

Dental Health Professional Shortage Area Methodology:  
A Critical Review

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## **ACRONYM AND ABBREVIATION REFERENCE GUIDE**

AADS: American Association of Dental Schools  
ADA: American Dental Association  
ADHA: American Dental Hygienists' Association  
ASTDD: Association of State and Territorial Dental Directors  
BLS: Bureau of Labor Statistics  
BRFSS: Behavioral Risk Factor Surveillance System  
CDC: Centers for Disease Control and Prevention  
CHP: State and Area-wide Comprehensive Health Planning agencies  
DHPSA: Dental Health Professional Shortage Area  
DHEW: Department of Health, Education and Welfare  
DMFT: Decayed, Missing, or Filled Teeth Index  
DPIS: Dental Planning Information System  
FTE: Full-time Equivalency  
FQHC: Federally Qualified Health Center  
GAO: Government Accounting Office  
HMO: Health Maintenance Organization  
HMSA: Health Manpower Shortage Area  
HPSA: Health Professional Shortage Area  
HRSA: Health Resource and Services Administration  
IDU: Index of Dental Underservice  
IMU: Index of Medical Underservice  
IMR: Infant Mortality Rate  
MUA/MUP: Medically Underserved Areas/ Medically Underserved Populations  
NHANES: National Health and Nutrition Examination Study  
NHIS: National Health Interview Survey  
NHSC: National Health Service Corps  
NOHSS: National Oral Health Surveillance System  
OSHPD: Office of Statewide Health Planning and Development  
SES: Socioeconomic Status  
WHO: World Health Organization  
YRFSS: Youth Risk Factor Surveillance System

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## EXECUTIVE SUMMARY

In September 2001, California Assembly Bill 668 was enacted. This law requires the Office of Statewide Health Planning and Development (OSHPD) to report to the legislature the feasibility of establishing a California dental loan forgiveness program. While it references the same basic guidelines as those governing the National Health Service Corps Loan Repayment Program, this bill opens a policy window for designation to be made based on criteria other than the Dental Health Professional Shortage Area (DHPSA) criteria that are the federal standard for identification of workforce shortages.

Similarly, California Assembly Bill 982 has proposed the establishment of a California dental loan repayment program expressly targeted at improving access in “Dentally Underserved Areas.” This bill, which is still being amended, has also allowed for area designation to be made using *either* federal criteria *or new criteria* designed to identify “an area of the state where the unmet priority needs for dentists exist as determined by the Health Manpower Policy Commission pursuant to Section 128224 of the Health and Safety Code.”

At the national level, Senate bill S.1626, a bill “to provide disadvantaged children with access to dental services” which is currently being discussed in the Senate Finance committee, includes a mandate to review the current DHPSA designation standard. The bill calls for federal consultation with state and local dental authorities around the need to “streamline the process to develop, publish and periodically update criteria to be used in designating dental health professional shortage areas.” These calls for new methodologies to identify dentally underserved areas are an acknowledgement of the growing concern that DHPSA designation criteria are outdated and ineffective.

This report explores the history of Dental Health Professional Shortage Areas, critiques the current designation criteria, and provides recommendations for the next steps in revising these criteria. DHPSA designation is currently a prerequisite for participation in a variety of state and federal programs designed to increase access to services, in particular the National Health Service Corps.

Current DHPSA criteria were formulated almost in their entirety in the years 1965-1980, in response to Congressional imperatives to allocate public dentistry funds equitably and rationally. During those fifteen years, the definition of shortage moved from being based on

simple availability of dentists – which focused funding primarily in rural areas – to a definition based on underservice and unmet clinical need. This newer understanding focused attention on urban areas with access issues beyond physical proximity to a dentist.

The current DHPSA methodology makes use of corrected population-to-provider ratios embedded in a definition of shortage intended to be sensitive to the variation in clinical needs of different populations. However, because the current criteria are based on older methods originally formulated to address simple availability of personnel, not access issues more broadly defined, it has been argued that DHPSA designations are ill-suited to their task. An examination of the shortage literature makes it clear that current DHPSA criteria do not meet Congressional requirements to “go beyond ratio’s alone” due to their over-dependence on the population-to-provider ratio and resultant inattention to indicators of need.

The data required for the population-to-provider ratio are more readily available than for other indicators, and it is for this reason that it has continued to be used as the DHPSA criteria’s principle metric for 30 years. In establishing new criteria, the difficulty will be to define a methodology that is simple, feasible, accurate *and* consistent with the public health goal to designate underserved populations. This is a daunting task. Evaluating need in a large population is an expensive endeavor complicated by imperfections in the dental market. The American Dental Association and others collect survey data on dental service utilization and production at the national level, but there is little utilization or supply data available at the local level required to inform the federal designation process.

As a result of these and other difficulties, there are currently no readily available statistics on disease prevalence, utilization, or productivity. The dual policy goal of generating meaningful designations while at the same time simplifying the designation process will necessitate a compromise between accuracy and feasibility given the current lack of infrastructure to collect requisite data.

This report therefore examines the literature on personnel planning with an eye toward developing new shortage criteria. These criteria should ideally be feasible for local administrators to implement *and* consistent with the public health goal to designate underserved populations based on unmet clinical need.

## KEY RECOMMENDATIONS

These recommendations are distilled from the responses of a broad based advisory group that included members of the practice community, facility administrators, professional organizations, policy analysts, and state, federal and local shortage designation authorities. Information was gathered primarily through a one-day guided discussion around shortage designation; members of the advisory group also participated via phone interviews and written responses.

1. **Increase the responsibility of State/Federal agencies** and decrease the burden on local communities
2. Construct an **index of dental underservice (IDU)** as a new measure for determining shortage designations
3. **Using state licensure and renewal mechanisms, develop requisite data collection methods and tools** to measure the supply, distribution, composition, and practice characteristics of the professions themselves.
4. Include an **alternative designation process** for hard to measure areas and populations not designated with reference to the Index of Dental Underservice
5. Allow **presumptive DHPSA eligibility** for providers documented to serve underserved populations (FQHC's, public health clinics, etc.)
6. Develop **rational service areas** specific to the dental market

## **I. THE DEVELOPMENT OF DENTAL HEALTH PROFESSIONAL SHORTAGE CRITERIA**

### **A. Government Intervention and the Development of Shortage Criteria**

In Healthy People 2000 and 2010, the Department of Health and Human Services established new oral health goals as part of the national agenda (USDHHS, 1990, 2000). In order to meet these goals, renewed attention has been paid to issues related to the provision and utilization of oral health resources. As noted by Capilouto et al. (1995), the government's role in the health care market, in part, is to ensure that socially acceptable levels of care are available to the population and that they are allocated in an efficient manner. This resonates with WHO recommendations that the goals of health policy should be to ensure both the best overall level of health – goodness – and the smallest health disparities – fairness (WHO, 2000).

