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# On Estimating a De Facto Population and Its Components

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**Abstract:** This paper deals with estimating a population that is largely defined by the fact that its size, composition, and distribution are not readily accessible from census data in the U.S. and the other countries that use the De Jure concept of population. The population in question is based on the De Facto concept, which involves the estimation of people where they are found rather than where they usually reside. In a country where the national statistical office uses the De Jure concept, estimating the De Facto population as well as its components is an important, but not easy task. It is important because of the many uses for estimates of the De Facto population; it is difficult because the data that can be used to estimate a De Facto population are skimpy. In an effort to develop this field of population estimation more fully we provide an equation to define the De Facto population as well as an example of its use. We describe and discuss each of the components of this equation and also provide examples of estimates of its direct components and an implied component – the daytime population. Although we view a population impacted by a disaster as distinct from a De Facto population, we include a discussion of it here since many of the methods used to estimate a De Facto population are applicable.

**JEL Classifications**: J10, J11, R23

**Keywords:** Visitor population, Daytime population, Seasonal population, Homeless

## 1. Introduction

De Facto populations permeate the U.S. and other countries that use the De Jure concept of population for censuses and related "counts," such as those derived from population registers in countries like Finland. For purposes of discussing estimation methods, it is convenient to look at the concept of a De Facto population from the perspective that it composed of six population categories: (1) visitor population; (2) homeless population; (3) seasonal population, which we subdivide into (3a) the amenity seeking population and (3b) migrant workers and their families; (4), the portion of the Daytime population that consists of residents from elsewhere; and (5) the De Jure population that is "present." One reason for using these six categories is that they correspond to the kinds of estimates (and projections) that are desired for De Facto populations (Akkerman, 2000; Happel and Hogan, 1987; 2002; Kavanaugh and Lamphere, 1989; Las Vegas Convention and Visitors Authority, 2011a; Schmitt, 1956; 1968; Smith, 1989). Another reason these six categories

are important is because of the potential impacts they have on the places were they are found. As examples:

Visitor Population. As of the 2010 census, the De Jure population of Clark County, Nevada (Metropolitan Las Vegas) was 1,375,765 (U.S. Census Bureau 2011); there were over 37 million visitors to Las Vegas in 2010 (Las Vegas Convention and Visitors Authority, 2011b).

Homeless Population. As of January, 2007, a total homeless population of 11,417 was estimated for Clark County, Nevada (Metropolitan Las Vegas), of whom 3,747 were enumerated on the streets, 3,844 in shelters, and the remaining 3,826 estimated as "hidden"(Applied Survey Research, 2007: 3).

Seasonal Amenities Population. The July, 1995 De Jure population of Leelanau County in Michigan's Upper Peninsula was estimated by Becker, Kincannon, and Wyckoff (1996) to be 18,502; the "second home" (seasonal) population was estimated by them to be 10,937.

Seasonal Migrant Worker Population. In the 2000 Census, the De Jure population of Chelan County, Washington was 66,616 (U.S. Census Bureau, 2001); the 2000 population of Migrant Seasonal Farm Workers and their families in this apple-producing county was estimated at 26,382 by Larson (2000).

Resident Population that is Present. Derived from data collected by the Hawaii Department of Business, Economic Development and Tourism (2001) and the U.S. Census Bureau (2005), the resident population of Honolulu, Hawaii (The Honolulu CDP) that was present as of April, 2000 is estimated to be 353,251; the entire resident population of Honolulu was counted at 371, 657 as of April 2000 (U.S. Census Bureau, 2005).

Non-resident Daytime Population. Derived from a U. S. Census Bureau (2005) estimate of the entire Daytime Population for Honolulu, Hawaii (the Honolulu CDP), the non-resident Daytime Population as of April, 2000 is estimated to be 93,305.

As these examples suggest, the concept of a de Facto population has more than a few nuances. For example, the visitor population in a resort area such as Las Vegas or Honolulu is a De Facto population, but where these visitors are during the day vs. the night can vary substantially. For example, during the day, visitors to Hawaii may be on beaches while at night they are in their hotels. Similarly, some of the visitors to Las Vegas may be in Death Valley, the Red Rock Natural Conservation area, Lake Mead, or the Grand Canyon during the day, but in hotel rooms during early evening, followed by theaters, restaurants, and casinos, then finally back to their hotel rooms in the late evening or very early morning. Similarly, many of the commuters to the financial district of San Francisco, California for purposes of work may be in Chinatown for lunch. Yet another example is that the population of McAllen, Texas may swell during the winter months with snowbirds from the upper Midwest, who during the day may be at south Padre Island enjoying the beach.

