

Geography and Disparity in Health

Task: To provide guidance on how best to assess the impact of geographic location on: health care access; health care service utilization; and health care quality.

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This paper briefly describes how health status, access to health care and health outcomes vary by geographic location and which aspects of location appear most to affect health care access, services, and utilization. A key to measurement of differences in health is the unit of analysis: the geographic unit that is used; and the paper describes the many potential geographies that can be used for analysis and policy making. One of the goals of the paper is to develop evidence to suggest a preferred geography to illuminate disparities as well as help structure policies to eliminate those disparities. However, one leading researcher examining the relationship between place and health has observed that:

“...there is no agreement about how to best define a geographical area in terms of socioeconomic position or about which area-based measures of socioeconomic position are most informative, especially across multiple kinds of health outcomes (Krieger 2001).

This paper does not contradict that conclusion but does recognize that there are options for understanding the geography of health disparities as well as for implementing solutions in places. One real problems that confronts those who would wish to understand better where and how disparities in care emerge and how to eliminate them is the way we geographically structure data to monitor our health and health system. The current small area geographies used most often to

depict health status—census geography including tracts and block groups, counties, ZIP code areas clusters of ZIP codes—are appropriate to identify and verify health status disparities. But the level of intervention appropriate to specific causes is not captured well by those boundaries. While we may identify that a neighborhood’s relative health status is reflected in a comparison among ZIP areas or census tracts, it is not easy to mobilize an intervention based on those boundary sets. People do not feel a sense of “membership” or citizenship to such an area and neither government nor the health care system is structured to act at that level. Town, city and county boundaries may create more of a sense of community, but they often mask disparities and differences between groups and neighborhoods. There is no uniform geography for interventions, no standardized health districting, and there may never be unless community groups take responsibility for health and they are given support and authority by governments.

LOCATION AND HEALTH

Geographic disparities in health have been noted down through history; indeed “place” was long considered more a determinant of health than vectors or micro-organisms. The rise of “specific etiology” in theories of health displaced concern with the ecology of health (Meade and Earickson 2000) until the emergence of a broader concern with the interaction of the physical environment and health (Dubos 1961). That has been followed by a more general definition of human ecology to include social structures and economic processes in a field sometimes termed “social epidemiology” (Berkman and Kawachi 2000). We now seek to explain differences in health through the interaction of theories of genetics, biology, sociology, economics and politics accepting that a person’s surroundings and opportunities affect how well and how long they live. Researchers have found areal or contextual differences in health that persist when carefully controlled (Macintyre and Ellaway 2000) and see the need to develop our knowledge of the ecology of health as a way to leverage improvements in population health. Clearly, the distribution of disease and illness is closely linked to geography. Vector borne disease are more evident in warmer areas and the effects of exposure and inactivity prevail in colder climates. Travel between the two may increase risks, the high recent incidence of skin cancer among Scandinavian populations is linked to their ability to vacation in sunnier southern European countries for brief intensive exposure to sunlight (Holland 1988). There are certain aspects of the built environment that create health risks. In the U.S. patterns of infection for syphilis and

HIV has been linked to locations of Interstate highways (Cook et al. 1999). There is evidence that the location of outlets for alcohol and cigarettes affects life chances (Voorhees et al. 1997). This recent sense of awareness of the geographic context of health has developed in parallel with an explicit concern with geographic variations in health care, health status and health outcomes that emerged from a medical perspective in the work of John Wennberg (Wennberg and Gittelsohn 1973) which continues to motivate policy-making to improve the quality and distribution of health care resources (Wennberg, Fisher, and Skinner 2002). However, these associations have used various geographies to identify associations and suggest causal pathways.

The comparisons that have been made to identify disparities in health care use, costs, and health status have depended upon the bounding of populations by geography as much as by other factors including race, ethnicity, income and employment. The factors that drive disparities often define them in a geographic sense; that is, we tend to speak of “low-income neighborhoods,” or “minority communities” as the defining characteristic of the place. This is a central problem that arises when examining disparities: How much does place determine health chances and how much does the definition of the place determine the eventual health chances of its population?

GEOGRAPHY

Geography is often thought of as the generation and interpretation of maps that describe the physical world. Geography is far more than that, but the physical description of boundaries has a great deal to do with how we view communities and how we construct society (Giddens 1984). The physical aspects of a community are usually defined by boundaries that may have been developed for a specific public purpose but which often create gradients that separate one population group from another. This can be apparent in zoning rules or in the creation of jurisdictions that have different systems of social support. Areas can also become different through social and economic processes that create regions or communities whose boundaries are essentially invisible; even the places themselves become invisible in a cartographic sense. They can be “disappeared” like the parts of Atlanta that were not included on the maps distributed to visitors to the 1996 Olympic Games. The Atlanta example was described by Tom Wolfe in *A*

Man in Full in the chapter entitled "The Lay of the Land" where the key characters ride through various neighborhoods of Atlanta and the commentary traces the transitions from rich to poor and visibility to invisibility (Wolfe 1999). The travelers learn to see the way the buildings reflect the underlying social structure and how the lay of the land both reflects and creates the life chances available to the people who live in those places. This kind of "landscape interpretation" filled with social perception and interpretation and sensitivity to the meaning of the buildings and space and human activity is an important part of the sub-discipline of human geography. In contrast, when speaking of health, the domain of medical geography is most often invoked. Medical geography, however, is more aligned with the study of disease and disease diffusion without explicit consideration of other aspects of human interaction. The structure of health services and how people use health services in ways that reflect and create disparities spans the human and the medical parts of geography. The discourse of the geographer involved in describing health care delivery and health status has become controversial within the discipline itself. While space and place in health care delivery are important, their structure and interpretation are, to some, either irrelevant to practical decision making because they are the result of overwhelming social forces and power relationships, while, to others, a spatial and landscape-regarding point of view can be useful locally and in broader policy development (Mohan 1998). Nevertheless, the power of geographic comparisons and boundary setting are real in the policy world and the application of policy is very sensitive to location and scale. This paper describes how the geographic structure of society, health services, and policy making can best interact to diminish health disparities.

The physical, map-related parts of geography are often thought of when considering health care issues—where to locate an ambulance service? How to determine hospital markets to test for competitive effects? Studies of the relationship of place to health are as old as the works of Hippocrates (“On Airs, Waters, and Places”) and have dwelt more on the relationship between environment and health. The effective use of geography in changing health policy is usually traced to the mapping work done by John Snow as he explored the relationship between drinking waters sources and cases of cholera (Snow 1936). The disease mapping did not become the universal solution for public health but, over time, geography has had an important part in the health policy process. In the United States geography has played a key role in the creation of

regions and divisions of states and sub-state areas for the purposes of planning and regionalization (Florin et al. 1994).

There is no consensus fundamental unit of geography on which health and health care is measured in the United States or elsewhere. There are many reasons for this including the problems of relating individual events to population rates, but most importantly because of the way in which health data are reported (Meade and Earickson 2000). Data are compiled according to the political and administrative organization of governments and, to a lesser extent, society. Denominators in rates are most often expressed as the population of some political unit; a state, for example. It would be more clinically useful to express rates in terms of gender and age, even occupation, since those relate more directly to the delivery of health care, to health status and to outcomes since they more accurately characterize the individual. Rates based on geographic denominators such as counties, census block groups, states, or urbanized areas, are developed for collective reasons, usually to address the public health responsibilities of a government or as a social indicator. Between the clinical and the political denominators lie rates and indicators that reflect the community context and how to change the health and the health services people receive. Again, no gold standard exists for expressing the degree of need in a community nor at what scale to address those needs (Ricketts 2001; O'Keeffe, Lohr, and Brody 2001).