In order to better target programs at areas and populations with high unmet need, the federal government has developed various criteria for designating areas and institutions where public intervention is warranted. The Dental Health Professional Shortage Area (DHPSA) criteria were designed to address oral health services. DHPSA designation is a prerequisite for participating in a variety of state and federal programs designed to increase access to oral health services, in particular the dental component of the National Health Service Corps. These programs also represent the federal government's primary attempt to address the distribution of dental health professionals.

Dental health shortages have been largely defined with reference to the dentist-to-population ratio. There is growing concern, however, that this metric is poorly suited to the intended role of federal shortage designations and the values these designations represent.

### **B. Trends in US Health Personnel Planning**

Personnel planning has been defined as the “process whereby a determination is made regarding appropriate numbers, types, and distribution of individuals capable of providing health services to achieve a desired goal or health outcome” (Arnjlot et al, 1985). As noted, “The need to plan for dental health personnel is rooted in the ethical imperative to use limited health resources appropriately”(Goodman and Weyant, 1990). In the United States, one major task of dental personnel planners has been to identify dental health professional shortages so as to target

areas and populations for government aid. However, the definition of “shortage” and, hence, the criteria by which it is measured, have changed over time.

Over the past 60 years, there has been a shift in perception on the part of dental health planners from a shortage criteria based on general undersupply, to a focus on maldistribution, and eventually to a focus on underservice (Lee, 1977). There has been a concurrent shift from supply-based indicators of shortage – mainly population-to-provider ratios – to measures of unmet demand for services, and eventually, to indicators of unmet treatment needs. This trend has been documented in the literature, in the evolution of the DHPSA criteria, and in the design of programs to address disparities, however defined. The accepted definition of shortage has critical implications for public policy, and vice versa. For example, a “shortage” defined simply as a general lack of available dentists warrants interventions aimed at training more dentists; if there is adequate supply of dentists, but other access issues remain, then more comprehensive programs – outreach, education, public clinics – are warranted (Defriese and Barker, 1983).

Shortage criteria were created in the current of the political mainstream, and now as federal law, they continue to have an effect even though the socio-political climate that created them has changed. By understanding the history of personnel planning and shortage area designations it becomes clear how and why the current DHPSA criteria have evolved as they have, what functions they are intended to serve, and what changes should be made in order to keep the criteria current.

### **C. Brief Historical Overview of Oral Health Personnel Planning, Pre-1970**

Health personnel planning in the United States is largely a product of post World-War II optimism that, with appropriate planning and coordination, all disease could be eliminated (Starr, 1982). This optimism translated into a focus on personnel planning, and also served to stimulate growing public demand for health services, including dental care (Starr, 1982; Douglass and Cole, 1979). The perception up until the mid 1970’s was that there was a shortage of dentists in the US, and that the dental infrastructure of the country was under-developed (Defriese and Barker, 1983). During the period from 1945-1970, a wide variety of reports documenting the perceived general shortage were published (Bane, 1959; Lee, 1977); in response, federal and state governments enacted legislation to help train new dentists and build brick and mortar infrastructure to support them (Starr, 1982; Douglass and Cole, 1979; Capilouto et al., 1995).

## **D. Early Federal Legislation and the Development of Dental Health Professional Shortage Areas 1965-1971**

The earliest federally determined shortage criteria were swept in on the tide of the “Great Society” legislation of the mid 1960’s. The Health Professions Educational Assistance Amendments of 1965 (PL. 89-290) and the Allied Health Professions Personnel Act of 1966 (PL 89-751) provided loan cancellation of portions of federal student loans obtained by students in schools of medicine, osteopathy, dentistry or optometry in return for service in counties found to have health personnel shortages.

The criterion for designating counties as such was an uncorrected countywide population-to-dentist ratio of 3000 to 1 or greater, which was the mean ratio, nationwide, in 1965 (Lee, 1977). In 1966 the Comprehensive Health Planning and Public Health Service Amendments Act, or “Partnerships for Health” Act was put into US code, Title 42, Chapter 6A, Subchapter II, Part B, Section 246. This act called for the allotment of funds between 1966-1973 for state and areawide health planning and grants-in-aid to support health services. This legislation supported the creation of the agencies that were eventually to do the planning and management of the new programs being developed.

## **E. The Creation of the National Health Service Corps 1970-1976**

In 1970, the Emergency Health Personnel Act (PL 91-623) created the National Health Service Corps (NHSC), a program designed to provide federally employed/subsidized health personnel, including dentists, to areas designated by the Secretary of Health Education and Welfare as having a critical shortage of “health manpower.” Along with the new program, then, came another, separate set of criteria to designate shortage areas eligible for NHSC placements.

The personnel planners responsible for the NHSC criteria chose to use already existing data in order to simplify the designation process. The “Health Services Scarcity Area Database” had already been assembled from information submitted by the various branches of the State and Areawide Comprehensive Health Planning agencies (CHP).

Available indicators from this data set consisted almost entirely of unadjusted population-to-provider ratios. It was largely on this basis – the readiness of available data – that policy makers chose to use this particular statistic (Lee, 1977).

Originally, the NHSC was intended to place practitioners in rural areas that would not, in the absence of subsidies, be able to attract a provider; but it was expected that these practices should, after approximately 2 years, be able to exist on a strictly fee-for service, risk bearing basis (DHEW, 1980). These requirements imply that site eligibility criteria should focus on potential demand for services, as well as a focus on the supply of dental services. The population-to-provider ratio was a valid diagnostic given these criteria for eligibility (DHEW, 1980). After all, as noted by Odrich, **the population to provider ratio is best understood as a measure of the population size necessary to support a viable practice for dentists, and not vice versa** (Odrich, 1985).

For dentists, the ratio of 5000 to 1 was chosen for the Critical Health Manpower Shortage Area cutoff, making the NHSC requirements much less inclusive than those specified by the loan repayment legislation. This higher cutoff was chosen so as to be indicative not just of inadequacy, but of gross inadequacy (Lee, 1977), as the median national ratio at the time was 3000 to 1. In response to criticisms of the criteria as overly simplistic, criteria were revised in early 1976 to include corrections for FTE dentists and contiguous resource availability. This was the first of many revisions to come but like those to follow, it left the basic indicator – the 5000 to 1 ratio – intact (Lee, 1977).