These nuances illustrate the fact that the estimation of de Facto populations presents difficulties not found with the estimation of De Jure populations, as is evidenced by some of the colorful names given to these methods – *Demoflush* comes readily to mind (Goldsmith and Dahl, 1976) as one such name that has a cachet not found among the names of De Jure estimation methods, Component Method II, for example, or the Housing Unit Method (Bryan 2004).

As implied in our examples, De Facto populations are important for many purposes, including transportation planning, marketing, the location of retail sites and health facilities, disaster mitigation, and measuring labor markets, among others (Foley, 1954; Kramer, 2009; Pol and Thomas, 1997, 2000). Also as hinted at in our discussion of "nuances" and as we discuss later, there are more ambiguities involving the definition of a De Facto population than there are in the definition of a De Jure population, and there are plenty in the latter (Cork and Voss, 2006). Among other issues, the categories often employed in determining De Facto populations are neither mutually exclusive nor exhaustive. For example, many places have seasonal fluctuations in terms of

both what we call visitor populations and what we call seasonal populations. However, our categories lend themselves to different techniques and in developing our definitions we will keep these different techniques in mind. We also will use the definition of "Census Day" in terms of our definitions and use the concept of usual residence as a foil to work from. Again, we stress that, neither this device nor others will resolve all of the many ambiguities of defining a population, whether De Facto or De Jure.

## 2. Definitions

We define a visitor population as people who are in a given area on census day for a short period of time that would not be considered their usual place of residence, but who also are not part of the area's daytime population. We introduce the idea of a short period of time to assist in distinguishing a visitor population from a seasonal population. This would include people on vacation staying in a hotel as well as people who are working on assignment for a few days who are staying in a hotel (e.g., conference attendees, salespeople). This follows the temporal dimension described by Happel and Hogan (1987, 2002) in their distinction between visitor and seasonal populations. From our definition it is clear we are not looking at visitors to specific attractions, a subject dealt with by Tyrrell and Johnston (2000). Also, we are interested in the number of visitors, not the number of visits, otherwise known as person trips (Leeworthy, 1996).

Under the charge of the McKinney-Vento Homeless Act, The U. S. Department of Housing and Urban Development (U.S. HUD), needed to define homelessness. In moving toward a definition (U.S. HUD, 2008b: 4) observes "residential stability" can be divided into two broad categories of people: (1) those who "literally homeless;" and (2) those who are "precariously housed." The "literally homeless" include people who for various reasons have found it necessary to live in emergency shelters or transitional housing for some period of time. This category also includes unsheltered homeless people who sleep in places not meant for human habitation (for example, streets, parks, abandoned buildings, and subway tunnels) and who may also use shelters on an intermittent basis" (U.S. HUD, 2008b: 4). The "Precariously Housed" refers to "…people on the edge of becoming literally homeless who may be doubled up with friends and relatives or paying extremely high proportions of their resources for rent. The group is often characterized as being at imminent risk of becoming homeless" (U.S. HUD 2008b: 4).

In defining a seasonal population, we begin with the observation by Cork and Voss (2006: 5) that no recent census in the United States has allowed respondents the ability to directly indicate that they believe that address information on their census questionnaire is inaccurate. Respondents have been unable to indicate, for example, that they have received the form at a seasonal home. They also note that unlike the case in the United States, there are other countries that ask questions in their censuses that allow one to determine usual place of residence and seasonal residence information (Cork and Voss, 2006: 54).

Happel and Hogan (1987, 2002), among others, not only use a temporal dimension to define seasonal population, but also the reasons for travel. As suggested by our earlier examples, this is useful in distinguishing between seasonal effects largely due to amenities (spending the month of July at a second home in Michigan's Upper Peninsula) and those largely due to work (migrant labor). Thus, we distinguish the seasonal population from the visitor population on the basis of time. For those seeking amenities, we view them as being in an areas for more than a couple of weeks, but not more than six months' For the migrant workers, we view them as being in areas for as short as a few days, but also not more than six months.

The next element of the De Facto population is the DeJure population that is present. This excludes those who are out of the area, but includes those who might be identified as part of a

daytime population in a specific subarea of the area in question. An example of this would be the DeJure population of San Francisco working downtown.

The final element is the portion of the Daytime population that consists of residents of another area than the one in question who are present. This is largely the population defined by the U.S. Census Bureau (2005).

