Chapter 4
Population Size, Distribution and Concentration

Abstract The size of a population is typically the first demographic fact that a demographer would obtain for an area or population under study. In addition to population size it is important to consider the manner in which this population is distributed throughout the geographic area and to discern patterns of concentration or dispersion. In addition to examining population size, distribution and concentration, this chapter describes the various geographic units and the various community types considered in demographic analyses.

4.1 Introduction

The size of a population within a geographic area—typically measured in terms of the number of people—is the simplest and most straightforward of demographic attributes. And, for many purposes, it is the most important. Not only is the size of a population important in its own right but many of the calculations utilized in generating demographic measures depend on this information. After size, the pattern of distribution and concentration of persons within geographic areas are probably next in importance for anyone examining the interface of demographics and other population attributes.

Demographers generally begin telling the "demographic story" about a population by presenting information on its size in very basic terms. Significant population increases (or decreases) often make the headlines and, when the census of population is conducted every ten years, reports on population gains and losses are eagerly awaited since a primary (and legally mandated) function of the census count is to determine Congressional representation. The significance of population size for the various states is demonstrated by the fact that, after the 2010 census, one state (Texas) gained four Congressional representatives and one state (Florida) gained two additional Congressional seats. On the other hand, eight states (Illinois, Iowa, Louisiana, Massachusetts, Michigan, Missouri, New Jersey, and Pennsylvania) lost one seat, and two states (New York and Ohio) lost two seats. Data on the size and location of the population also provide the basis for descriptive statistics such as rates and ratios.

Size is typically the first demographic "fact" obtained for a population, with the size of the population revealing a lot about the characteristics of the population and providing the basis for the calculation of a number of demographic measures.

4.2   Defining and Measuring Size, Distribution and Concentration

4.2.1   Population Size

The first demographic "fact" usually employed in describing a population is its size. Size is typically measured in terms of the number of individuals who reside within a defined geography at a specified time. The size of a population is an important consideration with regard to virtually every issue to be addressed, with size having significant implications for the population's social structure and concomitant demographic attributes. The fact that the United States has a population of over 300 million individuals has important national and international implications, as does the fact that Denmark has a population of less than 6 million residents (and is, thus, smaller than 17 U.S. states). The size of a population determines the level of need for various services and influences population dynamics.

While size is typically measured in terms of the number of individuals within a population in contemporary developed societies, the individual is not the only unit that might be considered. The size of a population might be determined based on the number of households or families for example. In societies that emphasize communal life and deemphasize the individual, they may see the world as made up of families rather than individual people. Other societies may see the household (which may or may not correspond with the number of families) as the unit for measurement. While measuring size in terms of individual group members is technically the most accurate method, the perspectives of other cultures with regard to their "demographic map" should not be ignored.

The most complete count of a population is performed by means of a census. As noted in Chap. 3, a census involves an attempt to count (and describe) each individual "officially" residing in the country (or other geographic area) at a particular point in time. In the U.S., a census is conducted every ten years, with the 2010 census being the more recent. (More detail on the decennial census is provided in Chap. 3.) Censuses at different times and different places vary in the types of data collected, but all attempt to enumerate every resident.

Data collection for census purposes in the U.S. is keyed to individual street addresses (provided by the United States Postal Service in the runup to the census). This address represents the "living unit" for enumeration purposes. For individuals

who live in group quarters such as a nursing home, college dormitory or prison, the institution would be identified for enumeration purposes (although ultimately related to a physical address). Data from individual living units collected via the census are associated with a specific geographic area with the data subsequently aggregated by the Census Bureau to various levels of geography.

Demographers and other users of census data are typically not interested in data on specific individuals and households (and, indeed, this information is not made available). Information on individuals is aggregated up to various levels of geography, with the smallest reported unit being the census block and the largest the United States as a whole. As demonstrated below there are various levels of aggregation that occur between the smallest and largest units, and the level of aggregation most suitable for a particular analysis depends on the circumstances.

The decennial census elicits information from the entire population for basic demographic variables while the American Community Survey collects detailed data for years in between censuses.

Several issues must be addressed in the counting of the population. The first concerns which individuals are to be counted. Censuses are designed to count every individual residing within the nation regardless of their legal status. There has not always been total agreement, however, as to who is a resident of the U.S. and, thus, eligible to be counted. In the early days of the census, there was debate at various times over whether to count children, women, slaves and American Indians. Today, with the increase in undocumented immigrants, new questions have emerged with regard to the counting of that population. The Census Bureau has established rules that determine who is eligible for enumeration. So, for example, U.S. military personnel and diplomats stationed abroad are counted as U.S. residents while foreign tourists visiting in the U.S. on census day are not.

The assigned location of individuals in terms of geography is also of concern, with people generally counted at their usual place of residence. Since the place of residence is defined as the location where the individual usually sleeps and eats, the usual place of residence is easy to establish for the vast majority of the population (and the postal address thus used as the basis for the census enumeration process). Definitional complications may arise, however, for subpopulations such as college students, migrant workers, persons with two or more residences and the homeless. While college students are typically assigned to the location of their educational institution, the determination of usual residence for the remaining groups involves the application of specific rules, enumerator judgment, and special counting attempts (e.g., visiting rescue missions to count the homeless).

A further distinction between an individual's usual place of residence (nighttime) and his workplace location (daytime) is important. The downtown areas and industrial complexes of many U.S. cities teem with people during working hours only to become virtual ghost towns in the evening. The opposite is often true for

residential areas. For some purposes, information on the location of the daytime population may be more useful than information on one's place of residence. Locational decisions relating to medical emergency facilities, vehicles, and staffing, for example, require a sensitivity to differentials in daytime and nighttime populations as does disaster planning. The ability to provide at least minimal services to all parts of the community requires either a count or an estimate of these distinct populations. Estimates of the daytime population for a geographic area can be estimated using such information as commuting patterns (e.g., from the American Community Survey) and commercial concentrations (e.g., from the Census Bureau's economic survey).

4.2.2   Population Distribution

While the size of a population is an important consideration, the manner in which that population is distributed within a geographic area is equally important. It is one thing to know that the United States has a population of over 300 million residents, it is another to realize that these residents are unequally distributed throughout the country's various regions, states and communities. An understanding of the population's spatial distribution is important since both population characteristics and demographic processes are likely to be affected by distribution patterns.