## **F. Health Maintenance Organization Act of 1973 and the Creation of the MUA/P**

### **Criteria**

In 1973, President Nixon signed into law the HMO Act intended to set the groundwork for what Nixon considered to be a viable form of national healthcare (Starr, 1982). While Nixon's vision of a national health system never came to fruition, the eligibility criteria created for this short-lived program, the Medically Underserved Area/Population (MUA/P) criteria, are still used today by the Community Health Centers Program and others (Lee, 1991).

What distinguishes this set of criteria is the HMO Act's stipulation that eligibility criteria must guarantee that funding reaches "medically underserved populations." This is a significant departure from the previously defined philosophy of redressing personnel shortages. At this point in time, there was a clear distinction between the concept of "underservice," which Congress referred to in the HMO legislation, and the concept of "manpower shortage," which was the basis for both NHSC and student loan repayment criteria. The former is a broader term

encompassing all populations not receiving adequate care (variously defined), while the latter category is restricted to underservice due to lack of trained personnel in a given area (Lee, 1991).

A variety of expert panels evaluated the available proxy data for underservice (infant mortality rate, crime rate, poverty level, etc.), and combined the most useful data into one general Index of Medical Underservice (IMU). A four variable model was ultimately selected, which made use of: (1) physician-to-population ratio, (2) infant mortality rate, (3) percent of population below poverty level, (4) percent of population over the age of 65. These four variables were weighted and incorporated into a single index of underservice. Median county level was set as the cut off threshold of the index (DHEW, 1980; Lee, 1991).

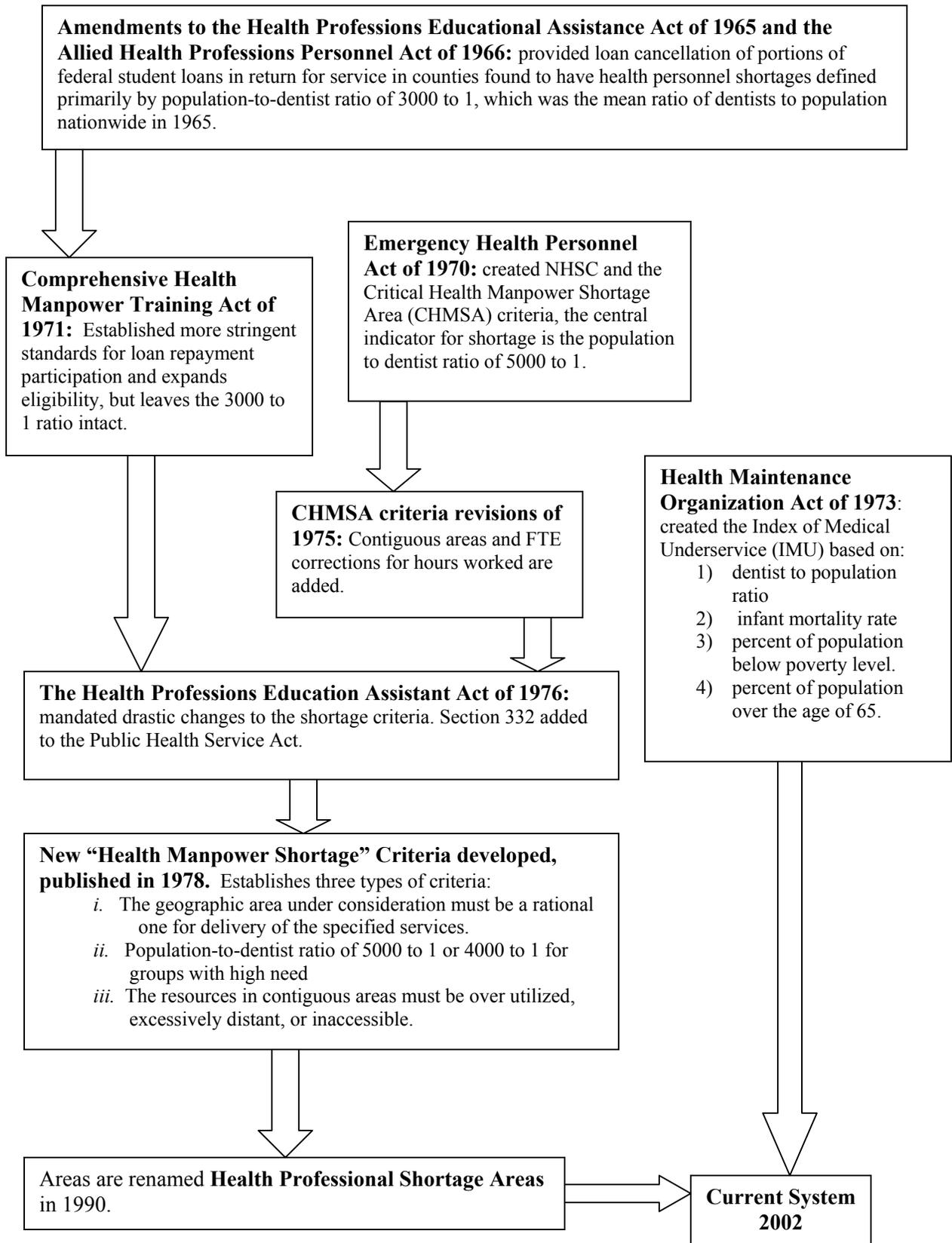
While the IMU represents a turning point in the federal definition of shortages, it was heavily criticized at the time for its reliance on face validity and lack of theoretical foundation. Fryback, Gustafson and Detmar (1978) found that MUA's did not correlate with expert opinion on underservice. They concluded, however, that "the IMU would be quite adequate for making initial designations of manpower shortage areas."

In 1981, Chiu et al. examined six shortage area indicators, including population-to-provider ratios, epidemiological surveys, and MUA indicators, and concluded that the IMU, "which is relatively inexpensive to construct and apply, compared to large-scale social survey data collection and analysis efforts, would then appear to be a useful tool for identifying areas in which health resources needs and individual access problems are great." However, the IMU was not created to measure dental underservice and has never been used in regards to the dental HPSA process.