The geographic expression of measures of disparity ideally would reflect a level of aggregation where those disparities could be reduced. Current policy emphasizes targeting “communities” for interventions to improve health and reduce disparities (Dorch, Bailey, and Stoto 1997). Community is, however, not treated with special attention in geography. The *Dictionary of Human Geography* defines it as: “A social network of interacting individuals, usually concentrated into a defined territory. The term is widely used in a range of both academic and vernacular contexts generating a large number of separate (often implicit) definitions.” Likewise, no special attributes are ascribed in the specific field of medical geography. Meade and Earickson simply contrast the “British” usage as an interacting subgroup of the population rather than the U.S. meaning of a place in which people interact.” (Meade and Earickson 2000, p. 291) The Robert Wood Johnson Foundation recently commissioned papers to explore the

appropriate geographic definition of a community that would allow the optimization of programs to improve population health. The final recommendations of the contractor to the Foundation were that:

Community is a difficult concept to work with empirically and it has many, often overlapping, sometimes competing, definitions. Little consensus exists about boundaries or membership either in a general sense or in the context of measuring capacity for improving population health, or measuring a community's performance with regard to specific health status indicators. Race, income, sexual orientation, geography, and service areas, *inter alia*, are all viewed as valid parameters for defining a community. (O'Keeffe, Lohr, and Brody 2001)

The relationship between socio-economic characteristics and health in small areas has been described and validated in multiple studies at the census block group, census tract and ZIP code levels (Krieger, Williams, and Moss 1997; Krieger 1992; Kwok and Yankaskas 2001). The field of "small area analysis" has amply demonstrated that variations can be found, but the determination of what are unacceptable variations remains open especially for the investigation of health services and access to health care (Stano 1991; Diehr et al. 1990; Diehr et al. 1992).

The Rural-Urban Continuum and Disparities

One view of the geographic structure of the nation contrasts how the population is distributed between cities and rural areas. The United States has developed from agrarian roots to an urbanized industrial nation with vast stretches of land devoted to agriculture, recreation or preserved as wilderness or parks. There are more than 60 million people classified by the Census Bureau as "rural" (living in a place of fewer than 2,500 people) and 55 million living in "nonmetropolitan" counties in 2000. This is a population group comparable in size to the United Kingdom. Rural America would be among the top 20 nations in population. The structure of the Congress which gives equal representation to states in the Senate, means that the rural issues that are important in the sparsely populated western states including Idaho, Wyoming, Montana, North and South Dakota, are given careful consideration in Congress. The political as well as physical geography of the U.S. makes rurality an important concept.

The two most common designations of rurality used in describing populations are those of the US Bureau of the Census and the US Office of Management and Budget (OMB). Persons are classified as living in “urbanized areas” which are defined by the Census Bureau according to a complex set of characteristics which take into consideration the economic nature of a place, transportation patterns as well as how many people are living in a fixed area. That definition is undergoing revision and a final rule is expected to be published before July 1, 2002. For the 2000 Census, rural areas are considered places outside urbanized areas which are defined as made up of: “...core census block groups or blocks that have a population density of at least 1,000 people per square mile and surrounding census blocks that have an overall density of at least 500 people per square mile.” (www.census.gov/geo/www/ua/ua_2k.html) This delineation has not been used often to determine effects on health and health care. More often the OMB Metropolitan-Nonmetropolitan classification of counties is used for comparisons.

The OMB designation classifies counties Metropolitan or Nonmetropolitan, based on whether the county has a large city and suburbs as well as a functional element which measures how economically integrated peripheral counties are with their surrounding Metropolitan counties. A Metropolitan Area (MA) must contain either a place with a population of at least 50,000 or a Census-defined urbanized area and a total MA population of at least 100,000 or reflect the economic activities of such a place. Various attempts to sub-classify the counties within the Metropolitan and Nonmetropolitan categories exist and they have been used to examine health care resource use and distribution and health status. In 2001 the National Center for health statistics included a rural-urban comparison in their Healthy People series. The NCHS report found:

The Americans who generally fare best on the Health indicators are residents of fringe counties of large metro areas ...many measures of health, health care use and health care resources vary by Urbanization level ... the data reconfirm the existence of regional variation..

Nationally, residents of the most rural counties have the highest death rates for children and young adults, the highest death rates for unintentional and motor vehicle traffic related injuries, and, among men, the highest mortality for ischemic heart disease and

suicide. (Eberhardt et al. 2001)

That comparison, while troubling, did not compel an immediate response on the part of the administration and did not dispel the observations made by some researchers that, when compared to urban, rural populations do not show an overall disadvantage for rural places (Miller, Farmer, and Clarke 1994). But these general comparisons are plagued by the problem of aggregation of widely divergent nonmetropolitan populations and communities into large, gross classifications that are meant to be consistent across the nation. There are clear regional patterns of rural disadvantage—much higher infant mortality in the rural southeast, for example, and those conditions are clearly related to the income and education differences between those rural regions and other parts of the nation. Geographic patterns of morbidity and mortality vary by race and ethnicity (Albrecht, Clarke, and Miller 1998) and these differences are sometimes reinforced by rural location; blacks and whites living in nonmetropolitan counties have higher death rates from diabetes (Ricketts 2001) and heart disease (Slifkin, Goldsmith, and Ricketts 2000). The ecological interaction of income and health has been widely reported (Kawachi et al. 1997) with a clear and consistent relationship shown to exist between the two—the lower the income of the place, the worse the health chances. The same has been found with income inequality but with less convincing evidence (Mellor and Milyo 2001). However, when examining income inequality and health at the state level, one study found an interesting stronger relationship between inequality and self-reported health for nonmetropolitan residents (Blakely, Lochner, and Kawachi 2002). That finding suggest that the structure of income inequality differs for rural areas, but it also might be an artifact of the clustering of respondents in nonmetropolitan counties.

Access to Care

Access to health care services in rural versus urban areas has been explored by health services researchers for decades. Rural residents are, on average, poorer, older, and, for those under age 65, less insured than persons living in urban areas (American College of Physicians 1995; Hartley, Quam, and Lurie 1994; Braden and Beauregard 1994; Schur and Franco 1999). Rural Americans also report more chronic conditions and describe themselves in poorer health than urban residents. Further, injury-related mortality and the number of days of restricted activity

are higher in nonmetropolitan areas. The degree to which lower levels of access affect health outcomes and utilization for rural persons is at issue, however, given the conclusions drawn by the MedPAC June 2001 Report to Congress. Their examination of the 1999 Access to Care files of the Medicare Current Beneficiary Survey data found that Medicare beneficiaries living in the most rural counties reported difficulty in seeing a doctor and lack of a usual source of care more often than urban or other rural beneficiaries (MedPAC 2001). This analysis used the Urban Influence Codes to classify nonmetropolitan counties (Ghelfi and Parker 1997), identifying counties that were not adjacent to metro counties and which did not have a central town of 10,000 or more population as the most rural group. The MedPAC report concluded and stated in its Executive Summary that there was no difference in the overall access to care for rural and urban Medicare beneficiaries. They did, however, comment that there may be some underserved areas where Medicare beneficiaries might be more vulnerable. The flat assertion that there was no access gap is easily challengeable, the analysis did not always include controls for health status, and when it did the risk adjustment for prior use may have made the analyses inaccurate. The access study also did not differentiate between underserved and adequately served communities and whether there was an independent rural or travel effect for the measures of access. But most importantly, the sample was drawn with the assumption that rural places composed a homogenous sample stratum. While the wide variation in access in urban systems is accepted and comparisons within and between metropolitan areas are usual in national surveys, this is not feasible for rural places given the current construction of these surveys (Schur, Good, and Berk 1998).

The interaction of race and ethnicity and rurality has been examined in a review of studies of six conditions emphasized by the US DHHS in their disparities initiative: infant mortality, cancer screening and management, cardiovascular disease, diabetes, HIV infection, and child and adult immunizations (Slifkin, Goldsmith, and Ricketts 2000). That review found that rural minorities are further disadvantaged than their urban counterparts in cancer screening and management, cardiovascular disease and diabetes. The gaps between whites and minorities appears to be greater for these conditions in rural places but the studies which made up the review did not carefully control for many variables that might describe problems with access to care. Likewise,

the comparisons were not controlled for regional effects. There are clear limitations to drawing inferences from geographical classifications at the county level.