One way of measuring population distribution is in terms of the proportion of the total population living in specified geographic areas and subareas. For example, the nation's 310 million residents in 2010 are unevenly distributed among the various states. The *numbers* of residents reported for each state is useful information but for many purposes it may be beneficial to think in terms of the *proportion* of the population accounted for by the respective states. It is one thing to understand that California contained more than 37 million residents, but this takes on more meaning when it is realized that these residents account for approximately 12% of the country's population. The numerical and percentage distributions for the various states are presented in Exhibit 4.1.

Examining the total population can be complicated enough when distribution is considered but, typically, researchers analyzing population distribution are going to be interested in the distribution of subpopulations based on demographic attributes (e.g., various racial or ethnic groups, poverty populations, age cohorts, etc.). The distributions of these subgroups are likely to differ in some cases significantly from the distribution of the general population. Thus, a health demographer studying the distribution of the poverty population across the U.S. will find a geographic distribution much different from that of the population as a whole.

While the size of a population is an important statistic, an examination of the distribution of this population within its geographic area provides additional information.

   Measures of population distribution assume both accurate population counts and
relatively stable geographic boundaries. The proportion of the population associated
with a subarea can only be successfully calculated if the population figures for the
subarea and the total population are reasonably accurate. Similarly, the proportion
allocated to a particular geography can only be consistently determined if the
boundaries remain constant. Thus, year-to-year state population estimates are not
likely to be problematic since there are virtually never any changes in state
boundaries. On the other hand, it is not unusual for the U.S. Postal Service to
modify ZIP Code boundaries in response to service demands. This means the
number and proportion of residents allocated to a particular ZIP Code could change
over time. Similarly, cities may modify their boundaries over time while the
boundaries for metropolitan statistical areas may expand through the addition of
counties. These types of boundary changes make tracking changes from one period
of time to another a challenge (illustrated in Case Study 4.1).

Exhibit 4.1: U.S. Population Distribution by State April 1, 2010

Alabama	4,779,736	Montana	989,415
Alaska	710,231	Nebraska	1,826,341
Arizona	6,392,017	Nevada	2,700,551
Arkansas	2,915,918	New Hampshire	1,316,470
California	37,253,951	New Jersey	8,791,884
Colorado	5,029,196	New Mexico	2,059,179
Connecticut	3,405,565	New York	19,378,102
Delaware	897,934	North Carolina	9,535,483
District of Columbia	601,723	North Dakota	672,591
Florida	18,801,310	Ohio	11,536,504
Georgia	9,687,653	Oklahoma	3,751,351
Hawaii	1,360,301	Oregon	3,831,074
Idaho	1,567,582	Pennsylvania	12,702,379
Illinois	12,830,632	Rhode Island	1,052,267
Indiana	6,483,802	South Carolina	4,625,364
Iowa	3,046,355	South Dakota	814,180
Kansas	2,853,118	Tennessee	6,346,105
Kentucky	4,339,367	Texas	25,145,561
Louisiana	4,533,372	Utah	2,763,885
Maine	1,328,361	Vermont	625,741
Maryland	5,773,552	Virginia	8,001,024
Massachusetts	6,547,629	Washington	6,724,540
Michigan	9,883,640	West Virginia	1,852,994
Minnesota	5,303,925	Wisconsin	5,686,986
Mississippi	2,962,297	Wyoming	563,626
Missouri	5,908,927		

Source U.S. Census Bureau

A variety of different geographic units are used by demographers in their examination of population distribution. These units may be as small as a census block or as large as a nation. They may be in easily recognized hierarchies that divide the nation into states and the states into counties or county equivalents. Other sets may include less familiar units such as census block groups or county subdivisions. Some sets of geographic units can be easily converted to other units (e.g., census tracts to counties), while it may be difficult to relate some units to others (e.g., census tracts to ZIP Codes). In any case, an understanding of the geographic distribution of the population begins with an understanding of the various spatial units utilized as a framework for population distribution. Exhibit 4.2 summarizes the various types of geographic units that might be of use to demographers.

Exhibit 4.2: Units of Geography for Demography

The geographical units used for demographic analysis can be divided into four categories: political or administrative units, operational units, statistical units, and a residual category of units that do not fit into either of these categories.

Political Units

Political or administrative divisions are the most commonly used geographical units for most demographic analyses. Political units typically constitute nested hierarchies that are easily understood (e.g., states "nested" inside the United States, counties within their respective states). Most relevant data are routinely collected for political units as part of their normal activities, and the permanence of virtually all political boundaries is an advantage. Political units also are useful in spatial analysis, as many statistics are compiled on the basis of political boundaries. The following political and administrative units are frequently used in applied demography.

Nation

The nation (in this case, the United States) is defined by national boundaries. Some analyses may be conducted at the national level (e.g., international comparisons), but most analyses focus on lower levels of geography. However, national averages (e.g., mortality rates) are often important as a standard to which other levels of geography might be compared, and the U.S. population is typically used as basis for data standardization.

States

The major subnational political unit is the state, with data typically available for 50 states, the District of Columbia, and several U.S. territories. Because the individual states have responsibility for a broad range of administrative functions, many useful types of data are compiled at the state level, making state agencies a major source of demographic data. However, each state compiles data independent of other jurisdictions, resulting in uneven data reporting from state to state.

Counties

The county (or, in some areas, county equivalents) represents the primary unit of local government. The nation is divided into more than 3,100 county

units (including some cities politically designated as counties). The county is a critical unit for analyses because many organizations view their home county as their primary service area. States typically report most of their statistics at the county level. Even when regional phenomena are being considered, the county is likely to be considered the building block for data collection.

Cities

Cites are officially incorporated urban areas delineated by boundaries that may or may not coincide with other political boundaries. Although cities typically are contained within a particular county, many city boundaries extend across county lines. Because cities are incorporated in keeping with the laws of the particular state, little standardization with regard to boundary delineation exists. For this reason cities are limited in their usefulness for demographic analyses. In many cases, however, city governments are involved in data collection activities that may be useful to demographers.

Congressional Districts

Congressional districts are established by state-specific procedures and approved by the federal government. These districts are typically delineated by means of political compromise and do not correspond well with any other geographical units. Although the Census Bureau reports its data for congressional districts, limited data are collected at the congressional district level. In addition, the boundaries tend to change over time, making these units not particularly suited for use in demographic analysis.