## **G. The Health Professions Education Assistance Act of 1976**

By 1976 there were three separate sets of federal criteria for shortage area designation, administered by two different agencies, all three of which were heavily criticized. The IMU, for example, was further criticized for its lack of defined service areas, which made it complex for administrators to apply. NHSC and Student Loan Repayment criteria were criticized principally for "excessive dependence on the population-to-provider ratio" (Lee, 1979). This ratio, critics argued, ignored productivity differences between dentists, failed to acknowledge access barriers outside of physical proximity to dentist, and obscured the considerable variance in health needs and demand for care displayed by different populations (Meskin and Martens, 1970; Odrich,

**Figure 1: Timeline of Major Dental Health Personnel Shortage Legislation**



1985). All criteria were criticized for relying on county data that were too idiosyncratic to be meaningful (Born 1981). Lastly, it was argued that there were too many lists, too many different criteria, and a lack of consensus/consistency on the concept of shortage (Lee 1979).

The Congressional response to these and other criticisms was the broad reforms stipulated by the Health Professions Education Assistance Act of 1976, which added Section 332 to the Public Health Service Act. As expressed in the House and Senate reports, this act embodied three major Congressional goals. First, it called for reforms to current criteria that would facilitate the designation of urban as well as rural areas. Second, it called for criteria that would “broaden the concept of shortage” by defining shortages less strictly, and by “going beyond ratios alone.” To this end, it required the formulation of new criteria that would take into account indicators of need – “notwithstanding the supply of health manpower” – including infant mortality, access to health services, and health status. Lastly, Congress wanted to insure that areas be prioritized in the list based on severity of shortage, so as to allow administrators to allocate resources more efficiently (Lee, 1979; DHEW, 1980; Lee, 1977).

Additional stipulations included: (1) Areas need not conform to political, geographic subdivisions – it must be a “rational service area”; (2) an allowance for the assignment of shortage status to medical/forensic facilities and populations; and, (3) the consolidation of the Student Loan and NHSC criteria into one set of criteria under (Lee, 1977).

## **H. Professional Support for Dental Public Health Legislation**

Throughout the 1960’s, the American Dental Association and its constituents labored under the banner of personnel shortages to stimulate government expenditures on America’s oral health infrastructure. The Health Professions Education Assistance Act of 1963 for example, was pushed through largely on the strength of dentist-to-provider ratios furnished by the ADA.

However, as the wave of economic prosperity began to break against the shores of the more fiscally conservative 1970’s, a perception of “oversupply” began to creep into the dental journals. National projections of decreasing population-to-provider ratios were used by the ADA and others to argue that there was a pending – and by the eighties, an actual – oversupply which was purported to threaten the quality of care and ability of dentists to earn a living (Goodman and Weyant, 1990).

It is worth noting, however, that, contrary to what one would expect in a period of market surplus, the average income of dentists from 1981 to 1986 outpaced the inflation rate by 200 percent. “It therefore seems odd that, within an alleged oversupply situation, both real income for dentists and prices for dental services would have increased to such an extent. Economic theory says otherwise” (Goodman and Weyant, 1990; Capilouto et al., 1995).

Based on their assessment of a pending surplus, the ADA began in the 1970’s to withdraw its support from programs designed to alleviate perceived shortages. In 1976, for example, the ADA rescinded its longstanding endorsement of the expanded use of dental auxiliaries to increase productivity, ostensibly because of a concern for public safety; but others have argued that the impetus was a fear for economic security (Goodman and Weyant, 1990). While the ADA had once been an advocate for public dentistry programs, by the mid 1970’s, the ADA had become hostile to government intervention in the private dentistry market.

“Fuelled by a dramatic decrease in the rate of population growth, a sluggish economy, and increasing numbers of dental graduates,” largely spawned by the governmental programs the ADA had helped to create, “organized dentistry feared that the profession would be increasingly vulnerable to government control and regulation.” In 1976, the ADA tried unsuccessfully to block the passage of the Health Professions Education Assistance Act – the natural extension of the programs it had originally inspired – arguing that the Act was a “governmental threat” to dentists’ “autonomy” (Goodman and Weyant, 1990).

### **I. New “Health Manpower Shortage” Criteria**

In response to the passage of the Health Professions Education Assistance Act, the Bureau of Health Manpower condensed the NHSC and Student Loan Criteria into a new set of regulations, the Health Manpower Shortage Area (HMSA) criteria, published in the Federal Register in 1978. Under the new provisions, three types of criteria were considered for each of seven professions (Lee, 1979). These three were:

- i. The geographic area must be a rational one for delivery of specified services.
- ii. The areas must have *FTE adjusted* provider to population ratios above distinct cutoffs for each profession.
- iii. The resources in contiguous areas must be over utilized, excessively distant or inaccessible.

For primary care there was a demand side adjustment based on demographic differences in utilization. For dentistry there was a supply side adjustment made based on the age of practitioners and the number of auxiliaries.

The largest departure from the older criteria was the addition of indicators of need, which were then used to define a lower shortage threshold ratio for communities that had either especially high need or where existing resources were clearly insufficient. Indicators of need were chosen so as to identify urban shortage areas because “these areas are particularly difficult to target with manpower ratios” (Lee, 1979). Infant mortality rate and poverty level were used to indicate need in primary care HMSA’s because they are “associated with poor health status,” particularly in urban areas, but these were seen as weak indicators of need for dental services (Lee, 1979). Dental need, in the new criteria, was defined by lack of fluoridation, which favored rural areas, and by 30 percent of the population being below the poverty line, which favored urban areas.

The HMSA criteria marked a distinct change in the concept of “shortage.” As noted by Richard Lee, then the Chief of the Shortage Area Designation Branch of the Bureau of Health Manpower, “with the required changes in the factors to be considered in designating health manpower shortage areas, there is really little conceptual difference left between ‘populations with health manpower shortages’ and ‘medically underserved populations’” (Lee, 1979). The result, according to Lee “is that we wind up fostering the use of the National Health Service Corps, originally conceived of as a program to place physicians [or dentists] where there were no, or almost no physicians [or dentists], to place physicians [or dentists] within portions of apparently physician-laden [or dentist-laden] metropolitan areas in order to meet the needs of under served population” (Lee, 1979).

## **J. Dental Health Manpower Shortage Area Designations, Circa 1978**

The HMSA criteria were instituted in 1978, and have remained virtually intact since that date. The following is a quick outline of the criteria reported in the Federal Register, Jan. 10, 1978 and the changes that have occurred since their publication.