In sum, there is credible evidence that being in a rural place has a strong and relatively consistent negative effect on one's economic chances but there is some difficulty in creating a strong claim that rurality has an independent and significant impact on people's health. The problem, it seems, is that the definitions of what is rural and nonmetropolitan are more closely tied to factors related to population and its density which have a consistent economic effect but an inconsistent health effect. Unfortunately, a definition of medical rurality isn't at hand, what is available are various measures of medical underservice, health professional shortages and vulnerability. While those measures are place-specific and tend to be more rural, they are also applicable in urban, even the most urban places. The search for a perfect measure of rurality that will capture its health effects may be a useful exercise if the strong prejudice toward the existing, well-documented, and relatively consistent systems of classification were ignored.

Distance and Health

One of the most important geographic features that may affect health status and health outcomes and which may contribute to disparities is distance to health care. The effects of distance on access to health care services has been a subject of research for some time. For example, Weiss examined how distance to a hospital combined with social class to determine patterns of use (Weiss and Greenlick 1970). Joseph and Phillips (Joseph and Phillips 1984) reviewed empirical studies of the effects of distance on use of care and found some anomalies summed up in the quotation from a study by Girt:

“distance has both a positive and negative effect on behavior. Individuals are likely to become the more sensitive to the development of disease the farther they live from a physician but those at a distance may be more discouraged about actually consulting than one living neared because of the additional effort involved.” (Girt 1973)

Conner and colleagues examined studies of distance to care to attempt to find standards for access (Conner, Kralewski, and Hillson 1994). While they found evidence of distance decay in use and some indication that quality of care suffered when care was provided to people who lived at some remove from services, they were unable to develop clear guidance for what would

be a fair standard for physical accessibility nor how to measure it. They were able to contrast units of analysis classifying areas as “town/community/ZIP”; county; “market-share defined;” and national; but made no recommendations concerning their ability to detect differences that might reflect disparity. There is evidence that underserved populations are located at a greater physical distance from services in rural communities, but in urban places, due to demographic shifts, low-income populations are often adjacent to high density of health care resources (Bohland and Know 1989).

Political-Statistical Geographies

In the US, the states are the fundamental polities for the support and regulation of most local health care delivery and when the federal government chooses to provide support for nationwide public health programs, it has three major options all of which involve the states: 1. Grants-in-aid to states based on their population, so-called block grants; 2. Formula grants that take into consideration some factors of need, the Medicaid program is an example of such a system; and 3. Program or project grants that involve states either as an umbrella applicant or as a passive reviewer; community health centers are an example. States have substantial direct power in public health matters, but even in programs and issues that appear to be strictly federal in nature, the power balance within the United States Senate that gives states with small populations immense leverage in the appropriations process tends to shift emphasis toward state autonomy. By the start of the twentieth century, the county had become the basic unit of government in most parts of the nation. The proven efficacy of preventive measures on health status and the subsequent imposition of regulations in the food, drug and housing sectors created the impetus for rapid development of public health law and public health agencies. The county, as the local extension of the state’s police power, became the most common political body either willing or situated appropriately to apply public health policies. There were exceptions and states sometimes retained central authority over public health. Those exceptions were primarily in the Northeast where townships were and remain the basic units of government; in Virginia (and selectively in other states) where independent cities are separate from county government; and Alaska whose boroughs were the dominant form of local government. There are approximately 3,070 county or county equivalent government units, though there remains some disagreement

over the number; the national Association of Counties (www.naco.org) reports that there are 3,066 counties, the Census Bureau lists 3,070.

Census and Postal Geography

Key to the collection of denominator statistics for local health measurement are the census geographies used to organize the extensive data collection done regularly by the U.S. Bureau of the Census. The Bureau employs geographers and cartographers who assist the Bureau in identifying and delineating spatial areas for the purposes of enumerating the population as well as characterizing the social and economic activity of the population and the nation. There is within the Bureau, a Geography Division which prepares and distributes a wide range of maps and geographic products that assists marketers, planners, researchers and citizens in understanding the distribution of the nation's population, housing, and economic activity. Among these products are a comprehensive guide to the areas, concepts and methods used for data collection and presentation by the Census Bureau as well as descriptions of other geographic and boundary systems. The *Geographic Areas Reference Manual* is intended primarily as a reference for local census statistical committees and others working within the Census Bureau or with cooperating organizations, but is also useful to others. The manual is available online at <http://www.census.gov:80/geo/www/garm.html>. Table 1 lists of the various levels of government and the range of statistical reporting areas in the nation.

Table 1. United States Political and Statistical Jurisdictions

| Political Jurisdictions | number | Statistical Reporting Areas | number |
|-------------------------------------|---------|--|--------|
| State and equivalent entities | 57 | Region | 4 |
| State | 50 | Division | 9 |
| District of Columbia | 1 | Metropolitan Statistical Areas (MSAs) | 268 |
| Outlying Areas | 6 | CMSAs (Comprehensive MSAs) | 21 |
| Counties and equivalent entities | 3,248 | PMSAs (Primary MSAs) | 73 |
| Minor civil divisions (MCDs) | 30,386 | Urbanized areas | 403 |
| Sub-MCDs | 145 | Alaska Native Village statistical areas | 217 |
| Incorporated places | 19,365 | Tribal jurisdiction statistical areas | 17 |
| Consolidated cities | 6 | Tribal designated statistical areas | 19 |
| American Indian reservations | 310 | County subdivisions | 5903 |
| American Indian trust lands | 52 | Census county divisions | 5,581 |
| Alaska Native Villages | 217 | Unorganized territories | 282 |
| Alaska Native Regional Corporations | 12 | Other statistically equivalent areas | 40 |
| Congressional Districts | 435 | Special economic urban areas | 4423 |
| Voting Districts | 148,872 | Census Tracts | 50,690 |
| School districts | 16,000 | Block Numbering Areas, now Census Tracts | 11,586 |

| | | | |
|-----------------------------------|--------|----------------------------|-----------|
| Neighborhoods (used only in 1980) | 28,381 | Block Groups | 22,9192 |
| ZIP Codes | 39,850 | Tabulated parts | 36,3047 |
| | | Blocks | 7,017,427 |
| | | Traffic Analysis Zones | 200,000 |
| | | ZIP Code Tabulations Zones | 40,000. |

One common geographic unit is the Zone Improvement Plan Code, or ZIP Code. ZIP codes are not always bounded areas; they are, by definition, a collection of postal addresses aggregated to improve mail delivery. A ZIP code may be assigned to a single building, a post office, or an institution. ZIP codes that cover a defined area may be interlaced as one delivery route passes and even crosses another—although that is rarely the case. ZIP code boundaries and route aggregations change continuously and do not require clearance at a central national level. They are reported, however, quarterly in the publication ZIP ALERT which is issued quarterly by the United State Postal Service¹ (www.ribbs.usps.gov/files/zipalert/). The Census Bureau has developed a ZIP Code Tabulation Area (ZCTA) geographic unit which approximates the geographic boundaries of ZIP codes areas that can be geographically defined, some ZIP codes are buildings, agencies, or postal facilities (<http://www.census.gov/80/geo/>). The Census Bureau has begun to release data linked to these ZCTAs and intends to use them as a regular geographic unit. The intention is to standardize these areas and report census data using these units which is roughly comparable to the ZIP code areas used by marketing and data reporting firms and familiar to most Americans. The federal government is currently testing the use of ZCTA areas to identify shortage areas to prioritize funding for safety net programs.