State Legislative Districts

State legislative districts have similar characteristics to congressional districts. They are drawn up by the states based primarily on political compromise. Although the Census Bureau reports its data for state legislative districts, virtually no other data are collected for such districts. Furthermore, their boundaries are subject to periodic change. For these reasons state legislative districts are not very useful as units for purposes of demographic analysis.

Operational Units

Operational units are areas drawn up for purposes of managing the operations of some entity. They may or may not have a formal regulatory designation and, because they are responsive to the needs of a particular entity are more susceptible to change than some other types of units.

ZIP Codes

Unlike the geographical units previously discussed, ZIP Codes are not considered formal government designations (with the United States Postal Service operating as an independent agency). ZIP Code boundaries are set by the USPS and are subject to change as population shifts occur or the needs of the Postal Service dictate. This lack of stability often means that ZIP Codes have limited value for historical analyses or tracking phenomena over a long period. Furthermore, ZIP Codes seldom coincide with census tracts or other political or statistical boundaries, making the synthesis of data for various

geographies extremely difficult. Despite these shortcomings ZIP Code-level data are frequently used in analyses due to the fact that virtually every relevant type of data is associated with a ZIP Code because almost no social transaction takes place today without ZIP Code data being collected.

Utility Districts

Utility districts are designated for purposes of distributing power, water and gas and for disposing of garbage and other by-products of human activity. These districts tend to reflect the spheres of influence of various utility companies and may or may not correspond with other boundaries. Such data are of limited use for general demographic analyses but may be useful inputs into the calculation of estimates and projections. (see Chap. 9.)

School Districts

School districts are established for the operation of school systems and are reflective of the educational needs of the local population. Although theoretically reflecting the distribution of school-aged children within the population, other factors may play a role in determining the configuration of school districts within a community. In older communities, school districts may be well established, but for most parts of the U.S. continuous population shifts mean that the boundaries for school districts must be frequently adjusted.

Statistical Units

Statistical areas are established to allow various agencies of government to collect and report data in a useful and consistent manner. The guidelines for establishing most statistical units are promulgated by the federal government. The most important statistical units for purposes of demographic analysis are discussed below.

Regions

Regions are established for statistical purposes by the federal government by combining states into logical groupings. Four regions have been established by grouping states based on geographical proximity and economic and social homogeneity. Although statistics are sometimes reported at the regional level by federal agencies, they are typically considered too large for most applications of demographic methods, even though some important metrics (e.g., migration trends) are reported at the regional level. (The term "region" is also used informally to refer to a group of counties or states delineated for some other purpose than data compilation as noted below.)

Divisions

For statistical purposes the federal government divides the nation's four regions into nine divisions. Each division includes several states, providing a finer breakdown of the nation's geography. Since the combining of states into divisions is based more on proximity than meaningful attributes, divisions are seldom used as a basis for demographic analysis.

Metropolitan Statistical Areas

Metropolitan statistical areas (MSA) are delineated by the federal government as a means of standardizing the boundaries of cities and urbanized

areas. Because each state has different criteria for the incorporation of cities, the MSA concept provides a mechanism for creating comparable statistical units. An MSA includes a central city, central county, and any contiguous counties that could logically be included within the urbanized area. MSAs are revised as necessary after each decennial census with component counties included representing interdependent attributes. An increasing amount of data are available on MSAs, and this unit is often used to define a distinct urban conglomerate.

Urbanized Areas

An urbanized area as defined by the Census Bureau includes the entire densely settled area in and around each large city, regardless of whether the area is within the corporate limits. The urbanized area might be considered more "organic" in that it reflects the actual pattern of urban development independent of any political boundaries. Although limited amounts of data are available for urbanized areas, knowledge about urbanized areas is important in developing a full understanding of the population distribution within a metropolitan area.

Census Tracts

Census tracts are small statistical subdivisions of a county established by the Census Bureau for data collection purposes. In theory census tracts contain relatively homogeneous populations ranging in size from 1500 to 8000. For many purposes the census tract is the ideal unit for compiling demographic data. It is large enough to be a meaningful geographical unit and small enough to contribute to a fine-grained view of larger areas. The Census Bureau collects extensive data at the census tract level primarily today through the American Community Survey (ACS).

Census Block Groups

Census tracts are subdivided into census block groups that include approximately 1000 residents. A tract is composed of a number of block groups, each containing several blocks. The block group provides an even finer-grained picture of a community than the tract level, although fewer data elements are likely to be compiled at the block group level. This represents the lowest level at which ACS data are presented.

Census Blocks

Census block groups are subdivided into census blocks, the smallest unit of census geography. The term *block* comes from the fact that the typical block is bounded on four sides by streets, although some other visible feature (e.g., railroad track, stream) or nonvisible feature (e.g., city limits) may serve as a boundary. Census blocks tend to be the most homogeneous of any unit of census geography, with the average block composed of approximately 30 households. Only a limited amount of demographic data is available for census blocks.

ZIP Code Tabulation Areas

ZIP Code tabulation areas (ZCTA) were developed by the Census Bureau to overcome the difficulties in precisely defining the land area covered by

each ZIP Code used by the U.S. Postal Service. ZCTAs are generalized area representations of U.S. Postal Service ZIP Code service areas and are created by aggregating the census blocks whose addresses use a given ZIP Code into a ZCTA. The Census Bureau's intent was to create ZIP Code–like areas that would retain more stability from census to census.

Other Units of Geography

Natural Region

There are certain geographic regions that are distinguished enough in terms of some physical, social or economic trait to be recognized as a distinct area. Some such areas may have been historically recognized as unique geographic areas and these may occasionally be formally labeled as such for some practical purpose (e.g., the "South" or the "rust belt"). Examples of regions that have been identified based on their distinct cultures and a history of geographic and/or social isolation from others include Appalachia and the Mississippi Delta. The federal government has formally recognized these two natural regions through the establishment of federal agencies (regional commissions) for addressing problems facing the respective regions.

Areas of Dominant Influence

Taken from media advertising, the *area of dominant influence*, or ADI, refers to the geographic territory (typically a group of counties) over which a form of media (e.g., television, newspaper) maintains predominance. Advertisers and others determine the demographic makeup of the ADI as a means of understanding economic potential among other factors. This concept is useful when economic demographers, for example, are interested in patterns of consumer behavior.