A. The area is a **rational service area** defined by:

- Travel time to obtain services is 40 minutes or less. This translates to:
  - a. normal conditions: 25 miles;

- b.* mountainous: 20 miles;
    - c.* Flat terrain connected by highways: 30 miles.
  - A strong self-identity -- homogenous socioeconomic or demographic structure – for which average income and race are often used as proxies.
  - Limited interactions with contiguous areas.
  - A population greater than 20,000. This is both the most quantifiable and least important criteria. If the second and third criteria are met, this criterion is often disregarded.
- B. The area has a **population-to-provider ratio greater than 5000 to 1; or greater than 4000 to 1** if area meets criteria for high need or insufficient capacity. The ratio of 5000 to 1 is roughly 150 percent of national average (Lee, 1979), and was chosen to indicate a “gross inadequacy.”
- Population is permanent, non-institutional civilian; but this can be corrected for migrant and tourist populations if appropriate
  - **FTE Dentists:** An equivalency weight by age, number of auxiliaries, and hours worked is calculated with a table designed by the BHPr
  - **Criteria for high need**, as previously noted, are:
    - a.* More than 30 percent of the population in the area is at or below 200 percent of poverty
    - b.* The area does not have a fluoridated water supply
  - **Criteria for insufficient capacity are:**
    - a.* More than 5000 annual visits per FTE dentist
    - b.* Unusually long waits for routine appointments
    - c.* Two-third’s or more of the area’s dentists do not accept new patients
- C. **The area is not contiguous with another area that has enough capacity to service both areas.** Contiguous areas can preclude designation if:
- The areas are within 40 minute travel time.
  - The areas share borders (Note: This is an unofficial guideline (ADA, 1980)).
  - The contiguous area has FTE of less than 3000 to 1
  - The contiguous area does not pose significant access barriers in terms of language, culture, economic considerations, etc.

The 1978 criteria also allowed for the designation of Population and Facility HMSA’s. These were designated using similar criteria, but without the stipulation of a rational service area. There were two basic types of alternative designations.

- Population HMSA’s allowed for designation of populations with special needs or access problems. These included low income, Medicaid eligible, migrant, Native American, and homeless populations, as well as groups otherwise isolated by language, cultural barriers or handicaps.
- Institutional HMSA’s were for:
  - a.* Federal and state correctional facilities with insufficient capacity or with unusually high needs

*b.* Public and non-profit facilities serving dental shortage populations

It is important to note that these designations were and are viewed as a last resort, used only if a group or institution cannot qualify under a geographic application (HRSA, 1995).

## **K. Updates To DHMSA since 1978**

These criteria have remained virtually intact since their inception. Two minor but noteworthy revisions are a 1980 update that lowered the needs criteria from 30 to 20 percent of the population below the poverty level so as to correlate with the national census criteria for designating a “poverty area” and the name change to the gender-neutral Health *Professional* Shortage Area in 1990 (DHEW 1980).

In 1998, the Health Resources and Services Administration began the process of a major revision to the *primary care* HPSA methodology (Federal Register, 1998). The goals for the new primary care criteria include:

- Consolidating primary care HPSA and MUA/P designation processes in to one process with consistent criteria that generates an integrated list
- Making the system proactive and increase the use of automation
- Making use of newly available, sub-county level, census data
- Simplifying and automating the process so that applicant familiarity will be less of a factor and independent data collection requirements for applicants will be less of a barrier
- Reducing need for population group designation through the use of specific indicators to account for the access barriers of low income, racial minority or Hispanic ethnicity and linguistic isolation
- Incorporating better measures or correlates of health status: Infant mortality rate, low birth weight, etc.

The specifics of the new primary care methodology have yet to be finalized. Because of the methodological issues and concerns about impact on existing safety net providers, the impacts of two iterations of an index of primary care underservice have been tested over the past four years. The most current indicator makes use of a population-to-provider ratio – corrected for FTE and weighted based on profession (physicians, nurse practitioners, nurse midwives, etc.) –

as a measure of supply, and a number of proxies for need, also weighted, and demand. These include:

- Infant mortality rate and low birth weight as indicators of need and poor outcomes in the health care system
- Percentage non-white, non-Hispanic for access barriers and higher need/lower life expectancy
- Percent Hispanic as a proxy for “discriminatory and cultural barriers” and higher disease prevalence
- Population density as a replacement for travel times and as an indicator of higher disease prevalence in rural areas
- Percent of population below 200 percent of the poverty line and unemployment rate, since both are associated with lower health status and decreased utilization
- Percent of the population over 65 as an indicator of increased need

Many of these proxies were chosen because of their national availability at the census tract level. The ultimate goal of this revision is to make the process easier, with fewer burdens on local communities, but not restrictive of state or local community input. HRSA is attempting to construct a national database of primary care shortage areas that is maintained by HRSA, based largely upon nationally available data collected by the federal government, and which will be made available through a partially automated GIS designation system.

However, because there are communities where national data will be unable to adequately measure need, the new primary care methodology will likely also have alternative means for areas/facilities to obtain designation. For example, the new methodology will likely allow for local areas to present their own data if national data are deemed incomplete or inaccurate. There will also be a mechanism for designation based on some type of population-based process. There will likely be some type of “safety-net” designation for Federally Qualified Health Centers (FQHC’s) and other facilities that can document a commitment to meeting the needs of the underserved. According to HRSA, the next updated methodology will capture a very high percent of the current primary care shortage areas while requiring far less effort from communities to obtain and maintain designation.

The pending revision to the primary care HPSA criteria more completely addresses the congressional mandates of section 332 of the Public Health Act to streamline the process for

designation and incorporate need indicators directly into the methodology. As of the writing of this report, there has been no formal discussion of how best to revise Dental HPSA methodology, despite state and federal initiatives, such as Senate Bill S.1626, which call for DHPSA designation criteria to be updated. That said, it is likely, according to HRSA representatives, that a revision of *all* HPSA methodologies will be undertaken once the primary care methodology is operationalized. Further, all such updates would likely use the new primary care methodology as the template for revision.