Market Areas

Markets are both observed, empirically derived assessments of human commercial behavior as well as conceptualizations of an intended consumption or activity pattern. While markets are most often associated with the buying and selling of goods and services in a commercial sense, markets can also be applied to activity spaces that describe general behavior. In the health sector, a hospital's market area may reflect where its patients come from, but also the people it

¹ The Census Bureau maintains a Master Area Block Level Equivalency file (MABLE) which cross lists ZIP codes with the census boundary files. Using that cross-walk, the Census reports data at the ZIP code level on "Summary Tape File-3" (STF-3) but the ZIP codes included on that file are modified in that they are the ZIP codes that have some boundary characteristics and they include within those boundaries the ZIP codes that are assigned, for example, to a post-office and its related boxes or a "point" ZIP which is a building or institution.

reaches in information dissemination and prevention programs acting through intermediary agents. Markets are defined at varying levels of geography:

- for local goods and services (e.g. hardware stores, primary medical care, grade school education); these take the form of neighborhood bounded by streets or roads, collections of ZIP codes, a city and its surrounding area.
- for regional markets (e.g. heavy construction equipment sales, secondary and tertiary hospitals, specialty surgery, and colleges); These are usually described in terms of a set of counties or a region of a state or states (examples include: central Missouri, the Delmarva Peninsula).
- to national and global markets (e.g. research universities, quaternary hospitals, multiple transplant surgery, and drug manufacturing). (for example: the east coast, North America).

There are theories or generalizations about markets and market areas that may apply to the questions at hand. Health as a function of lifestyle, diet and exercise may be considered exclusively within an individual's control but the ability to exercise and the diet choices available to a person are tied to their lived space. The forces that shape those choices or, in turn influenced by national trends and policies and the structure of health care delivery systems related to a higher order market befitting a complex, technology-associated service industry. Health promoting or shaping goods and services are usually "produced" in central places where local economies can support the people and systems necessary to produce those services and goods. This applies even to food choice due to the centrally controlled content of fast food and mass-marketed groceries.

Even the development of data that might identify local disparities depends on geographically large market areas. Epidemiological and statistical analysis and interpretation is efficiently done for markets that are centered on the larger state health departments and research universities. Nationally, this market might be made up of perhaps 100 centers which "sell" or provide these services. The idea of devolving this process of statistical abstraction to localities may not adequately consider the realities of this market structures.

There are a number of potential general market-derived geographies that are candidates for assessment of disparities in health. These include Labor market areas (LMAs)² and ZIP code clusters. Currently, there are 394 multi-county LMAs in the U.S. which are constructed from 741 multi-county “commuting zones” which are defined using Census data. Labor market areas are generally considered too large for meaningful local or community interventions.

The inception of the Zone Improvement Plan (ZIP-code) system by the postal service and the proven effectiveness of direct-mail marketing brought regional marketing down to the “pin-point” level. The most commonly encountered, current example of this is the use of the PRIZM (Potential Rating Index for ZIP Markets) marketing clusters which characterize ZIP codes areas on the basis of patterns of consumption of residents in those areas. The original classifications, which appeared in 1978, with names such as “wine and cheese”, “shotguns and pickups”, were based, initially, on Census and magazine subscription data. Their use and construction has become much more complex and sophisticated. In a recent revision of the system (which is now owned by the Claritas Company) the original 40 clusters were modified and the number of clusters expanded to 62. These clusters currently reflect groupings of as few as 22 households identified through census geography or ZIP+4 addresses. The originator of this systems of ZIP area clustering, Jonathan Robbin, called this approach to marketing, "geodemographics." The clustering logic rests on the notion that neighborhoods are alike in many ways, that you are "like your neighbor" and that your neighborhood will be like many others, even those very distant from where you live. The question may be asked: Are these real clusters? And do the clusters represent unified neighborhoods or communities that could be used for influencing health? Communities developed along the lines of segment clusters proposed by Claritas can be tested along several conceptual lines, provided the data are available and reliable at the market segment level. From a technical viewpoint, clustering systems like PRIZM, despite their apparent locational accuracy, represent a very rough characterization of community type which is

² LMAs are formally described using county level data and are based on a clustering algorithm that makes use of county-to-county commuting flows that are part of the Census data collection process. The basic clusters of counties that are used to develop labor market areas are called commuting zones (CZs). In 1990, 741 commuting zones were delineated for all U.S. counties and county equivalents. These commuting zones are intended to represent more local labor markets. They are then aggregated into 394 Labor Market Areas (LMAs) by the Bureau of the Census which uses a population threshold of 100,000 for the LMA designation. In health care policy LMAs are used for the calculation of certain inputs to HCFA payment systems and have been used in the analysis of the ability of rural areas to recruit physicians (Brasure et al. 1999).

essentially dimension-less and not well tied to health care use, need, or health policy capacity. However, their use for these purposes has not been empirically investigated.

Natural Communities and Social Networks

“Natural” communities or natural areas are described by the activities of people living in a named place or neighborhood. There are empirical techniques for identifying and summarizing natural areas in geography and sociology. The geographic relationship of health care seeking behavior of people in comparison to their work, shopping and leisure spaces has been described using maps that show areas of higher potential and actual use (Gesler and Meade 1988). The natural communities that might emerge from secondary analysis of rates that show contrasts could be developed and compared using the techniques of geographical and sociological analysis. The development of a “landscape of disparities” may be more of a visualization exercise than an empirical problem, but there is some movement toward using GIS systems to relate problem locations to populations and population activity to suggest solutions (Rushton, Elmes, and McMaster 2000).

Epling, Vandale and Steuart (1975, p. 87) describe extended family networks as perhaps the most appropriate denominator for epidemiological characterization of populations because this would allow for “more efficient units of diagnosis and therapy.” In this case the denominators and numerators used to determine disparities in health would be developed on the basis of kinship and connection. They suggest that the validity of the construction of household networks can be determined by testing the hypothesis that there is greater similarity of health/disease episodes and behaviors within distinct social networks than between them. Social networks and social support are understood to be important in determining health status (Weissbourd 2000). But the only tractable way to understand these ties that bind seems to be through anthropological and ethnographical study which involve primary data collection.

GEOGRAPHIES FOR HEALTH POLICY AND HEALTH SYSTEM ANALYSIS

Local Health Department Jurisdictions

One likely focus for the implementation of health enhancing and disparity reducing policies on a geographic basis is the local health department. However, only half of the states currently have local health departments which are controlled by local government (Turnock 2001). Fifteen states have centralized systems with control over local health units exercised by a state health agency and the balance have some form of mixed or shared control. The population coverage for local health departments may be very small and local—one-quarter of health departments are responsible for 14,000 people or less. Health department districts or units represent the local presence of public health and these units have a responsibility for monitoring health status. It is less clear that there is any responsibility for them to measure their capacity for affecting health although there are currently energetic efforts on the part of the Centers for Disease Control and Prevention to promote the evaluation and assessment of the performance of local health departments (Halverson, Nicola, and Baker 1998; Halverson 2000; Mays and Halverson 2000). These assessment measures for public health may provide some input to “actionability” since the health department is often a key element in identifying local health priorities and developing programs.

Describing Localities with Data and Relating The Data to Levels Appropriate for Action

In describing localities, data are often drawn from systems that use the county as the denominator for a population rate, or the state as the sampling frame for a survey. The problems of applying data from multiple levels of aggregation to analyze conceptually coherent neighborhoods or communities in the U.S. has been described in several places (Diez-Roux 1998; Duncan, Jones, and Moon 1998). The analytical difficulties inherent in this type of statistical work can be generalized as either creating an “ecological fallacy,” which attributes collective characteristics to very dissimilar individuals or the lack of agreement on the power and specificity of multi-level modeling. The geographic unit of analysis is often key to the ability of a measure to be sensitive to the underlying construct or local characteristic that is being

measured. In a review of studies of geographic access to health care in rural areas, Connor and colleagues described studies that used “town/community/ZIP code areas”, counties, “market share defined areas,” and “other areas” which were usually aggregates of ZIP codes or clusters of counties (Conner, Kralewski, and Hillson 1994). They were seeking guidance on the appropriate unit of analysis for assessments of the adequacy of access and guidance for allocating resources. The idea of access as a unifying concept that would lead to a consensus definition of an appropriate geographic unit was not supported by that review. The general geographic size of places where access was most effectively measured was at the local level, usually small counties or clusters of ZIP areas and was closely associated with the system that was meant to affect or provide access to primary care. These areas represent where the fit between a measurable disparity in access closely fit the area in which a solution could be achieved either through the enhancement of availability (creating a clinic) or modifying some factor that reduced access (developing a subsidy for care). However, many of the studies they reviewed made note of (but seldom measured) important effects and influences on the programs and projects from adjacent areas or state systems.