One way to assess population distribution is by examining the settlement patterns displayed by the population under study. Obviously, communities are not settled randomly and there are a number of factors that play a role in how the population distributes itself. There are rare occasions when a population may be evenly dispersed over an area (such as the case of a purely agrarian society where each householder has a piece of property some distance from other property owners). It is more likely that settlement patterns will follow one or more of the standard arrangements that have been identified by demographers and others. Settlements tend to concentrate on coastlines and waterways, on transportation routes or at transportation nodes, on fertile land as opposed to infertile land and/or in relation to various vital resources. There are a few communities that were established due to some random event but these are uncommon.

Human populations display a variety of settlement patterns, and these patterns demonstrate the extent to which populations are concentrated or dispersed.

The satellite map exhibited in Exhibit 4.3 displays settlement patterns in the U.S. based on the light sensed by satellite cameras. It is hard to imagine a more meaningful display of settlement patterns. It is clear from this map that there are major differences in population density across the nation—from some of the world's most densely populated communities to some of the least. It can be seen that the eastern portion of the U.S. is much more densely populated than the western portion. It is also clear that the coasts are much more densely populated than the interior of the country. Although it cannot be determined from this map, we also find that every major city in the U.S. is located on a waterway of some type (with the exception of Atlanta, Georgia).

Exhibit 4.3: Midnight in America: Settlement Patterns via Satellite Photographs
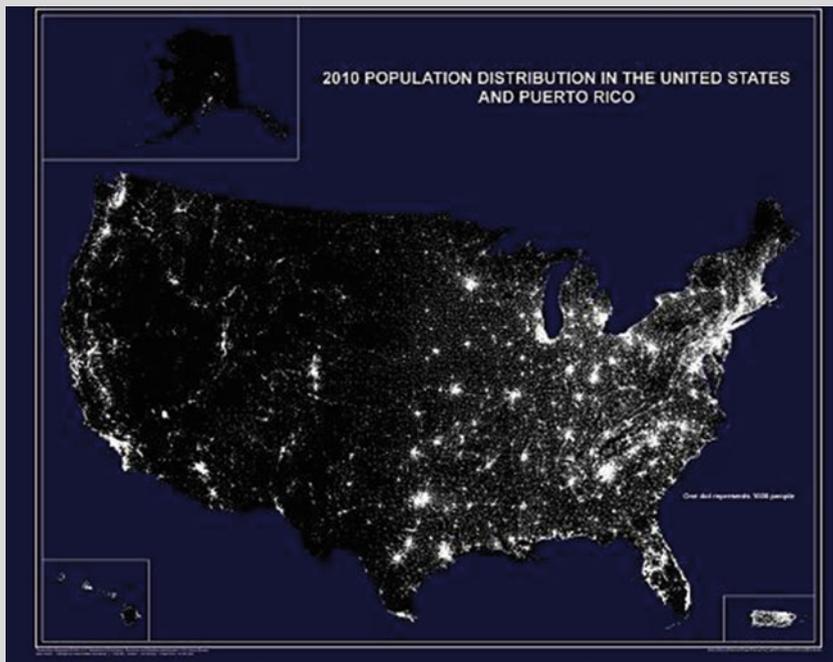
The U.S. with its large land mass is characterized with a wide variety of settlement patterns reflecting the diversity of its geography and cultures. Most other societies exhibit less complex settlement arrangements and more easily discerned patterns of population distribution. Two examples that might be considered are Australia and Egypt. Exhibit 4.4 illustrates the situation in Australia where virtually all of the settlement is on the coast and the case of Egypt in which 90% of the

population is settled adjacent to the Nile River. These two quite different examples illustrate the variety that can be found in terms of human settlements and subsequent population distribution patterns.

Exhibit 4.4: Settlement Patterns for Australia and Egypt
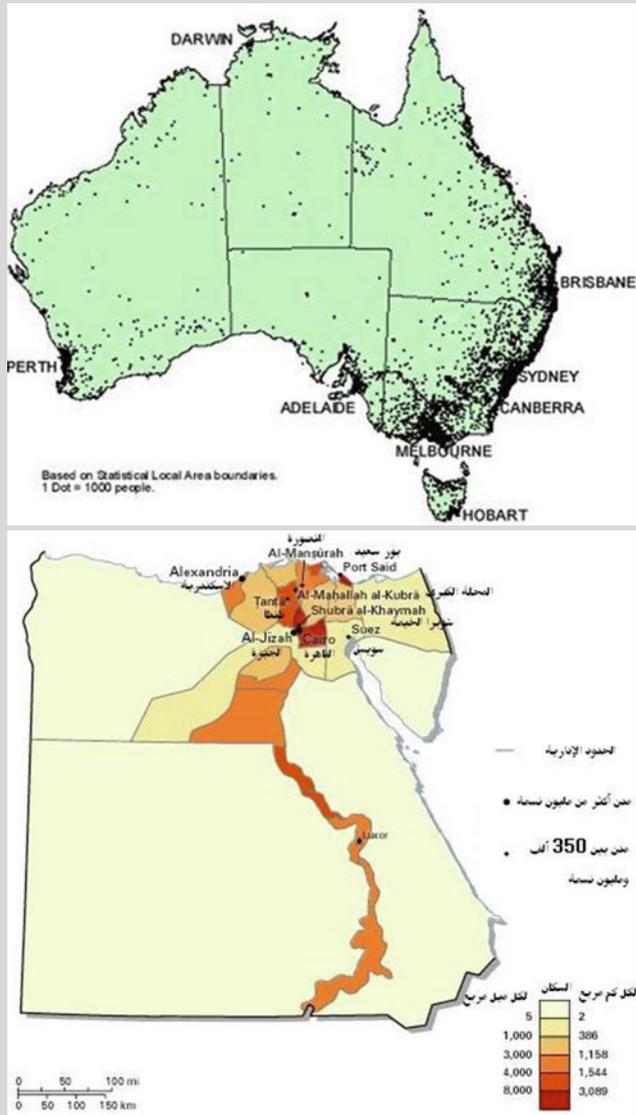
Sources U.S. Department of State (Australia); University of Edinburgh (Egypt)