## 3. Estimating the Entire De Facto Population

To our knowledge, nobody has put together a fundamental "De Facto Population Equation," which we believe could be a useful tool. To this end, we offer the following equation, which is based on the types of De Facto populations we identified and defined in the preceding section:

$$D_i = V_i + H_i + A_i + M_i + + REP_i + ND_i + RP_i \quad [1]$$

where i = the area in question
D = De Facto Population
V = Visitor Population
H = Homeless Population
A = Amenity Seeking Seasonal Population
M = Migrant Worker Seasonal Population
ND = Non-Resident "Daytime" Population
RP = Resident (De Jure) Population Present

and

$$RP = R - RA \quad [1.a]$$

where R = Resident Population and RA = Resident population away.

In some areas, there is a large "ND" (Non-Resident Daytime) population and in others, it is virtually zero. For example, a large chunk of the daytime population of San Francisco is composed of people who live elsewhere. Similarly, the Honolulu Census Designated Place (basically, the city of Honolulu), will have a daytime population that commuted in from areas on the island of Oahu, outside of the Honolulu CDP. However, for the entire state of Hawai'i there are virtually no members of a "daytime" population that are from outside of Hawai'i who are not part of either the visitor or seasonal populations.

As an example application of Equation [1] we provide an estimate of the De Facto population of 636,970 for Honolulu, Hawai'i as of April 2000, which was obtained as follows:

$$D_{Honolulu} = V_{Honolulu} + H_{Honolulu} + A_{Honolulu} + M_{Honolulu} + RP_{Honolulu} + ND_{Honolulu}$$
$$636{,}970 = 168{,}101 + 8{,}000 + 14{,}297 + 16 + 353{,}251 + 93{,}305$$

The visitor count of 168,101 is taken from a report by the Hawai'i Department of Business, Economic Development, and Tourism (2000); the homeless estimate of 8,000 is taken from a report done by SMS Research that provided an estimate for 2003, which was delivered to us in a personal communication from the President of SMS Research, Jim Dannemiller (2011), who also provided advice on the likely number in 2000; the amenity seeking seasonal population estimate of 14,297 was derived using the same method described later in this paper for Arizona, but with data specific to Honolulu, as was the estimated number of 16 for the migrant worker seasonal population. The estimate of 353,251 of the total Honolulu resident population that was present was derived by using statistics on returning residents (60,000) for the month of April, 1999 found in a report by the Hawai'i Department of Business, Economic Development, and Tourism (2001). This number was assumed to apply to April of 2000 and multiplied by the proportion of Hawaii residents who live in

Honolulu (60,000* (371,657/ 1,211,537)) to get an estimate of the number of Honolulu residents who were away (18,406), which was subtracted from the total number of residents (371,657) to get the estimate of 353,251 for the total number of residents present.

As is the case with any equation, Equation [1] offers the potential to estimate a missing term if the others are available. For example, $H_i = D_i - (V_i + A_i + M_i + ND_i + RP_i)$. Another example of how Equation [1] might be used would be to take ratios of various elements and then use them to fill in missing terms. For example, if the ratio of the De Facto to the De Jure population was relatively constant (at least during certain seasons or months), this relationship might be used to estimate the total De Facto population, such that a missing piece (e.g., the homeless population) could be estimated. And of course some terms could be combined to make the task of making such estimates more tractable (e.g., the amenity seeking seasonal population could be combined with the migrant worker seasonal population to get a total seasonal population term). We now turn our attention to the elements found (and implied) in Equation [1] above.

## 4. Estimating a Daytime Population

In addition to developing direct estimates via remote sensing imagery (Bhaduri et al. 2007, Cai et al. 2006; Wicks, et al. 1999), there are two general approaches that can be used to estimate daytime populations from census or sample information based on the De Jure concept. In the first of these two approaches, "commute to work" information is required and in the second, "place of work" and "place of residence" information is required. Using such information, the U.S. Census Bureau (2005) developed two equations, which are algebraically equivalent to one another. The first equation uses "commute to work" information:

(estimated daytime population of area i) = (resident population of area i) +
(workers who commute into area i) - (workers who commute out of area i) [2.a]

The second uses "place of work" and "place of residence" information:

(estimated daytime population of area i ) = (resident population of area i ) +
(workers working in area i) - ( workers living in area i) [2.b]

Using Equation [2.b] we find that as of April 1st (Census Day), 2000, the estimated Daytime population of San Francisco, California is 945,480 (U.S. Census Bureau 2005), where

945,458 = (776, 733) + (587,300) – (418, 553)
(S. F. resident population) + (workers working in S.F) – (workers living in S. F.)