**Figure 2: Overview of Dental Shortage Criteria Development 1965-Present**

<b>Criteria</b>	<b>Date</b>	<b>Details</b>	<b>Associated Program</b>
Federal Loan Cancellation Criteria	1965-1966	Uncorrected Population-to-dentist ratio of 3000 to 1	First Federal Loan Repayment Program for health professions
NHSC Criteria	1970	Uncorrected population – to-provider ratio of 5000 to 1.	NHSC: Federal program to place health professionals in shortage areas
HMO Act	1973	Index of Medical Underservice based on: 1) Physician-to population ratio 2) Infant mortality rate 3) Percent of pop. below poverty level. 4) Percent of pop. over the age of 65.	National HMO Program: Federal Attempt to encourage development of and competition among HMOs.  Later: Community Health Centers, Federally Qualified Health Centers, Rural Health Centers, Title VII programs
HMSA Criteria	1978	i. The area under consideration must be rational for delivery of the dental services. ii. Corrected pop-to-dentist ratio of 5000 to 1/ 4000 to 1 for groups with high need. iii. The resources in contiguous areas must be over utilized, excessively distant, or inaccessible.	Federal and State Loan Repayment and NHSC  Later: Title VII Programs.
HPSA Criteria	1990	Same as Above	Same as Above

## **L. Summary: Shortage Area Designations, 1965-2000**

DHPSA criteria were formed almost in their entirety in the years from 1965-1980, in response to the administrative imperative to allocate public dentistry funds equitably and efficiently. During those fifteen years, the definition of shortage moved from a concept based on simple availability of dentists – which focused funding primarily in rural areas – to a construct based on underservice and unmet clinical need. This newer concept of shortage focused attention on urban areas with access issues beyond physical proximity to a dentist.

DHPSA methodology makes use of corrected population-to-provider ratios embedded in a definition of shortage based on level of need. This methodology was intended to be sensitive to the variation in clinical needs of different populations. However, because the current criteria are based on older methods originally formulated “to address availability of manpower, not access” more broadly defined (Stambler, 1977), it has been argued that DHPSA designations are ill suited to their task.

Specifically, it is often argued that the population-to-provider ratio is an outdated and inappropriate methodology. A recent GAO report concluded, for example, that the current criteria are “based on flawed methodologies that have not been effective at specifically identifying which parts of the population are underserved and why” (GAO, 1995). The following sections will further explore the DHPSA designation methodology, and suggest alternative strategies for designating shortages.

## **II. PROBLEMS WITH CURRENT DHPSA CRITERIA**

### **A. The Role of DHPSA Designations in 2002**

Currently, there are 1,953 Dental Health Professional Shortage Areas nationwide, and 68 in the state of California (Federal Register, 2002). California, which has 12 percent of the nation’s population, has 3 percent of the nation’s DHPSA designations. The list of HPSA’s, including Dental HPSA’s, is administered by the Shortage Designation Branch of the National Center for Health Workforce Analysis at the Bureau of the Health Professions, within the Health Resources and Services Administration. This list is used to evaluate the eligibility of a given area or population for a number of federal and state programs. These programs include: the

National Health Service Corps, Federal and State Loan Repayment Programs, the Rural Health Centers Program, and a number of Title VII Programs (Federal Register, 1998).

DHPSA criteria function within these programs (1) as an initial screening, and (2) as a means of weighing the criticality of intervention in a given service area. Many of the aforementioned programs – most notably the NHSC – have secondary, and even tertiary eligibility criteria that extend well beyond the data requirements of the DHPSA designation process. With these functions in mind, some useful questions that might be asked in evaluating the current DHPSA criteria are:

- Can the criteria identify *underserved* areas and populations, where “underserved” is an inclusive term signifying all groups who have limited access to dental care due to financial, geographic, cultural, or language barriers?
- Can the criteria identify populations with high unmet clinical need?
- Is the application process simple enough that applicant familiarity and data collection requirements do not pose an unreasonable barrier to local communities?
- Are the criteria sensitive enough not to exclude communities with high unmet need, even if this means accepting groups which will later be disregarded by a secondary eligibility screening?

Unfortunately, even a cursory review of the literature on this subject tends to indicate that the current methodology, because of its dependence on the population-to-provider ratio, is not up to the task.

## **B. Identifying Underserved Areas**

The current criteria are ill equipped to distinguish access barriers beyond simple availability of dentists. Claims that the population-to-provider ratio embodies a proxy measure for need or demand in the form of a population count are based on the incorrect assumption that the population counted relates directly to population served (Meskin and Martens, 1970; Odrich, 1985; Goodman and Weyant, 1990; Cavanaugh, 1983). The large split between public and private dental delivery systems, and the predominance of the latter, guarantees that the statistic will be skewed. The existence of private dentists does not speak to the accessibility of dental services to the poor. In California, according to Aved, the overall supply of dentists is very high relative to the national average (Aved, 1996), but many populations remain

**Figure 3: Programs That Require the DHPSA Designation**

Program	Date Created	Mission	Eligibility Criteria
National Health Service Corps	1970	To deliver health care in underserved communities	<ul style="list-style-type: none"> <li>• Site must be in a designated DHPSA that has at least one practitioner needed.</li> <li>• All NHSC candidates are measured by a five point scale/index of the “criticality” based on: dentist to population ratio; infant mortality rate; poverty rate; rate of low-birth weight births; access, including physical proximity to a dentist</li> <li>• Those that make it past a defined threshold for criticality are ranked for placements based on a similar index focused on the site itself.</li> </ul>
Federal and State Loan Repayment Programs	Varied- beginning in 1963	To improve the geographic distribution, quality, and diversity of the health care work force	<p>Variable: NHSC Placements are based on above criteria. State programs vary, but generally mirror federal programs. One example is Kansas, where site eligibility is based on:</p> <ul style="list-style-type: none"> <li>• Clinic being in a HPSA</li> <li>• Number of persons per square mile</li> <li>• Provider to population ratio.</li> <li>• Significant risk factors such as IMR</li> <li>• High poverty levels, high percent of the population over age 65.</li> <li>• Degree of community support.</li> <li>• Written plan to care for all clients in need regardless of ability to pay.</li> <li>• Written assurance that Medicare and Medicaid patients served.</li> </ul>
Rural Health Centers	1977	To increase services for Medicaid and Medicare patients in rural communities	<ul style="list-style-type: none"> <li>• Clinic is located in HPSA or MUA.</li> <li>• The clinic must employ a mid-level practitioner at least 50% of the time the RHC operates.</li> <li>• Must provide outpatient primary care.</li> <li>• Clinic must be under the medical direction of a physician.</li> <li>• Must provide six basic lab tests on site.</li> <li>• Must be clean and handicapped accessible.</li> <li>• Must have a current and applicable policy procedures manual.</li> <li>• Drugs and samples stored safely.</li> <li>• Adequate medical records must be maintained for six years.</li> </ul>
Health Professions Education Training (Title VII) programs	1988	To improve the diversity, geographic distribution, and quality of the health care work force	<p>Variable: Often have second tier of site eligibility based on demonstration of commitment to serve a particular underserved/high need population: eg HIV/AIDS, rural communities,</p>

underserved because of barriers to access beyond simple availability (Mertz et al., 2000; GAO, 2000).

