 (February): 71-84.
- Woodrow-Lafield, Karen A. 1997. Issues in Estimating Legal Migration. In E. Loaeza and S. Martin (eds.), *Mexico-U.S. Migration Patterns: Research Papers*. Washington, D.C.: U.S. Commission on Immigration Reform (forthcoming).
- . 1996. Emigration from the U.S.A.: Multiplicity Survey Evidence, *Population Research and Review*, 15: 171-199 (April).
- . 1996. In Search of a Method: Judgment and the Problem of Estimating Unknown Migration, (Draft) Earlier version presented at American Sociological Association annual meeting, August 13-17, 1993. Austin: The University of Texas.
- . 1995. An Analysis of Net Immigration in Census Coverage Evaluation, *Population Research and Policy Review*, 14: 2 (June): 173-204.
- . 1993. Coverage Evaluation and Growth of the Foreign-Born Population, Paper presented at the Census Bureau Research Conference on Undercounted Ethnic Populations (May).
- Woodrow, Karen A. 1992. A Consideration of the Effect of Immigration Reform on the Number of Undocumented Residents in the United States, *Population Research and Policy Review*, 11: 117-44.
- . 1991. Preliminary Estimates of Undocumented Residents in 1990: Demographic Analysis Evaluation Project D2, Draft, Preliminary Research and Evaluation Memorandum No. 75, May 22.
- . 1990. Undocumented Immigrants Living in the United States, *American Statistical Association of America*, Anaheim, CA.: (August).
- Woodrow, Karen A. and Jeffrey S. Passel. 1990. Post-IRCA Undocumented Immigration to the United States: An Assessment Based on the June 1988 CPS, pp. 33-75 in Bean, Edmonston and Passel (eds.), *Undocumented Migration to the United States: IRCA and the Experience of the 1980s*, Washington, D.C.: The Urban Institute Press.

- . 1989. Estimates of Emigration Based on Sample Survey Data from Resident Relatives, Report prepared for the Office of Management and Budget, Office of Information and Regulatory Affairs, Washington, D.C.: U.S. Bureau of the Census.
- Woodrow, Karen A., Jeffrey S. Passel, and Robert Warren. 1987. Preliminary Estimates of Undocumented Immigration to the United States, 1980–1986: Analysis of the June 1986 Current Population Survey, Paper presented at the 1987 annual meetings of the American Statistical Association, San Francisco, California, August.
- Zazueta, Carlos H. 1982. Mexican Workers in the United States: Some Initial Results and Methodological Considerations of the national Household Survey of Emigration, unpublished manuscript.
- Zazueta, D. and R. Corona. 1979. *Los Trabajadores Mexicanos en Los Estados Unidos: Primeros Resultados de la Encuesta Nacional de Emigración*. Mexico City: Centro Nacional de Información y Estadísticas del Trabajo.