Neighborhoods were once considered the appropriate level at which to measure and intervene in health (Kivell, Turton, and Dawson 1990). Geographers in England working to develop a local focus for the National Health Service were able to say, in 1990, that: “Health and social service administrators are increasingly realizing the importance of adopting a community or neighborhood scale for the organization and delivery of many different services.” (Kivell, Turton, and Dawson 1990, p 701) They went on to suggest a method for determining what those neighborhoods were, based on a review of data, followed by an overlay of existing boundaries of areas for which data were available. They then aggregated census enumeration districts and postal code areas as the building blocks for a data system; its subsequent use has not been widely reported.

Technical Problems with Community Indicators

The determination of small area rates and indices describing the health status and health care resources available to populations is subject to varying degrees of error. In creating these rates and indicators, analysts rely on a largely dispersed and cooperative system of reporting that is

based on local and state rules and laws although the standards and guidelines are centrally agreed upon. Mortality rates, overall, are generally considered accurate but there is evidence that cause of death is often miscoded on death certificates which are the source of mortality data (Kircher 1985; Goodman and Berkelman 1987). The accuracy of health care resource data is not often called into question, but for secondary data analysis, there are problems with national data sources which may skew a picture of a county or community. The AMA Masterfile is the most often used source for national estimates of physician supply down to the county level but it has been shown to have a degree of error due to reporting lags and the high mobility of physicians (Cherkin and Lawrence 1977; Grumbach et al. 1995; Kessler, Whitcomb, and Williams 1996; Williams, Whitcomb, and Kessler 1996). For rural areas, the difference between the number of physicians reported in the Masterfile and the actual, locally verified number is striking in many places (Konrad et al. 2000; Ricketts, Hart, and Pirani 2000). At the state level, license and survey data indicate that the Masterfile may overestimate primary care physician supply by as much as 20%. Data for nurses, pharmacists, and other health professionals are far less accurate when drawn from national sources due to the lack of a national inventory system. (Kresiberg et al. 1976; Osterweis et al. 1996).

Health Service and Health Market Areas

The involvement of communities in planning health care delivery systems reached its peak in the U.S with the passage of P.L. 93-641, The Comprehensive Health Planning And Resource Development Act of 1974. The language of the Act included guidance for communities to assess their needs and capacity to improve health. Under the Act, the nation was divided into HSAs—Health Service Areas, that represented a potential set of “communities of solution”³ for the problems of resource distribution. The argument for a de-centralized, plural system that “went to the people” for advice was thought to strengthen democracy and make health systems more “responsive” to the consumer. James Morone views this form of devolution in health planning as one example of the abrogation of responsibility by government when decision-making becomes too difficult (Morone 1990). Morone sees community participation as an often

³ The idea of a “community of solution” was proposed in 1966 by the National Commission on Community Health in *Health is a Community Affair* (National Commission on Community Health Services 1966). It emphasized that communities of solution should overlap as much as possible “communities of need.” In the search for the right geography to determine where disparities exist, we are seeking to find the appropriate level to bound disparity as well as identify the proper scale at which to target solutions.

unproductive process to which the elites and interest groups turn when re-distributive policies are necessary because of all-too-apparent imbalances and because favored interests must give something up and politicians don't want to be blamed. Morone's interpretation of the relationship among institutions, professionals and the democratic process doesn't provide much support for the idea of identifying communities and their capacity and then letting them decide how to improve health. Nevertheless, the local health planning agencies did compile impressive amounts of local resource and need data and their services were so appreciated in some states and communities that they survived the de-funding then repeal of the national health planning act and a continuous drum-beat of ridicule as one of a series of failed experiments in national health coverage. The more recent failure of the Health Security Act, Clinton's health reform plan, in 1993-4 may have replaced health planning as the primary target of anti-reform factions, but those who care more for market solutions have successfully linked health reform to health planning and made the two unfashionable even among liberals (Johnson and Broder 1995).

Hospital Service Areas

Hospitals in many communities have been actively developing community-focused programs that attempt to coordinate preventive, primary care, and specialty outpatient care with their more traditional inpatient services. In places where the hospital is the hub of health activity, its market area would form the appropriate boundaries for a "community of solution" for improving population health. The determination of medical service areas became an important part of health policy considerations in the 1980s due to the attention being paid to legal and economic issues surrounding competition (Morrisey, Sloan, and Valvona 1988; Morrisey 1993).

Geographic methods for health care service area construction were the subject of a comprehensive review in the context of geography (Simpson et al. 1994). There are three major types of methods for creating service areas: 1. Geographic Distance, 2. Geopolitical Areas, and 3. Patient Origins.

A distance approach would create radii or ellipses that surround a central place or a limited number of nodes that represent core activities. This method is appropriate where a legislature or a regulator wishes to set a general standard for access, e.g. "all enrollees must have a primary care clinic or office within 30 miles of their home." These systems usually create a "crow-fly"

or straight line standard, but occasionally travel time is used. Distance measurement can now be done along road networks with GIS systems and very detailed areas can be described based on actual over-the-road distance from a central point along all available routes. The road network can be converted into time-based increments based on the road type, the number of intersections, the presence of traffic lights, traffic volume or periodically dense traffic and travel times computed (Walsh, Page, and Gesler 1997). The use of distance and time have not been used extensively in the development of areal boundaries for health policy or for the analysis of health status largely due to the difficulties of calculation. There is potential for greater use of linear distances or approximations of travel time through GIS systems which can easily calculate “buffers” or radii and include or exclude populations within defined boundaries that are included within those buffers or which touch them.

Geopolitical boundaries are most commonly used to define health care service areas largely due to their close links to policy-making bodies including local and state governments which often operate health services or have public health responsibility. The use of public funds are most often restricted to benefit specific, pre-existing jurisdictions and crossing those boundaries runs counter to the mutually exclusive nature of local government and its operations. If taxes are collected by local governments, then the expenditures will most likely be required to be on behalf of the citizens of the polity, or spent within the boundaries of the polity in order to benefit them indirectly. County hospitals and health departments have obligations to the citizens of their county based on this civil-fiduciary relationship and politicians and bureaucrats face voter retribution if they don't “keep the money at home.”.

The use of patient origins to create service boundaries usually aggregates smaller geographic units such as ZIP codes or census tracts into areas using an inclusion rule based on proportion of total hospital admissions or hospitalizations from the small area. In creating the *Dartmouth Atlas of Health Care*, the Dartmouth Medical School team, led by John Wennberg with the assistance of professional geographers, created an algorithm for the development of hospital service areas for the entire United States (Dartmouth Medical School. Center for the Evaluative Clinical Sciences 1998). The algorithm was created to identify the appropriate population denominators for the comparison of rates of surgery and the supply of physicians. The approach used for the

Atlas was to aggregate by ZIP code all Medicare hospitalizations for 1992 and 1993 into hospital service areas. The ZIP code was assigned to the hospital (or town in which there were more than one hospital) to which the plurality of patients went. This initially created discontinuities in the resulting geography; ZIP codes that were not contiguous were identified. To solve the problems of “islands” or “doughnuts” that appeared after the algorithm was applied, ZIP areas that were not properly attached were assigned to the closest service area. The specific method used for assignment of wayward ZIPs is not clearly described in the *Atlas* and likely depended heavily on visual inspection and hand-adjustment. The final service area map constructed for the *Atlas* created 3,436 hospital service areas for the 4,900 general hospitals in the nation. The *Atlas* and its derivative products are being used for benchmarking of many rates of treatment and resource allocation. The very wide apparent range of distributions across the service areas is seen as evidence for the need for change in the health care delivery system. The distributions themselves are seen as giving guidance for the setting of benchmarks for system performance with the desirable rate or resource seen to be somewhere in the lower half of national distributions. The *Atlas* also provides data for the determination of comparative needs and points to important disparities in the healthy care system. However, the suggestion that the service areas that are described in the *Atlas* are potential “communities of solution” has not been directly made. The ubiquity of the *Atlas* may, however, create a perception that these areas can be used for such analysis as more and more policy makers refer to it and its structure.