A 1980 DHEW sponsored study found that the updated primary care HMSA criteria, which were intended to meet the Congressional demand for criteria capable of discerning urban HMSA's, could not “successfully differentiate small urban areas with impeded access from areas in which access is [acceptable as] measured by levels of medical service utilization” (DHEW, 1980).

Additionally there is the issue of what a “rational service area” is and how this may or may not affect the calculations of supply. Many states simply use county boundaries as their areas, while others, particularly larger western states (Washington, California, Arizona), have developed their own areas using a variety of different methodology. A recent study in North Carolina found that “compared with market areas constructed using patient origin data, county-based market areas adequately proxy for dental markets. Using the county as the market area also avoids the time and computational costs associated with using a patient origin-based approach and facilitates the use of widely available data” (Mayer, 1999). HRSA has recently funded the “Primary Care Service Area Project” which is intended to “rectify the deficiencies in the existing primary care data infrastructure by creating service areas using nationwide claims data to reflect actual utilization patterns for primary care clinical services” (HRSA, 2001). However it is unclear whether these areas will suffice for dental care markets or whether a different methodology is needed for defining rational dental care areas.

### **C. Identification of High Unmet Clinical Need**

The inclusion of need criteria – fluoridation and insufficient capacity – may provide some increased sensitivity to need in rural areas; but in urban areas, the majority of which are fluoridated, these indicators may not be as useful. While population DHPSA's directly acknowledge the importance of unmet need, these types of designations pose administrative problems and are generally viewed as a less flexible, less desirable classification (ADA, 1980). This emphasis on geography over population characteristics makes it difficult to accurately target specific subgroups.

The current criteria, then, are based on an inadequately corrected population-to-provider ratio. This ratio, as will be discussed later in the report, is premised on the assumption that need

is constant across populations. As such, current criteria are relatively insensitive to unmet need due to anything but simple availability, and even here the utility of the population-to-provider ratio has been questioned. Fryer et al. (1983) found that provider-to-population ratios in rural Colorado counties were unrelated to utilization rates. Thus, even in rural areas where access barriers are largely defined by proximity issues, the population-to-dentist index is not a useful referent because of the difficulty of defining appropriate demand/productivity corrections and rational service area requirements.

#### **D. Difficulties in Negotiating the Methodology**

There is a concern among many local administrators and providers that despite the *relative* availability of the data required for the current criteria these data can still be quite difficult for local communities to obtain. Particularly in urban areas with large numbers of dentists, the data collection phase of the process is often a substantive barrier to communities that might otherwise apply for designation. This situation poses a serious threat to the utility of the current methodology.

The DHPSA designation process puts the onus of responsibility for data collection on disenfranchised communities and local health departments with scarce resources. These local interests often do not have the personnel, skill or the political will to negotiate the administrative hassles and data collection requirements posed by current criteria. In many cases it is the providers themselves that must do the calculations, meaning lost patient care hours. Thus, even if one grants the validity of the indicators used by current criteria, the application process itself poses barriers to designation that hinder the effectiveness of the overall program. In the 1960s and 1970s planning agencies were developed that were responsible for collecting data, monitoring communities and submitting applications. These agencies were mostly abolished because of funding cuts in the 1980s. In their absence, State Primary Care Offices have picked up some of this function, but it is the communities themselves that have had to take on most of this responsibility.

#### **E. Sensitivity of Current Criteria: Where to Set the Threshold for Shortage**

The issue of where to set the threshold for adequacy is as much a value judgment as anything else. There is a significant body of literature suggesting that the 5000/4000 to 1 ratio is

too high (DHEW, 1980). The 5000 to 1 threshold is indicative of “grossly inadequate” service availability, as it is roughly 2.5 times the national average, and double the average patient load of a typical dental practice.

However, this focus on gross inadequacy is inconsistent with the function of DHPSA’s as an initial screening. It has been suggested that the national median (now approximately 1800 to 1) would be a better/more inclusive referent for adequacy (DHEW, 1980). It is important to note that even if one grants 5000 to 1 as a reasonable cutoff, it is likely that the ratio used by DHPSA – which has no correction for demographic differences in need or demand – likely underestimates the “effective” or “corrected” population-to-provider ratio functionally present in a given area (Federal Register, 1998).

## **F. Summary**

It can thus be seen that the current criteria have a number of significant weaknesses. These inadequacies stem, in large part, from DHPSA’s reliance on the population-to-provider ratio. The report now turns to a discussion of possible alternative methodologies used to estimate personnel requirements and federal or state intervention in a community.

## **III. GENERATING ALTERNATIVES**

This section will elaborate upon the complex theoretical and methodological considerations at stake in personnel planning and shortage designation. First, some core theoretical issues will be discussed. Second, specific methodologies will be elaborated and analyzed.

### **A. Defining Shortage**

The most commonly used and well-developed definition of health care shortage is that offered by Jeffers et al. (1971): “In the aggregate, the quantity of medical services consumed is less than the quantity that ought to be consumed.” Within this general definition there are three sub-definitions, indicating different concepts of what “ought” to be consumed. The consumption side of dental care has three components: professionally-defined need, perception that need exists (want), and action by the individual to have that need met (Dolkart, 1978). These are also

referred to, respectively, as “normative need,” “potential demand,” and “effective demand” by other authors (Striffler, 1983).

A **market shortage**, then, implies that the quantity of dental services supplied is less than that effectively demanded. That is, there are people who wish for dental services, but cannot get them because either supply is lagging behind demand or because there is interference in the market that keeps the supply of services low (e.g., government regulation or licensing requirements that alter hygienist scope of practice, number of dentists, etc). In a perfect market, these types of shortages are temporary and self-correcting (Defriese and Barker, 1982).

In a **normative shortage**, the quantity of services effectively demanded is less than that required to bring the health of the population up to a professionally derived standard of health (Jeffers et al., 1971). This is a result of attitudinal differences between dental opinions of need and public wants, structural barriers to obtaining care, and financial barriers that keep those in need from being able to purchase services. Correcting these types of shortages usually requires some type of public intervention (Defriese and Barker, 1982).

Lastly, a **total shortage** is the most inclusive definition offered by Jeffers and others. In a total shortage, the “quantity of medical services needed [normatively defined] exceeds [the] quantity of medical services supplied at existing prices.” This quantity is equal to market + normative shortage. It is this definition of shortage that is most significant from a public health perspective, since a rational allocation of resources to improve overall health cannot be made without reference to health goals, current health needs, and the supply required to meet those needs (DeFriese and Barker, 1982).