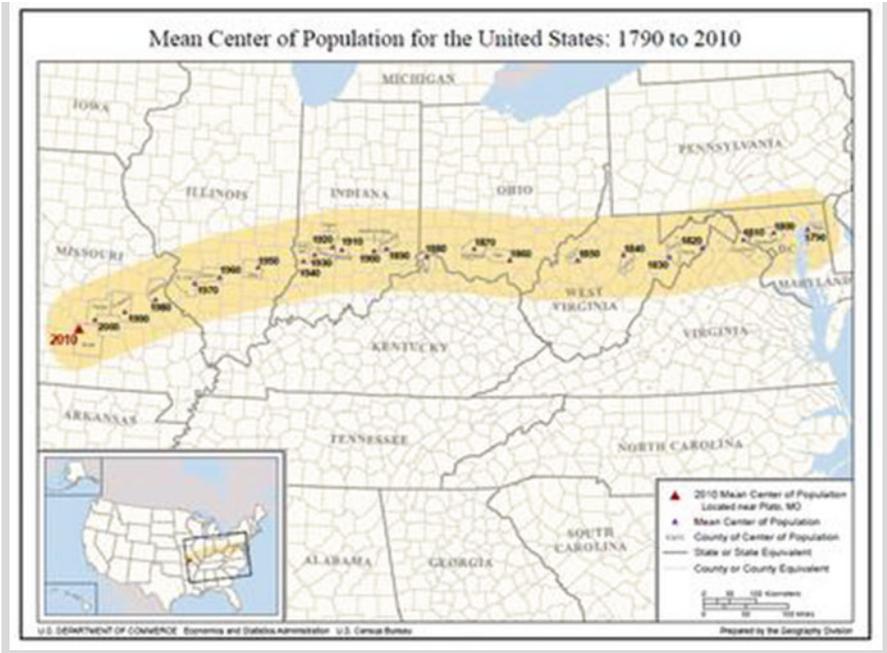### 4.2.3 Population Concentration

The concentration of the population represents a measure of distribution and indicates the level of concentration or dispersion characterizing its population. Concentration is usually measured in terms of density, with this specialized measure of distribution providing insight into a population's dispersion within a particular geographic area. Concentration is usually measured in the U.S. in terms of persons per square mile, while in other countries density may be stated in terms of square kilometers, hectares, acres or some other areal measure. Population density can be computed for any area—as long as one knows the size of the land area and the population within that area. Note that land area is emphasized since bodies of water are typically excluded when calculating density. Similarly, any areas where habitation is restricted (e.g., national parks) may also be excluded from the denominator in density calculations.

The population density of cities, states, entire continents, and even the world can be computed. Monaco, with an area of less than one square mile, has the world's highest population density or almost 43,000 people per square mile. Mongolia is the world's least densely populated country with only 4.3 people per square mile. Australia is a close second with 6.4 people per square mile. The United States, with its extensive territory, has a current population density of around 87 per square mile.

Population concentration in the U.S. is calculated by dividing the population by the land area to generate the population per square mile.

Another way of looking at concentration is in terms of an area's mean center of population. This is the point at which the population is equally distributed in all directions so that the area would balance like a plate set on top of a stick. At the time of the first U.S. census in 1790 the mean center of population was in Maryland; today it is in Missouri. During the 20th century the mean center of population shifted 324 miles to the west and 101 miles to the south (as illustrated in Exhibit 4.5).

Exhibit 4.5

Mean Center of Population for the United States: 1790 to 2010

Obviously, in the U.S. and in much of the world for that matter, population has become more concentrated, with the number of persons per square mile in the U.S. and most other nations increasing over time. The estimated population density for the U.S. in 2010 was around 87 persons per square mile (i.e., 309 million residents divided by 38 million square miles), but this figure masks the state-by-state differences that exist. The most highly concentrated state population is found in New Jersey, with nearly 1200 persons per square mile in 2010; the least highly concentrated state population is found in Alaska, with barely one person per square mile. The borough of Manhattan in New York City is considered the highest concentration of population within the U.S., with approximately 20,000 persons per square mile. Exhibit 4.6 illustrates the population density for each of the U.S. states.

Human populations are virtually never randomly distributed but exhibit patterns of distribution that reflect a variety of geographic, social and economic factors.

Exhibit 4.7 illustrates the distribution of population worldwide in terms of density. As can be seen about 90% of the earth's people live on 10% of the land. Additionally, about 90% of the people live north of the equator. The coasts are generally the areas of highest population concentration although there are some exceptions (e.g., Europe). Areas of greatest concentration are clearly identified and include south Asia, the Pacific rim and Europe. The world's population distribution is not stable and there are continuous shifts in concentration throughout much of the world especially with the current high level of migration.

Like distribution, measures of concentration assume reasonably accurate population counts and fixed geographic boundaries. For most units of geography (e.g., states, counties, census tracts) the boundaries and, hence, the area typically do not change. For other units such as ZIP Codes and school districts the boundaries are more subject to change.

Exhibit 4.6: Population Density United States 2013
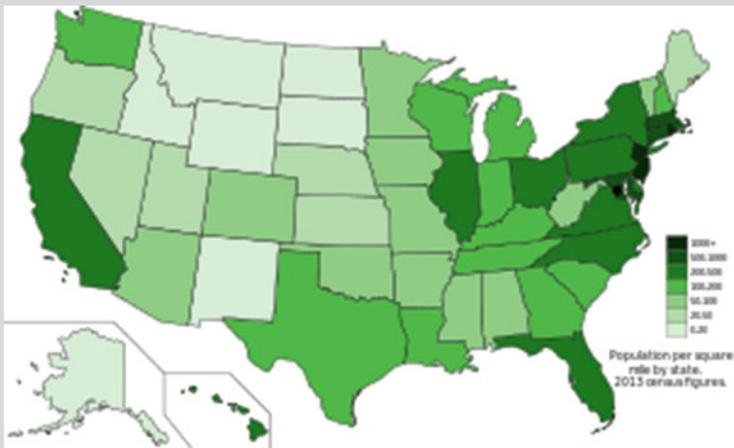
Source U.S. Census Bureau