Primary Care Service Areas

In the delivery of health services, there is a prevailing belief that the fundamental unit for constructing a rational health care delivery system is the primary care practice. In the COPC paradigm these areas often become coterminous with public health target areas. Primary care practices staffed by a generalist physician or other primary care practitioner are, under this regionalized scheme, appropriate care givers for the small village or community of 1,000 or so people. Such a systematic allocation of primary care is often seen in the context of a comprehensive scheme that allocates population to “higher” levels of care. The specialty clinic and local hospital are the next level, followed by the regional or secondary hospital, then the tertiary or referral hospital and an even “higher” level of complexity is reached at the quaternary medical center, usually a teaching facility with the most complex technology and research

undertaken within its walls or on its campus. The national institutes or centers may also be seen as a separate, apex level of care or investigation. Recommendations for the appropriate match of population to services for each level have been proposed starting early in the century and the appropriate mix of professionals and services for communities continues to this day (Hicks and Glenn 1991).

Primary care service areas have been developed in several states including Arizona, California, Maine, North Carolina and Tennessee for the analysis of access to care or to create sub-county areas for designation for federal programs. These are clusters of ZIP codes (NC) and sub-county census geography (AZ, ME, CA). The system used in California is perhaps the oldest continuously used system and may present a template for other states to consider in developing a set of communities of solution for health services at a geographic level that is appropriate to local action (Smeloff and Kelzer 1981). Whether these areas represent communities of solution for health improvement has not been addressed. But their use in California and North Carolina in the examination of preventable hospitalizations, points to a broader set of causal factors for health beyond health care (Ricketts et al. 2001; Bindman et al. 1995).

The primary care service areas in California were mandated by the planning regulations in that state and, in 2001, are made up of 487 geographic areas called Medical Service Study Areas (MSSAs) and MSSA Urban Subdivisions. These areas are composed of one or more census tracts. The responsibility for determining and modifying the boundaries of each of these areas resides with the California Health Manpower Policy Commission. The Office of Statewide Health Planning and Development provides staff services to the Commission. The MSSAs must include one or more complete census tracts and not cross county line, all communities must be within 30 minutes travel time of a “population center,” and the population of the MSSA should be in the range of 75,000 to 125,000.

North Carolina has used clusters of ZIP codes to assess the relationship of workforce and healthcare resources to medical outcomes (Ricketts et al. 2001). The ZIP clusters are centered on places where there are concentrations of primary care physicians. The ZIP areas where physician practice are ordered from those with the most to those with the fewest and a “natural

break” in the distribution separates the “seed” nodes for the creation of clusters. Based on the number of physicians in the “seed” ZIP code, the population of the outlying ZIP areas and the distance to those areas, other ZIP areas are attached to the seed using a computer algorithm that minimizes the net weighted distances. Effectively, ZIP areas with more physicians are able to attract more populous and more distant ZIP areas. The resulting map of clusters agrees with expert informants’ opinions of the structure of primary care service areas in the state. The advantage of this approach is that it can be repeated in other states with readily available secondary data.

The U.S. Bureau of Health Professions in cooperation with the U. S. Bureau of Primary Health Care is currently (1998-2001) supporting a project to determine a national set of “rational” primary care service areas (RPCSAs). This work is being done at Dartmouth Medical College with the collaboration of several states which will test the validity of the proposed areas with locally available data. The project makes use of Medicare Part B data to create clusters of ZIP code areas following the methods used by the Dartmouth Atlas of Health Care in the creation of hospital service areas. As of late, 2001, the project had identified over 6,000 RPCSAs. Once these primary care service areas are put in place on a national level, they are likely to be viewed as the appropriate boundary for a range of local interventions that address access and disparity issues.

Measures of Underservice and Underserved Areas

One example of the use of secondary data to characterize the health and resource capacity of communities has been the development and use of indices of professional shortage or of medical underservice. Currently, in the United States. These include the Index of Medical Underservice (IMU) and the Health Professional Shortage Area designation (HPSA) designation. Both are used to allocate resources for federal and sometimes state programs including the assignment of National Health Service Corps Physicians or allowing International Medical Graduates with J-1 visas to practice in a community. Each of these designations requires that the population that is to be qualified be part of a “rational service area” or, if such an area cannot be drawn, be an identifiable population (e.g., Medicaid recipients, migrant farmworkers) or an institution that serves low-income populations or groups with difficulties accessing health care (e.g., a public

mental health hospital may be designated). The MUA designation is most often applied to an entire county; HPSAs are defined as often by a sub-county collection of census tracts as it is by county boundaries. The designation of a community as a MUA is required prior to funding as a Federally Qualified Health Center (FQHC) Physicians practicing in HPSAs are able to receive bonuses up to 20% of the normal payment under Medicare. In all, over 30 discrete federal programs make use of one or both of these measures to qualify a community for assistance (Lee 1979; Lee 1991; Taylor and Ricketts 1994). In 1999, there were 833 whole county HPSAs, 723 part county HPSAs, 1,410 whole county MUAs, and 1,003 part county or population based MUAs.

The designation process initially made use of existing boundary sets but over the years, many more sub-county, or customized geographies have been developed to identify underserved areas. These include clusters of census tracts, townships, or block groups that often cross county lines, even state boundaries. This process of identifying more precisely areas of underservice has tended to increase the statistical contrast in health status by more carefully defining boundaries around areas and populations in need.

Policy makers in the United Kingdom look at underservice in a slightly different way. Access, for example, has not been considered a central, organizing concept for the National Health Service, mostly because the system was developed to eliminate any disparity in availability (Taylor 1998). The classification systems that were developed to allocate resources have used terms such as “underprivileged” and “deprivation.” Three measures that have been widely discussed include: the “Jarman Index of Deprivation” or the “Jarman Underprivileged Area (UPA) score (Jarman 1983, 1984); the Carstairs Deprivation Index (Carstairs 1995); and a measure of material deprivation proposed by Townsend (Townsend 1987). These have been applied in various contexts in Great Britain and debated vigorously in the health services literature and the popular press (Jarman 1983, 1984; Morris and Carstairs 1991; Sundquist et al. 1996). Common components of these indices include unemployment, crowding and no car access. All are applied at the Post Code level.

These indices, both in the U.S. and the U.K., recognize some threshold value for underservice or deprivation as opposed to some localized measure of disparity of inequality. There was, however, an attempt to scale the degree of severity of health professional shortage in the U.S. in the 1980s but was phased out. The level at which underservice is apparent on any scale is heavily debated; but, to date, no concrete proposal to include an index of disparity or inequality has been considered by the government agencies that make use of these score.

Geographic Information Systems: GIS as Savior?

Geographic(al) Information Systems (GIS) have been proposed by some as an all-purpose answer to problems of community characterization, and are touted as capable of solving resource allocation problems as well as being an essential part of the field epidemiologist's armamentarium. The widespread use of GIS in public health came relatively late⁴ in the development of computer assisted cartography and geographic analysis largely due to the lack of useful data to attach to geographic coordinates (Rushton, Elmes, and McMaster 2000). A working group of federal agencies, geographers, GIS users and policy makers met in Washington in December, 1999 to discuss the potential for using GIS for health policy making at "A Symposium on Uses of Spatial Data Analysis and Geographic Information Technologies for Health and Human Services Policy and Planning," sponsored by the Office of the Assistant Secretary for Health, DHHS. That meeting demonstrated that there was widespread use of GIS systems for health policy development but that the federal government was perhaps the last governmental level to formally consider the use of such systems. Since that meeting there have been more conscious initiatives to set a standard for the use of GIS in federal health policy making. Healthy People 2010 includes the goal of increasing "the proportion of all major national, State, and local health data systems that use geocoding to promote nationwide use of geographic information systems (GIS) at all levels" from a baseline of 45 percent to 90 percent (Office of Disease Prevention and Health Promotion 2001). and the decision by the National Cancer Institute to give priority to "geographic-based research on cancer control and epidemiology" .

⁴ Although some of the first applications of automated cartography were used to address health services problems.