We also can use elements from Equation [1] in conjunction with the concepts found in equations [2.a] and [2.b] to define and estimate the non-resident day time (ND) population. For example, the ND population of the Honolulu CDP can be defined as:

(workers who commute into area i) =
(estimated daytime population of area i) - (resident population of area i) [2.c]

In the case of the Honolulu CDP, we use the data for daytime population estimates assembled by the U.S. Census Bureau (2005), which shows a daytime population of 464,964 and a De Jure population of 371,657. Thus, we have an estimate of the "ND" population of 93,305 = 464,964 - 371,657.

Unfortunately, with the loss of the decennial "long form," the data needed to use these two methods is no longer available and one must turn to the American Community Survey, which while possible to use, presents some challenges not found with the decennial census "long form" (Cork and Voss, 2006; Van Auken et al., 2006; Swanson and Walashek, 2011). However, countries with census

data similar to those needed for methods 1 and 2 would be able to employ either method, respectively (United Kingdom Statistics Authority, 2001).

# 5. Estimating a Visitor Population

Estimating visitor populations can be done through several methods, the most common of which include counting occupied rooms in hotels and other facilities in combination with an average number per occupied room, and surveys conducted via transportation modes, entry and exit points area, and visitor sites (Leeworthy, 1996; Watson et al., 2000). These methods are generally time and resource intensive because in part they rely on surveys, but, even with the use of "administrative records" such as occupied hotel rooms they remain time and resource intensive.

As an example of the time and resource intensity it takes to develop these estimates, the Hawaii Tourism Authority (2010:2) estimates that there were 6,517,054 visitors to Hawaii in 2009, staying an average of 9.33 days. To get these estimates (and other information), the Hawai'i Tourism Authority combined information from three major steps: (1) determining passenger counts on arriving airline flights, foreign and domestic, separating visitors from in-transit passengers, returning Hawai'i residents, and migrants intending to reside in Hawai'i; (2) determining arrivals by cruise ships: Visitors who entered Hawai'i via foreign-flagged cruise ships, derived from the Cruise Visitor survey which covered U.S. flagged and foreign flagged cruise ships; (3) obtaining Cruise ships "Arrivals by Air," derived from the Domestic In-flight and International Departure surveys which sampled only visitor arrivals by air. This figure represented an estimate of visitors staying on cruise ships. These three major steps used data from 10 sources: (1) airline passenger counts (both scheduled and chartered), domestic and foreign; (2) reports by the U.S. Office of Immigration Statistics; (3) reports by the Bureau of Customs and Border Protection, Honolulu Office; (4) U.S. Customs Declaration Forms; (5) International Intercept Survey, a systematic sample of passengers in the boarding area and walkways at the Honolulu International Airport and the Kahului Airport on Maui; (6) Domestic Survey, the form for which is on the reverse side of the Hawai'i State Department of Agriculture's mandatory Plants and Animals declaration form, which is distributed to passengers on all flights from the U.S. mainland to Hawai'i every day of the year; (7) The Island Visitor Survey, from samples taken conducted at departure area of the airports on all the islands; (8) the Cruise Visitor Survey, which is distributed to the cabins on the cruise ships; (9) Honolulu International Airport Billing Records, which show the number of passengers on flights from Canada who were pre-cleared in Canada and not included in the INS; and (10) Cruise Passenger Counts: All cruise ships which entered Honolulu, Hilo and Lahaina Harbor for which passenger counts are reported to the Department of Transportation, Harbors Division and the Department of Land and Natural Resources.

As this example for Hawai'i illustrates, the development of visitor population estimates is often time and resource intensive, with a high level of administrative coordination. The example is not dissimilar to methods described elsewhere in this regard (Erkkila, 2000; Leeworthy, 1996; Tyrrell and Johnston, 2002; Watson, et al., 2000).

# 6. Estimating a Seasonal Population

## 6.1 The Amenity Seeking Seasonal Population

Some countries have the ability to develop De Facto numbers along with De Jure numbers built directly into their regular census counts, while others are more limited (for a suggested list, see, e.g., Cork and Voss, 2006: 303-325). Unfortunately, the United States conducts a census in which De Facto numbers cannot be directly extracted. However, as shown earlier in the section on Daytime Population Estimates, it has collected census information that can be used to develop De Facto estimates. In the case of seasonal populations, of the features of the U.S. decennial census is

its classification of vacant housing, which includes those reserved for seasonal, recreational, or occasional use. This can be exploited for purposes of estimating a seasonal population.