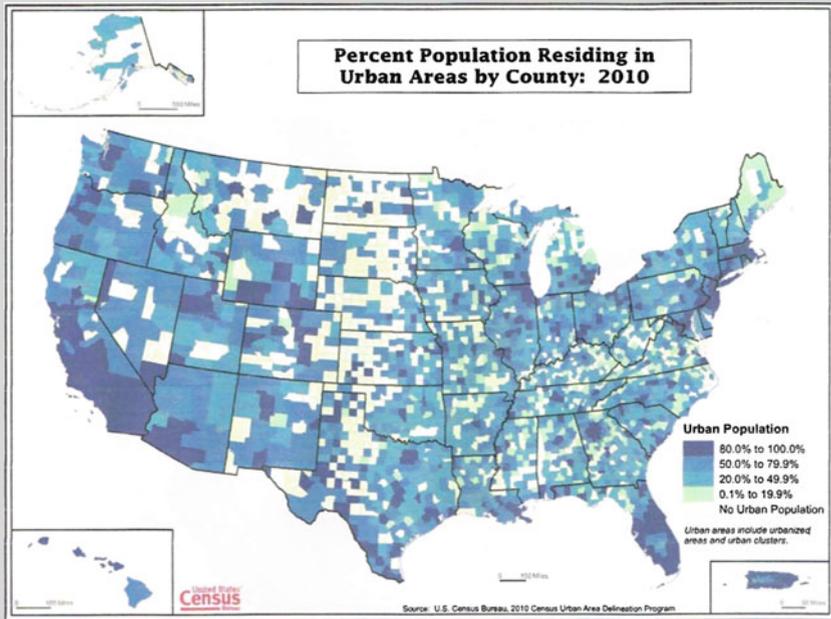**Exhibit 4.7: World Population Density 2015**
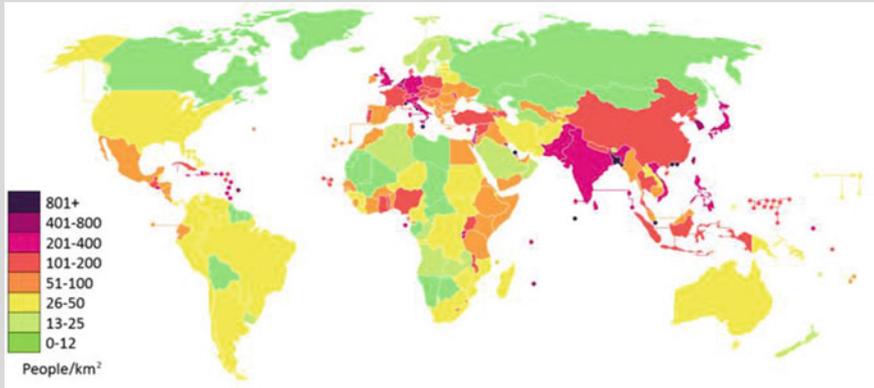
Source Wikipedia Commons

4.3   Community Type

Demographers classify populations in terms of the types of communities they occupy. While the type of community is addressed somewhat by the geographic units discussed above, there are other less formal community types that demographers may employ in their analyses. These are important not only because they describe the nature of population distribution, but because they reflect differences in lifestyles and various demographic characteristics. Further, different demographic attributes are associated with different community types.

A basic distinction developed by the Census Bureau is between rural areas and urban areas. The Bureau identifies two types of urban areas: urbanized areas (UAs) of 50,000 or more people and urban clusters (UCs) of at least 2500 and less than 50,000 people. "Rural" encompasses all population, housing, and territory not included within an urban area. Technically, from the Census Bureau perspective rural areas are geographic areas containing less than 2500 residents. The Bureau further divides rural areas into rural farm areas and rural non-farm areas. Even with this low threshold for being classified as rural, a few states are still predominantly rural today. Exhibit 4.8 illustrates the distribution of urban populations (both "urbanized areas" and "urban clusters").

Generally speaking, communities of 2500 or more residents (with at least a certain population density) and less than 50,000 residents are considered "small towns" or just "towns" in popular parlance. It is usual to have small towns scattered around rural areas; however, increasingly, the suburbs and exurbs of metropolitan areas also contain previously isolated small towns.

Exhibit 4.8: Urban Areas in the United States 2010

Percent Population Residing in
Urban Areas by County: 2010

Urban Population
80.0% to 100.0%
50.0% to 79.9%
20.0% to 49.9%
0.1% to 19.9%
No Urban Population

Urban areas include urbanized areas and urban clusters.

Source: U.S. Census Bureau, 2010 Census Urban Area Delineation Program

Typically, communities of 50,000 or more are considered to be "cities", with social, cultural and economic characteristics that separate them from towns. Cities can be further classified as small cities, medium cities and large cities, with essentially no upper limit on the population size. The thresholds for different sizes of cities vary based on who is establishing the classification.

The Census Bureau categorizes population as either "rural" or "urban" depending on population size and density.

Cities of any significant size are classified by the Census Bureau as metropolitan statistical areas, micropolitan statistical areas, or combined statistical areas. The first two invariably contain a central city of 50,000 or more for a metropolitan area or 10,000 or more for a micropolitan area. With rare exceptions, these urban areas contain a central county which houses the central city and adjacent counties that comprise the metro- or micro-area. These adjacent counties are typically referred to as suburban counties and the urban communities within there borders referred to as

suburbs. Further, the central county often includes suburbs that are politically distinct from the central city. Combined statistical areas (CSAs) are metropolitan or micropolitan statistical areas that retain their metro- or micro- identity while being included in a larger metropolitan area.

In certain parts of the country, most notably the East Coast and West Coast, there are unbroken stretches of urban development in which metropolitan areas actually merge with each other. These are referred to as consolidated metropolitan statistical areas and may contain tens of million residents.

The central city is also often subdivided into an urban core (that typically includes a central business district) and surrounding suburban areas (which may or may not be within the city limits). Older cities may have two or more successive rings of suburban development, often encouraged by the establishment of highway "loops". Finally, communities and counties that exist beyond the suburban counties of a metro- or micro-area are referred to as exurbs. These may include rural areas, small towns and/or cities that are somewhat beyond the Census Bureau-recognized limits for consideration as part of the metro- or micro-area.