There are notable recent examples of how neighborhoods and communities can make use of data describing local needs and capacity to effect change. One of the more recent initiatives to promote the use of social indicators for more local applications has been through the National Neighborhood Indicators Partnership (NNIP) (Kingsley 1999). They have developed a guidebook and supported teams of technical advisers to assist communities in setting up systems and recommending specific software and data sources (Kingsley 1999; Kingsley et al. 1997). The program also makes extensive use of Geographic Information System (GIS) technology to gather and disseminate data for decision making. The indicators include considerations of local, geographic conditions that may affect health and health care and imply the creation of measures of disparity and difference between racial and ethnic groups but do not provide specific guidance for measures of inequality or for the geographic unit to be used for such measures. The goals of the indicators project is to identify contrasts that suggest problems and to match local resources to them at the appropriate level of geography. Those contrasts and the geography are dependent on existing boundary systems and boundary sets.

Additional Community Health Information Resources

One example of the use of geographic information systems as a mechanism for disseminating health status and health resource information is provided by the HealthQuery® system which is being piloted in Los Angeles (www.healthquery.org). The system describes its mission as: "To place in the public domain a unique aggregation of health-related Internet-based tools, which enhance the health and healthcare of Californians and potentially the nation. The tools utilize existing software products that contributing organizations agree to have integrated into new applications available only at the non-commercial HealthQuery® site." The demonstration site active in early 2001 includes small area data for demographics, facilities and resources and includes a route finder to direct people to the nearest clinic, hospital or emergency room. The site includes community health indicators and promises to provide projections and models of trends at a future date.

A summary of "Social Indicators at the Community Level" is included in the *Handbook of Research Design and Social Measurement* by Delbert Miller (Miller 1991). The community

indicators reviewed there that might reflect community capacity to improve population health and reduce disparities were usually based on survey data collected for specific studies. Some constructs that are related to community capacity include the “goodness” rating system for cities (Thorndike 1939); the “Community Attitude Scale” (Bosworth 1955); the “Community Solidarity Index” (Fessler 1952); the “Community Leadership Index” (Hunter 1980). The references in Miller’s book list multiple other scales and measures that might apply to the idea of “capacity.”

The Community Health Status Indicators Project

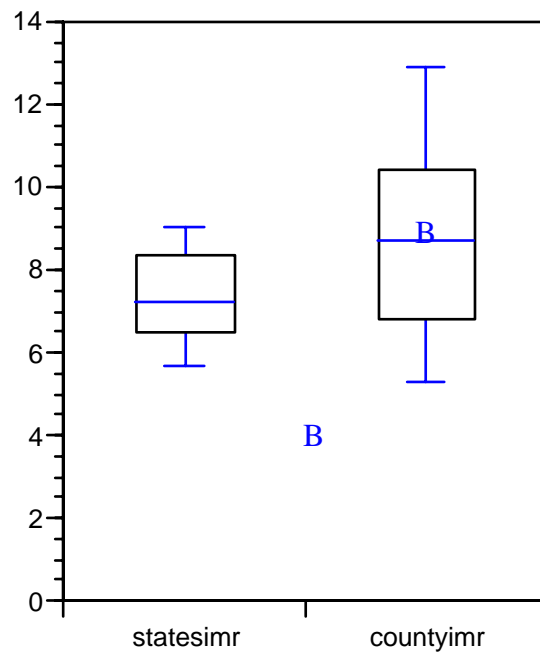
The Public Health Foundation has joined with the Health Resources and Services Administration (HRSA) to identify a set of community measures of health and publicize these for counties as a rough guide to the comparative health status and resources available to counties. This program, “Community Health Status Indicators” (CHSI) posted data for all US counties on a web site maintained by the U.S. Health Resources and Services Administration (HRSA) in July of 2000 (www.communityhealth.hrsa.gov). All U.S. counties are clustered into 88 strata that were developed through “expert input.” The method as described on the web site, set a target number of counties per strata, between 20 and 50, with the intention of allowing for comparisons of similar counties by size, population, age structure and density. The resulting system identified roughly equivalent peer groups that range in number from 14 to 58 counties with an average of 35. The data are presented in a way that allows counties to identify their priority conditions or problems and compare themselves to their peer group. The clustering system was developed in cooperation with work for the Comprehensive Approach to Tracking Community Health (CATCH) program at the University of South Florida (Studnicki et al. 1997).

MEASURING DIFFERENCES

Key to the identification of a substantial difference in health status or access between geographically defined populations or population segments is the degree to which the boundaries separate or include the population which is negatively affected or the degree to which the nature of the area itself affects health and health care. Maps of the United States at the state level show strong and important differences in mortality, morbidity and access to care measures. There are different ranking and ratings systems that reveal health disparities at the state level and include those distributed by the UnitedHealth Group (UnitedHealth Group 2000), Morgan Quitno

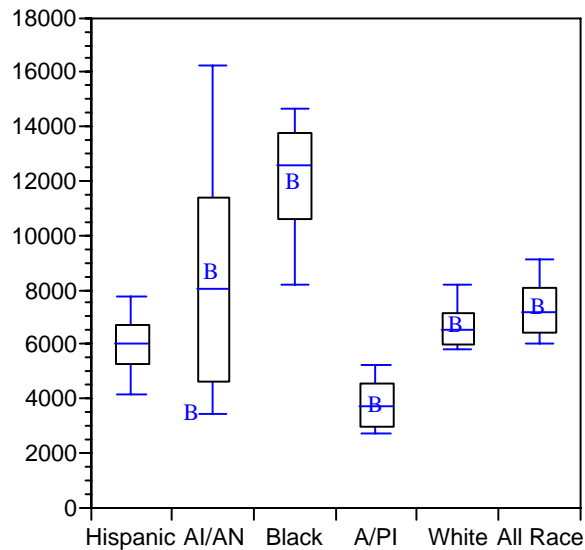
(Morgan and Morgan 2001) the National Conference of State Legislatures (Siegel 1998), The American Association of Retired Persons (AARP) (Lamphere et al. 1999), the Urban Institute (Liska, Brennan, and Bruen 1998). The CDC's National Center for Vital and Health Statistics does not explicitly rank states in a comparisons but data they distribute are easily subject to ranking and grouping. Those rating systems are criticized for their accuracy and the inclusion of subjective judgments as to what constitutes a summary measure of health (Gerzoff and Williamson 2001). Comparisons of state rates of key health indicators result in variations that are constrained by the aggregation of data. The variation increases when examining the data at the county level as illustrated in Figure 1; the box area covers the 25th to the 75th percentile of values, the top and bottom cross lines the 19th and 90th percentile of values.

Figure 1. Infant Mortality Rates, US, 1999 50 States and 3,040 Counties



The variation may change within population groups. The plots below illustrate the potential ranges of difference. The first is of Years of Potential Life Lost (YPLL) by state and by race/ethnicity. The American Indian/Alaska Native group shows great disparities in levels by state due to the wide variation in the numbers in different states. African-Americans show a higher average number than all groups and a relatively high level of variation. Whites the lowest variation and Asian and Pacific Islanders, low variation and the lowest average despite equally low numbers in some states.

Figure 2. Years of Potential Life Lost before age 75/100,000, US States, 1999



Many measures of health status are difficult to compare across counties and other levels of geography are used. For example, in the United State Atlas of Mortality (Pickle et al. 1996) for most causes of death, the county was too fine a level of analysis due to the low number of deaths in a majority of counties. The rates were clustered into 805 Health Service Areas based on hospital usage for people over 65 (Makuc et al. 1991) and adjustment to aggregate areas for visibility on maps. The maps in the Atlas show broad variations in rates and a significant degree of clustering of higher and lower rates by region (view sample maps at: www.cdc.gov/nchs/products/pubs/pubd/other/atlas/atlas.htm). The Atlas went one step further and spatially smoothed the mortality rates and created quintiles of the distribution. These maps show remarkable clustering by region for various causes of death in age and race categories. For example colorectal cancer for white males age 40 shows a very high rate in the mid-Atlantic region. The geographic distribution changes at age 70 with the highest rate shifting to the northeast. Among blacks, the rates remain highest in the coastal southeast, Mississippi Delta and east Texas for both age specific groups. The Atlas identifies regional difference and shows the diversity of disparities across race groups by both age, geography and cause of death.