To start, here is some background on this classification from the U.S. Census Bureau (2004). First, in order to make the vacation home category consistent over the decades, the three categories, "seasonal," "held for occasional use," and "for migrant workers" are combined. Second, the "occasional use" category was not used prior to the 1960 census. Third, counts of seasonal and occasional use vacant units are separately provided from 1960 to 1980, but they were combined beginning in 1990 because evidence indicated enumerators had great difficulty determining the difference. Fourth, counts of housing units for migrant workers were included with seasonal units before 1990; for comparability, this housing type was added beginning with the 1990 count of seasonal, recreational, or occasional units. Fifth, separate counts of migratory vacant units are provided beginning with 1990, a number observed to be very small over the decades.

The availability of this information is one of the reasons we made distinction between the visitor population and the seasonal population. With the preceding data and an estimate of the average number of seasonal persons per seasonal household (SEASONPPH) in hand, the Housing Unit Method (Bryan, 2004; Smith, 1986) can be used to develop an estimate of the total amenity seeking seasonal population of a given area i. To proceed, we need an estimate of SEASONPPH. Although it is dated, the U.S. Census Bureau (1982) produced a report from the 1980 census on non permanent residents. This report is nicely geared toward seasonal populations, especially those that are amenity seeking. Table C of this report provides Average Persons Per Households for non-permanent households (i.e., SEASONPPH) for selected states, which we can use in conjunction with the Census Bureau's 2004 report on seasonal housing to obtain an estimate of a seasonal population:

$$SEASONP_i = SSMHU_i * PPHSEASON_i \quad [3]$$

where $SEASONP_i$ = Estimated Seasonal Population in area i
$SSMHU_i$ = Seasonal Single and Multiple Housing Units
$PPHSEASON_i$ = Average Number of Persons per Seasonal Household

As an example of the preceding, we develop a seasonal population estimate for Arizona as of April 2000. First, we find that there were 142,601 housing units for seasonal, recreational, and occasional use in Arizona for 2000 (U.S. Census Bureau 2004). Second, we find that the SEASONPPH for Arizona as of April 1980 is 1.84 (Table C, U.S. Census Bureau 1984) and that the median age of persons in non-permanent households is over 65. The latter suggests that the non-permanent households are made up of amenity seeking "snowbirds" (Happel and Hogan, 2002). With Equation [3] in hand, we can estimate the seasonal amenity seeking population for the 1999-2000 winter seasons for Arizona as:

$$262,386 = 142,601 * 1.84$$

The preceding estimate differs from the 1999-2000 estimates of 273,000 snowbirds in state of Arizona provided by Happel and Hogan (2002), but not by much. The absolute difference is -10,514 and the relative difference is -3.89%.

Our HUM based method as shown in Equation [3] could be refined, given the availability of information on Recreational Vehicle (RV) parks, which are not part of the permanent housing stock, but should be included because seasonal residents live there. For areas that keep track of RV space inventories, Equation [3] can be refined as follows

$$SEASONP_i = (SSMHU_i + RVS_i) * PPHSEASON_i \quad [4]$$

where $SEASONP_i$ = Estimated Seasonal Population in area i
$SSMHU_i$ = Seasonal Single and Multiple Housing Units in area i

$RVS_i$ = Recreational Vehicle Spacves in area i
$PPHSEASON_i$ = Average Number of Persons per Seasonal Household in area i

Additional refinements could be made if survey data available. For example, if a survey is done of RV parks that collected data on the occupants, then a separate PPH value for them could be used, along with an estimate of the occupied RV spaces.

There is some ambiguity in the "winter season" 1999-2000 date given for our example estimate for Arizona. As noted by Smith (1989) an accurate enumeration of the entire seasonal population is almost never available. Among, other limitations, this means that the empirical relationship between the symptomatic variables and seasonal population is not based on an actual point-in-time census, which means that we have no direct estimate of error. At best, a given estimate can be compared with estimates from other sources in hopes of "triangulating" the seasonal population, keeping in mind that it likely fluctuates over the season in question. These fluctuations leave even such precisely named methods as "Demoflush" with estimates that are not as precise as the name might suggest.

In concluding this discussion of the amenity seeking seasonal population, we know that there are people who move in combination with seasonal amenity seekers for purposes of employment. For example, many of the people working at lodges and related facilities in national parks only are there for the season, (e.g., summer in Yellowstone and winter in Death Valley). For our purposes, we include them as part of the amenity seeking population and not part of the next seasonal group we examine, the migrant worker population.