> *Since the criteria for drawing city boundaries vary from state to state, "metropolitan statistical areas" have been established as a standard designation to allow for comparison of one urban area with another.*

Understanding these various gradations of both official and unofficial community types would benefit from a concrete example. Officially part of the Washington-Arlington-Alexandria, D.C., Virgina, Maryland and West Virginia Metropolitan Statistical Area, the Washington, D.C., area illustrates the various community types. The District of Columbia, while not techically a county, essentially has the status of the central county in the MSA. Washington is the central city in that "county" which contains other, smaller cities (e.g., Georgetown). This central county is surrounded by counties in three states—five in Maryland, ten in Virgina, and one in West Virginia. These "suburban" counties include cities of various sizes (e.g., Arlington, Virginia, and Silver Springs, Maryland), towns of various sizes (some incorporated, others unincorporated) and rural areas (including some rural farm areas). There are an additional eight counties in Maryland and Virginia that are considered exurban (i.e., not part of the metropolitan area but nevertheless interconnected). Finally, the Washington metropolitan statistical area is combined with the Baltimore Metropolitan Statistical Area to form the Washington-Baltimore Consolidated Statistical Area. (See Exhibit 4.9 for a map showing certain aspects of the Washington MSA and Exhibit 4.10 for a practical example of the use of geographic units for demographic analysis.)

Exhibit 4.9: Washington, DC, Metropolitan Statistical Area
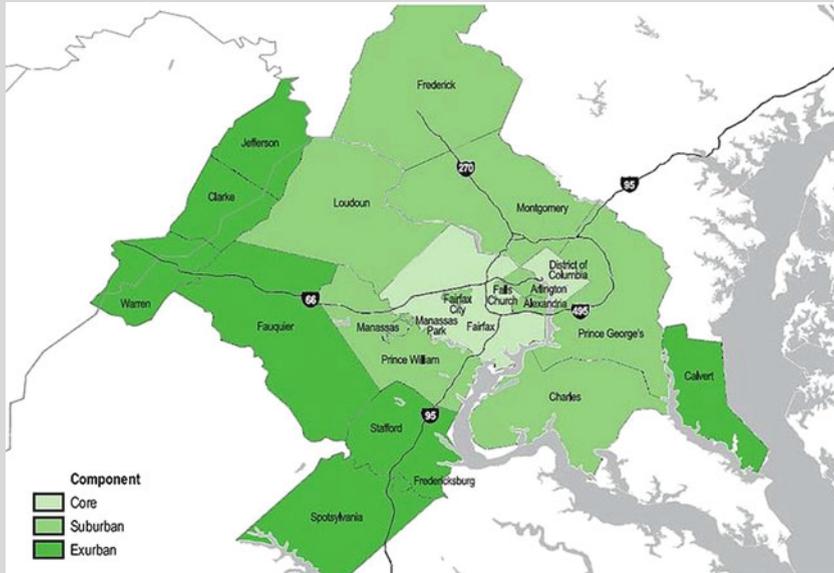
Exhibit 4.10: Choosing the Geographic Unit For an Applied Healthcare Analysis

Toward the end of the 20th century, the healthcare arena became increasingly competitive, providing new opportunities and challenges for health demographers. This new healthcare environment demanded that healthcare providers understand the characteristics and distribution of their patients and potential patients. This development prompted hospitals and other providers to access demographic resources in order to get a handle on the geographic distribution of their patients (and perhaps those of their competitors). All administrative record systems maintain street address and ZIP Code identifiers for patients for billing purposes if for no other reason. The obvious first step for these organizations was to determine where their patients were coming from based on ZIP Code or some other unit of geography.

By accessing ZIP Code-level data, health professionals are able to acquire insights into the distribution of those who use health services. The wide use of ZIP Codes by healthcare administrators and planners reflects the fact that

ZIP Code data are widely available and easy to understand. Further, a number of data vendors make estimates and projections available at the ZIP Code level between censuses. If a certain segment of the population is to be targeted for a promotional campaign by a healthcare organization, it is likely that the mailing lists requested will be made available at the ZIP Code level.

On the minus side, ZIP Codes tend to be relatively large in terms of both population and geographic area, making them unwieldy in some cases. They may not correspond to the boundaries of an identified market area. The fact that ZIP Code boundaries are subject to change also limits their usefulness given the importance of measuring change in the characteristics of targeted populations.

Regional hospitals and other healthcare providers that serve multicounty or multistate markets may find the ZIP Code or even the county level of geography to be adequate. However, most healthcare providers, particularly those in urban areas, are more local in their orientation. Smaller urban hospitals as well as clinics often cater to a certain segment of the community that demonstrates a more narrow geographic distribution. The practices of primary care physicians, for example, are likely to serve a limited geographic area.

While ZIP Code-level data give an indication of the socioeconomic status of the patient, a lower level of geography is often required by healthcare providers. The next lowest level after the ZIP Code is the census tract, with a ZIP Code typically encompassing a number of census tracts. Unfortunately, since ZIP Codes and census tracts have been developed independently, there is little correspondence between the boundaries of the two types of units. Census tract-level data allow a much more granular analysis, and plotting one's customers on a map by census tract presents much more detail than can be achieved using ZIP Codes. Further, if the healthcare organization is federally funded (e.g., a federally qualified health center) or is seeking federal grant funding, the federal agency involved will require that data be provided at the census tract level.

There may be rare occasions where an analyst requires data at a lower level than the census tract (e.g., census block or census block group). At the block group level, a substantial amount of data is available for use by the analyst. However, the breadth of data available at the block level is, understandably, limited to a few basic variables.

Ultimately, the choice of geographic level to be used for an analysis depends on: (1) the objectives of the analysis; (2) the degree of granularity required; (3) the implications of crossing political boundaries; and (4) the type of data required. The last criterion is worth expanding upon, since data of different types and levels of granularity vary with geographic level. At the national level, for example, health-related data can be obtained in great detail for virtually any desired variable. These data are readily available and can be disaggregated for any relevant demographic category (e.g., Hispanics, frail elderly, baby boomers). Similarly, at the state level a wide range of data is

available and, in some cases, exceeds in scope what data may be available at the national level due to state-specific programs that are in place. At the county level, a considerable amount of data is available, with counties being the initial source of vital statistics. Of course, data collected through the decennial census are available for all of these levels, although it quickly becomes dated. (See the discussion on the American Community Survey in this regard.) While the Census Bureau does allocate census data to the ZIP Code level, an alternate source of data at this level is the commercial data vendors who specialize in generating estimates and projections at the ZIP Code level.