The Dartmouth Atlas of Health Care series uses a set of hospital service areas made up of clusters of ZIP codes to illustrate differences in the use of resources and rates of procedures among Medicare beneficiaries. Many of those 3,436 service areas do not include sufficient populations to compare morbidity and mortality as well as the rates included in the Dartmouth

Atlas. This led to the construction of 306 hospital referral regions each with a minimum of 120,000 residents. These regions allow for comparisons of outcomes and health status rates linked to health system structure. Linking the geographic analysis of health status data to the health care resources that may be mobilized to affect those rates is a powerful step toward reducing disparities. The link between the reporting of data and the development of policies to address identified disparities has generally not spanned political boundaries to more functional health system regions. There are some signal exceptions of systems that attempt to do so.

SYSTEMS TO AFFECT LOCAL HEALTH

While it is more common to use data to describe places which are statistically separate from the direct delivery of health services, there are examples of the integration of community surveillance into health care delivery systems. Community health and community medicine are accepted as rubrics for a recognizable component in the organization of health care services. Communities have within them individuals and families who communicate and learn jointly and they have “interesting etiological and intervention potentialities.”(Epling, Vandale, and Steuart 1975). Yet, in the eyes of medical anthropologists who, in 1975, sought the proper level at which to investigate the spread of disease and the effects of social structure on disease found that the search for the proper area was not fruitful: “Unfortunately, there is, to our knowledge, very little concrete epidemiological evidence that supports these general notions of a community effect on illness.” (Epling, Vandale, and Steuart 1975, p. 86) On the other hand are experts and advocates who see the community as the appropriate and inevitable location for control or influence of the health system (Institute of Medicine. Committee for the Study of the Future of Public Health 1988; Stoto, Abel, and Dievler 1996). Others see it as the loser in a struggle for dominance as health care becomes more and more a corporate enterprise (Spitz 1997). Epidemiologists see their discipline as offering a special contribution to the improvement of health by being able to determine the appropriate denominator and apply sensitive methods to the prioritization of problem solution sets (Morrow 2000).

Community Oriented Primary Care.

Community oriented primary care (COPC) is an important contemporary conceptualization of how health care should be organized and COPC has been applied to systems that integrate public health with individual health care delivery (Bogue and Claude H. Hall 1997). The origins of

COPC can be traced to early organized structures for identifying local needs and addressing them but the name and the elaboration of the concept is the legacy of Sidney Kark, Guy Steuart, Joseph Abramson and their colleagues in South Africa (Kark and Steuart 1962). The COPC process involves four common steps: 1. Identify the community; 2. determine its needs; 3. implement changes in practice to meet those needs; 4. assess progress and adapt to remaining or emerging needs. Hal Strelnick, an early American practitioner of COPC, described the community-defining process as an ongoing, dialectical process where there was a changing emphasis and refining of the community among the three major types of community and population, the predefined, the practice-defined, and the problem defined (Strelnick 1990). Thomas Mettee offers an approach to the development of a larger set of options for building health within the COPC structure when he integrates the idea of community diagnosis into planning for community health (Mettee 1987). He develops the ideas of Edward McGavran to view the "community as patient" ascribing a hierarchy of needs, like Maslow's, to the community. Maslow saw the individual's needs for nutrition, air and water as basic; followed by safety, then family and society through self-esteem to independence and finally growth. The community hierarchy of needs is depicted in Figure 3 and describes the most important needs of communities as, first, clean air and water and safe food; then safe housing, medical care and fire and police protection; moving up to growth and prosperity.

Mettee compared the information gathering process in the care of individuals with a parallel process for communities. In McGavran's and Mettee's formulation, various types of information collected from the individual patient would be compared to data describing the community and a combined diagnosis made. This parallel system offers important suggestions for how to arrive at a sense of community needs as well as community capacity. Mettee's and McGavran's ideas were reflected in the subsequent push for "community diagnosis," a process that was refined and elaborated in public health in forms such as the Planned Approach to Community Health (PATCH), the Assessment Protocol for Excellence in Health (APEX), and the current Mobilizing for Action through Planning and Partnerships (MAPP) (National Association of County & City Health Officials 2002), all models for the assessment of community needs. These models were largely meant for local application and not meant to compare or rank communities or to assess

disparities. However, they do emphasize contrasts and “problems” which are equivalent to “deficits” in health in the localities.

Identifying The “Healthy Community”

The characteristics of healthy communities have been described by organizations like the Healthy Communities movement associated with the Civic League. Healthy communities, according to Norris and Pittman, exhibit seven patterns with four core characteristics that unite mind, spirit and body (Norris and Pittman 2000); a community that is healthy: shapes its future; cultivates leadership everywhere; creates a sense of community; connects people and resources; knows itself; practices ongoing dialog; and embraces diversity. These characteristics would provide a direct contrast to disparities and the questions arises, are healthy communities with these characteristics but residual health outcomes to be considered in a “disparity” column?.

In the recent past, the idea of “social capital” as contributing to the capacity of a community to improve health has been proposed. As an example of a social capital index, Joshua Galper, in a paper developed for the Urban Institute (Galper 1998), describes an empirical approach to clustering and ranking counties on the basis of their social or civic capital. His indicators include the structure of the local economy, including number of large firms, payroll of membership organizations, number of museums, gardens and zoos, the crime rate, unemployment rate, education levels, the age distribution, and newspaper readership, among other variables. This grouping and ranking system is similar to that used in the article “How To Build Strong Home Towns” which appeared in *American Demographics* in 1997 (Irwin, Tolbert, and Lyson 1997). The Pew Charitable Trusts, the Population Association of America, and community and government agencies in Canada and Australia have also created approaches to measure social capital or community capacity (Pew Charitable Trusts 1997; Teachman, Carver, and Paasch 1997; Bullen and Onyx 1998). These assessments of social capital have many of the same limiting characteristics that are encountered in community indicators of health care needs: they depend on fixed and often irrelevant units of analysis or denominators, they are made up of indicators whose original purpose was to characterize some other element of the society or discrete activity, and they are not very predictive of “outcomes”—whether they are health status or economic performance.

CONCLUDING REMARKS

Geographers who examine the relationship between place and health don't sense a relationship with fixed places so much as how people have interacted across space to make a particular place more or less healthy. The relationship between HIV infection and interstate highway locations represents a perfect example of a health consequence that is literally in motion and dependent upon place only to facilitate transmission. The consequences are felt at a distance. Injury prevalence is dependent on risks which are tied to geography: higher rates of trauma in rural areas are due to factors related to exposure and behavior (snowmobile use, chainsaws, tractors, higher highway speeds, lower seatbelt use) that reflect the interaction between human activity and space and places. These are disparities in risks related to geography. Paradoxically, urban places tend to be a bit safer in terms of trauma; there are more guns in rural places and firearm injury rates are higher and the urban-rural differential in drug and substance abuse is no longer so great as to create clear contrasts in the net health effects of crime.

There are obvious structural and physical differences between the decaying inner city of Scranton, PA and of the "cotton trail" area of South Carolina. However, the health disparities in access, services, and quality are fundamentally the same and described in the same terms. Across geographies there is a convergence of human health status and of how we deal with it.

Geographic location has very few absolute effects on access, use and health status. Those are: distance (time and topography fit under this heading as well) and weather. If the task is "how best to measure" then there are two ways: classify populations by place or measure individual's distance to care, net of other opportunities. However, we often "control" for differences in weather and the effects of distance are accepted as part of the condition of human settlement leaving pure geography outside of the causal structure for health policy. The "neighborhood" may be considered a form of pure geographic effect. However, it's definition is difficult and bringing some form of consistency to its measurement may be antithetical to a concept that reflects the variety of human interaction. If one is to measure disparity in terms of rates with delimited denominators, it is the choice of the unit of analysis—the geography—that will affect any measure of disparity in access, etc.

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