## 6.2 Migrant Worker Seasonal Population

This population largely works in agriculture and related areas (e.g., fish canneries in Alaska), and for those that work in serves geared toward the amenity seeking seasonal population, we have included them as part of this group, as just stated. Moreover, evidence indicates that the migrant worker seasonal population is decreasing in that people who once moved from place to place following harvests and related seasonal work are becoming permanent year-round residents in agricultural areas (Kandel 2008).

While the data on this population may be skimpy in terms of the Decennial U.S. Census on Population and Housing this is not the case in regard to the U.S. Census of Agriculture, which was formerly conducted by the U.S. Census Bureau, but is now conducted by the National Agriculture Statistics Service, U.S. Department of Agriculture (http://www.nass.usda.gov/). The U.S. Department of Agriculture (USDA) maintains and analyzes a wealth of data on this population (Kandel, 2008) as does U.S. Department of Labor (USDOL), especially in the form of its National Agricultural Workers Surveys (http://www.doleta.gov/agworker/naws.cfm ). As an example of the richness of these data, the 2007 Census of Agriculture shows that in Arizona, 28,754 farmhands were hired, of which 238 were migrant laborers (U.S, Department of Agriculture, 2008). Similar data are available for other states and for sub-areas within states via the USDA's "quickstats" service ((http://quickstats.nass.usda.gov).

As we described at the outset of this section, we used information we had about available data and methods to assist in developing our De Facto population categories. Developing estimates of a visitor population is perhaps the most onerous because there are little, if any, publically available data for such a population. At the other end of the spectrum, we have the readily accessible and no-cost data available on the seasonal migrant worker population, courtesy of USDA and USDOL. Very close to the USDA and USDOL information in terms of accessibility and cost, we have the information from the U.S. Census Bureau that can be manipulated to obtain estimates of daytime populations as well as estimates of the seasonal amenity seeking population. We now turn to a related, but distinct task: estimating the immediate effect on populations due to disasters.

## 7. Estimating the Homeless Population

In a country such as the United States where the De Jure concept is used to define population, the presence of people who do not live either in permanent resident units or in group quarters (e.g., dormitories, barracks, convents, shelters for the homeless) creates problems for census and estimation purposes. To start with, the U.S. Decennial Census completely went to "mail-out/mail-back" by 1980 as the initial mode of contact (U.S. Census Bureau, no date). To implement this method, the "Master Address File" (MAF) was developed, which is a national register of addresses (Swanson and Walashek 2011). As you can guess, the major bulk of census activities are based on the MAF, which returns us to the point made earlier that those not living in permanent units present enumeration problems since where they "reside" is not in the MAF. The U.S. Census Bureau is, of course, well aware of the presence of people not living in permanent units and makes an effort to count them in the decennial census (Glasser, 1991; Salo, 1990; U.S. Census Bureau, no date).

Fortunately, efforts to count the homeless in the United States received a tremendous boost in 1987 when the McKinney-Vento Homeless Act became law in the United States. Among its provisions is the requirement that surveys of the homeless must be done by agencies seeking funding under the Act (U.S. HUD, 2008a). The Act was re-authorized in 2009 with the same survey requirement.

Under the charge of the McKinney-Vento Homeless Act, The U. S. Department of Housing and Urban Development needed to define homelessness. In moving toward a definition, U.S. HUD (2008b: 4) observes "residential stability" can be divided into two broad categories of people: (1) those who "literally homeless;" and (2) those who are "precariously housed." The "literally homeless" include people who for various reasons have found it necessary to live in emergency shelters or transitional housing for some period of time (U.S. HUD, 2008a, 2008b). This category also includes unsheltered homeless people who sleep in places not meant for human habitation (for example, streets, parks, abandoned buildings, and subway tunnels) and who may also use shelters on an intermittent basis" (U.S. HUD 2008a, 2008b). The "Precariously Housed" refers to "…people on the edge of becoming literally homeless who may be doubled up with friends and relatives or paying extremely high proportions of their resources for rent. The group is often characterized as being at imminent risk of becoming homeless" (U.S. HUD 2008b).

With these definitions in hand, U.S. HUD developed two manuals designed to assist local jurisdictions in meeting the survey requirements of the McKinney-Vento Act. The two manuals are aimed at the two groups composing the "literally homeless," the unsheltered homeless (U.S. HUD 2008b) and the sheltered homeless (U.S. HUD 2008a). U.S. HUD (2008b) defines the unsheltered homeless as the homeless who are not residing in shelters for the homeless and similar facilities. It is designed to produce counts of the unsheltered homeless and their characteristics. This orientation complements the information on those living in shelters. U.S. HUD (2008a) defines the sheltered homeless as adults, children, and unaccompanied youth who, on the night of the count, are living in shelters for the homeless, including: (1) Emergency shelters; (2) Transitional housing; (3) Domestic violence shelters; (4) Residential programs for runaway/homeless youth; (5) Any hotel, motel, or apartment voucher arrangements paid by a public or private agency because the person or family is homeless.