Case Study 4.1: How *Not* to Plan for Retail Expansion

In the mid-1980s a "big box" retail chain was looking to expand its operations and assigned an eager young market analyst the task of identifying new store locations. The strategy involved identifying communities that already had a successfully operating store and determine if there were additional opportunities for expansion.

In casting about for opportunities the analyst included Memphis, Tennessee, on his list of potential communities for expansion. There was an existing store there in an older part of the city and the population appeared to be growing. The analyst compiled data on the city's historical population growth in order to determine the potential for store expansion. His research revealed that the population for the city of Memphis appeared to be growing at a substantial rate. Based on data from previous censuses it was found that the city's population in 1960 was 497,500, in 1970 was 623,500 and in 1980 was 646,300. Although the growth appeared to be slowing somewhat over previous years the population was still showing a healthy increase as of 1980.

Based on these figures the analyst recommended that three new stores be added in what were considered the fastest growing areas. Based on these recommendations three new stores were opened in Memphis. Within two years all three of them had to be closed due to lack of business. How could the market research have been so wrong?

As it turns out, the analyst failed to consider the boundaries that defined the city of Memphis and how they might have changed over time. In the state of Tennessee it was very easy for a city to incorporate surrounding communities within its boundaries, while in many states this is almost impossible to do. Over the course of the three decades under study the city had been aggressively absorbing surrounding communities within its boundaries.

Because of this pattern of urban development the city was actually incorporating *existing* communities and adding existing populations to the city's total. The increase in population was a mirage since the city was simply changing its boundaries to incorporate more territory. In reality, the city's

population growth was well below that of comparable cities and, rather than being an opportunity for expansion, Memphis was barely able to support the current store due to its meager growth. Needless to say, the market analyst did have a very long career in retail planning.

Exercise 4.1: Identifying Metropolitan and Micropolitan Areas
Metropolitan and micropolitan areas have been established for each state by federal agencies based on the demographic characteristics of the population. Students should access the Internet to obtain a base map for their state. Using information from www.census.gov students should identify for their states the location of metropolitan counties and micropolitan counties. Using colored pencils or other markers indicate on the map the locations of the urban concentrations as represented by metropolitan areas and micropolitan areas. Indicate when appropriate where metropolitan areas extend into adjacent states.

Exercise 4.2: Geographic Unit Identification
For this exercise, students will access the Census Bureau website in order to identify various units of geography with which they should be familiar. Follow the steps below and identify the geographic units requested relevant to your residence.

(1) Access the Census Bureau website at www.census.gov.
(2) Go to the bottom of the page and choose "American FactFinder" off the FIND DATA list.
(3) Click on "Address Search" in the right-hand column.
(4) Enter home address in the boxes provided.
(5) Click on "Go" and a table will be displayed.
(6) Extract the following information from the first column of the table for your address:

- Region: _____
- Division: _____
- Census tract: _____
- Census block group: _____
- Census block: _____
- County: _____
- Metropolitan statistical area (if applicable): _____
- Congressional District: _____
- ZIP Code Tabulation Area (5-digit): _____

(7)   Select Map tab at top of Table
(8)   Enter address and click "Go".
(9)   Click on the "stack" on the right-hand menu.
(10) Change the date to 2010.
(11) Check the boxes for Block, Census Tract, and Block group.
(12) Click on "Update"
(13) Verify the following information from above on the map:

- Census tract: _____
- Census block group: _____
- Census block: _____

Exercise 4.3: Calculating and Displaying Population Density
The table below presents the 2010 population for each of the 50 U.S. states and the area for each stated in square miles. For the first part of the exercise, students are to calculate the population density for each state, creating a table that includes the population per square mile. For the second part of the exercise, students are to create a map of the United States that displays the densities generated for the table. After examining the densities students are to determine how many intervals there should be and then shade the intervals with various colors to indicate different categories of density. (Convention calls for making intervals with higher values a darker color.) The resulting map should provide an overview of population density for the United States.

Alabama	4,779,736	50,645.33	Montana	989,415	145,545.80
Alaska	710,231	570,640.95	Nebraska	1,826,341	76,824.17
Arizona	6,392,017	113,594.08	Nevada	2,700,551	109,781.18
Arkansas	2,915,918	52,035.48	New Hampshire	1,316,470	8,952.65
California	37,253,956	155,779.22	New Jersey	8,791,894	7,354.22
Colorado	5,029,196	103,641.89	New Mexico	2,059,179	1,21,298.15
Connecticut	3,574,097	4,842.36	New York	19,378,102	47,126.40
Delaware	897,934	1,948.54	North Carolina	9,535,483	48,617.91
Florida	18,801,310	53,624.76	North Dakota	672,591	69,000.80
Georgia	9,687,653	57,513.49	Ohio	11,536,504	40,860.69
Hawaii	1,360,301	6,422.63	Oklahoma	3,751,351	40,860.69
Idaho	1,567,582	82,643.12	Oregon	3,831,074	95,988.01
Illinois	12,830,632	55,518.93	Pennsylvania	12,702,379	44,742.70
Indiana	6,483,802	35,826.11	Rhode Island	1,052,567	1,033.81
Iowa	3,046,355	55,857.13	South Carolina	4,625,364	30,060.70

(continued)

(continued)

Kansas	2,853,118	81,758.72	South Dakota	814,180	75,811.00
Kentucky	4,339,367	39,486.34	Tennessee	6,346,105	41,234.90
Louisiana	4,533,372	43,203.90	Texas	25,145,561	261,231.71
Maine	1,328,361	30,842.92	Utah	2,763,885	82,169.62
Maryland	5,773,552	9,707.24	Vermont	625,741	9,216.66
Massachusetts	6,547,629	7,800.06	Virginia	8,001,024	39,490.09
Michigan	9,883,640	56,538.90	Washington	6,724,540	66,455.52
Minnesota	5,303,925	79,626.74	West Virginia	1,852,994	24,038.21
Mississippi	2,967,297	46,923.27	Wisconsin	5,686,986	54,157.80
Missouri	5,988,927	68,741.52	Wyoming	563,626	97,093.14

Source U.S. Census Bureau

Additional Resources

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Swanson, D. A., & Siegel, J. S. (2004). *The methods and materials of demography* (2nd ed.). Maryland Heights, MO: Academic Press.

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