As an example of the type of information that can result from these two manuals, we turn to the 2007 census and survey of the homeless in southern Nevada, which includes Las Vegas (Applied Survey Research, 2007). The study was conducted in January, 2007 and included not only counts of both the sheltered homeless and the unsheltered homeless, but estimates of the "precariously housed," which was termed the "hidden homeless" in the study. Using a range of methods geared specifically to enumerating and surveying these three types of homeless population, the study estimated a total homeless population of 11,417, of whom 3,747 were enumerated on the streets,

3,844 in shelters, and the remaining 3,826 were "hidden" (Applied Survey Research, 2007). The methods included a systematic two-day canvassing of streets, a canvassing of shelters and institutions, and a general population telephone survey (Applied Survey Research, 2007). The telephone survey was used as the basis for estimating the "hidden" homeless, "…persons living on private property but in locations that would not be considered "double-ups" as defined by U.S. HUD such as tents, cars/vans, unconverted garages, storage sheds, etc. The general population phone survey was a 10- 15 minute survey designed to determine if there were people staying in the household who would otherwise be homeless" (Applied Survey Research, 2007).

While the 2007 Las Vegas study may be one of the most comprehensive of the homeless counts and surveys, it is not alone. Studies of the homeless abound and it may be the case that a study has already been done for an area of interest to you; if not the two U.S. HUD manuals and the Las Vegas Report provide the basis for estimating the homeless population in the area of interest to you.

## 8. Estimating a Disaster-Impacted Population

Estimates of De Facto populations are useful in planning for and coping with a disaster, especially those of daytime populations and seasonal amenity seeking populations. Here, however, we are interested in the impact of a disaster. In this regard we also note that there are two distinct groups of interest: (1) the population remaining in an area in which a disaster occurred; and (2) the population dispersed by the disaster. In regard to the former, the location is generally easy to define (Swanson, 2008; Swanson, et al., 2007; Swanson et al., 2009) while the latter is less easily defined because of the nature of dispersion (Henderson, et al., 2009 Smith and McCarty, 1996). Here, we provide an overview of methods used to estimate both groups. We note that these methods, like those used to estimate visitor and homeless populations are largely time and resource intensive in that all three are ephemeral. One major difference in developing estimates for visitor vs. homeless and disaster impacted populations is that the direct data needed for the latter are usually collected under difficult – even dangerous –circumstances (Applied Survey Research, 2007; Swanson, et al., 2007). On the plus side, "pre-disaster" data are available on the De Jure population (Swanson, et al., 2007).

As an example of developing an estimate for the area in which a disaster occurred, we turn to the study of Hurricane Katrina on the Mississippi Gulf Coast (Swanson, et al., 2007). As one of nine "social network" post-Katrina research projects funded by the National Science Foundation under the provisions of the SGER program, this study required $96, 212 in funding to accomplish two major tasks:

(1) gather pre- and post-Katrina information on housing and population from 573 targeted census blocks at the epicenter of Katrina's impact on the Mississippi gulf coast that the 2000 census showed as containing people (the "Short Form"); and

(2) employ a random start, systematic selection, cluster sample targeting 126 of these 573 blocks for administration of a 115-item questionnaire (the "Long Form"), such that at least 350 completed questionnaires would be obtained. The Long Form was designed for several purposes, one of which was to collect retrospective information on the roles that social and kinship networks played in determining respondents' success (i.e., the capacity for respondents to sustain their physical and emotional well-being after Hurricane Katrina).

Before Katrina stuck, there were 8,535 (permanent) housing units in the 346 blocks that were canvassed, an increase of nearly 10% over the Census 2000 count of 7,793. Of the 8,555 housing units in study area, 2,227 (27%) were destroyed and 3,997 substantially damaged (47%), leaving 2,261 habitable (26%). There were 2,012 temporary units found the Study Area after Katrina struck, of which 94% were occupied.

There were approximately 16,540 people residing in 6,486 (occupied) permanent housing units in the 346 blocks as of Census 2000. Just prior to the impact of Katrina on August 29th, 2005, there were approximately 7,100 occupied permanent housing units (83% of the total number of permanent housing units) containing 18,105 people in these same 346 blocks After Katrina stuck, the study found approximately 10, 950 people residing in 3,938 permanent and temporary housing units in these same 346 blocks. At the time of Census 2000 and just prior to when Katrina struck, the average number of persons per household (PPH) in the Study Area was 2.55. Subsequent to Katrina the PPH was 2.78.

Thus, for the 346 blocks comprising the study area it was found that Hurricane Katrina resulted in:

(1) A decline of 7,155 for the household population – a 40% drop from the pre-Katrina household population of 18,105;8 and

(2) An increase of 0.23 persons per household– a 9% increase from the pre-Katrina PPH of 2.55.

The preceding estimates are consistent with the special estimates of Hancock and Harrison counties that the Census Bureau released for January of 2006. These estimates were designed to show the impact of Katrina in the 117 counties designated by the Federal Emergency Management Agency (FEMA) as being eligible for individual and public assistance (U.S. Census Bureau, 2006).

In a larger study, Swanson et al (2009) extended their estimates to include New Orleans and other areas of Louisiana directly impacted by Hurricane. They found relative to what had been projected for the zip code impacted by Katrina, the hurricane had resulted in 311,150 fewer people expected in the absence of its impact. For the 18 zip codes in Orleans Parish (i.e., the City of New Orleans), the impact was a reduction of 203,198 people. As these estimates suggest, the pre-Katrina population was elsewhere. Frey, Singer and Park (2007) found where much of the Pre-Katrina population had moved, at least in terms of the City of New Orleans.

Using data from the 2006 American Community Survey along with Drawing on this survey as well as other Census Bureau estimates and Internal Revenue Service migration data, Frey, Singer, and Park (2007) analyzed population change from July 1$^{st}$ of 200 to July 1$^{st}$, 2005 (pre-Katrina, since Katrina struck in August of 2005) with that found for July 1$^{st}$ 2005 to July 1$^{st}$ of 2006 in selected metropolitan areas in Alabama, Louisiana, Mississippi, and Texas to estimate population losses in the impact area and simultaneously estimate gains in terms of nearby receiving areas. The results are not definite, but they are suggestive. For example, Frey, Singer, and Park found that Harris County, Texas (where the City of Houston is located) increased its population by 123,000 in 2005-2006 (Frey, Singer and Park 2007). They compared this to the increase of 67,000 people for 2004-2005 and concluded that much of the increase was due to the presence of displaced people from the New Orleans area. Taking into account that some of the people displaced by Katrina went to places far from the impact area, one can get a good picture of the metropolitan areas that were themselves impacted indirectly by Katrina in terms of the movement it caused among the populations it impacted directly.

## 9. Summary

As our examples suggest, the impact of De Facto populations can vary widely from place to place and where the impacts are substantial, the ability to generate estimates becomes important. Unfortunately, the estimation of a De Facto population in a country that depends on a De Jure concept of population is generally not a task that is easily accomplished. This is true both in countries that rely on a population registry system (e.g. Finland) and a regular census (e.g., the United States and Canada). As we noted, however, some countries have census information that can be used to develop estimates for daytime and seasonal populations (Cook 1996). In this paper, we have provided examples of how these estimates may be accomplished. In many regards, these examples should be viewed as templates that can be adjusted to different situations. For example, where the data are a bit different than those used in our examples, those seeking to develop daytime and seasonal population estimates at least have a starting point so that they can and find the data and make the necessary adjustments to develop the estimates of these populations. To this, end we hope that the general model we provided for estimating a De Facto population will prove a useful point of reference (or departure).

While it is clear there are countries that have information on international visitors at the national level, we are not aware of any jurisdiction that can easily develop estimates of visitor populations, both domestic and international, for sub-national areas. In the United States, Hawai'i is virtually unique in this regard since visitors can arrive only by air or sea and because of its economic dependence on visitors, it has developed a sophisticated system for estimating visitors to the state as a whole, and selected subareas. While not as geographically isolated, Las Vegas is not far behind Hawai'i in terms of its dedication to the development of visitor population estimates.

Like the estimates of visitor populations, those for homeless and disaster impacted populations are time and resource intensive. Some of these needs can be reduced by relying on "off the shelf" methods developed by U.S. HUD (2008a, 2008b) for the homeless and Centers such as the National Hazards Center at the University of Colorado at Boulder or the Disaster Research Center at the University of Delaware for populations impacted by disasters. Along with the "off-the-shelf" methods, there is, of course, a great deal of knowledge and experience in homeless research at U.S. HUD and local jurisdictions seeking its funding for the homeless, and in disaster research at the National Centers, to include methods to estimate the demographic impacts of natural and man-made disasters.

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