Time frame is also an important factor that warrants consideration. The existing methodology measures whether an area currently has a shortage, but does not examine whether existing services are on the increase or decrease. Across the nation, the dental workforce is aging, the dentist-to-population ratio is declining, and the number of hours in patient care is also declining (Mertz & O’Neil, 2002). A recent study in Wisconsin found that 1 of 7 dentists intended to retire in the next 5 years (Byck et al., 2002). An unexplored notion is whether the DHPSA methodology (rather than large workforce planning methods) would be able to not only show existing unmet need, but forecast unmet need in the future.

A few last clarifications on the definition of shortage are warranted because of the particularities of the dental market: the split between public and private funding of dental

services (and the predominance of the latter) may result in a shortage of providers willing to serve underserved communities not being reflected by a statistic sensitive only to shortages in the dental health market as a whole. This was not as much an issue for Jeffers, who was writing in the early seventies when overall supply was the leading concern. It has, however, become a pivotal issue in an era in which federally defined shortage areas are intended to account for underserved populations within “over-dentisted” metropolitan areas (Lee, 1979; Aved, 1996).

In addition, it may be important in the dental market to distinguish in some way between shortages in the “preventive” care market versus the “restorative/emergency” market. While these two markets are not discrete entities – sealants, for example, might be included in both – in general, preventive treatment relies more heavily on hygienists and has lower treatment cost than does restorative/emergency care. This issue of the different roles of dental professionals also warrants attention.

General dentists make up approximately 80 percent of the dental workforce, and therefore supply of general dentistry may not at all relate to the supply of specialist services. For this reason, it may be desirable to measure supply, demand and need for dental specialists separately from general practitioners. One dental specialist group in particular, pediatric dentists, are in such extremely short supply that they are actively lobbying to increase their numbers (Litch, 2002). Policy responses regarding the shortage of pediatric or other specialist dental practitioners may differ from the DHPSA criteria as a whole.

Along the same lines, alternate methods for measuring dental hygienists may be appropriate. Unlike medicine, where nurse practitioners and physician assistants serve as substitutes to physicians for many primary care needs, dental hygienists provide a completely different and complementary set of services to dentists. Currently, hygienist practice is linked to dental practice through regulatory mandate, but this is starting to change. Several states, including California, have expanded and independent practice rights for dental hygienists. If the shortage designation system continues to measure hygienists only in relation to dentists and dental practices, then important details about preventive services, particularly in alternative settings will be lost. Moving towards an independent measurement system for dental hygienists is necessary to enable an assessment of the shortage of preventive dental services available in all settings, rather than simply measuring a shortage of hygienists in relation to the dentists who hire them.

In conclusion, demand and supply characteristics for different markets (public and private, restorative and preventive) are likely to be as different as are the providers who function within them. Therefore, the definition of shortage used will reflect the values and concerns of policy makers, and the policy questions the criteria are intended to answer.

## **B. Defining Adequacy**

Another facet of the problem of defining personnel shortage is the question of where to set the cutoff between adequate and inadequate levels of care. As noted previously, neither the dental profession nor health planners know what level represents an adequate supply of dental personnel. “The dynamics of demand are ill-understood; the nation has no clearly defined health objective” (Tiede and Born, 1975b). The determination of adequacy, then, is a subjective decision dependant on the perspective of the evaluator (Goodman and Weyant, 1990; Shanley and Hobdell, 1983) Opinions on adequacy vary, as does the power to impose those opinions through public policy.

Born has distinguished three basic approaches to this question (Born, 1981). The **health status** approach, also referred to as a health needs (DeFriese and Barker, 1982) or public health (Goodman and Weyant, 1990) approach, views adequacy as the amount of services required to maintain the population at a professionally defined standard of health. This approach is preferable from a public health viewpoint because it can be used to identify problems that should receive priority attention. A **social needs**, or welfare, approach conceptualizes adequate supply as the amount and type of services required to assure access to care at some minimum level guaranteed by society. Lastly the **economic** viewpoint views adequate supply as the self-actuated equilibrium point determined by the market forces of dental supply and consumer demand (Born, 1981).

Government’s role in the US largely utilizes a social needs approach to insure that socially acceptable levels of care are available to the population and that resources are allocated in an efficient manner. It is important to note that the concepts of surplus and shortage as explained here are essentially economic terms without intrinsic value. The value ascribed to a shortage will depend on the perspective of the evaluator. For example, a surplus might, under some circumstances, be a bad thing from a private provider’s perspective because it could mean lower reimbursements; but the same surplus might be viewed positively from a public health

perspective, since lower prices could conceivably allow more people to purchase care or encourage more providers to enter the public sector.

### **C. Values**

Thus, decisions about how to define shortage, where to set the threshold for adequacy and what meaning to attach thereto will all depend in large part on the values one holds. Whether planning should focus on “meeting the need for dental care or meeting the demand for dental care is a value decision which will determine policy and stipulate the needed resources” (Odrich, 1985).

The fundamental value question at issue in the formulation of dental shortage criteria is the question of whether dental health is a commodity that should be allocated by market forces or whether it is a fundamental right to be guaranteed by government. The public health answer to this question is clear. Nash states “the moral fabric of society is best judged by how it treats its least advantaged citizens” (Nash, 1993). Defriese concludes that a socially responsible approach to health personnel planning cannot start from a perspective that assumes either a limitation of the ability to pay or a diminished level of consumer demand (Defriese and Barker, 1983).

However, the continued predominance of the private financing of dental health care – only 4 percent is publicly funded, almost 50 percent of dental care is paid for out-of-pocket (Ingargiola, 2000) -- would seem to be a de-facto public judgment that dental health is first a commodity and only secondarily a right. However, market forces alone will not ensure adequate care for all Americans. Consumers, in a free market environment, cannot afford to buy all the services they want/need. “In the past, differences between revenues and costs have been made up by private philanthropy and government” (Jeffers et al., 1971).

Public health dentistry, with its health status approach to defining adequacy, has different objectives than a private market; and DHPSA criteria should, ideally, reflect this difference. Such a value system argues clearly for a designation strategy focused on *need* and geared toward identifying *total shortages* of health-care.

### **D. Personnel Planning Methodologies**

Goodman and Weyant (1990) distinguish three basic personnel planning models. All are intended to define the “supply versus requirements gap” (Defriese and Barker, 1983), but each

defines the “requirements” from a different perspective. The **supply-based** estimation, virtually synonymous with population-to-provider ratios, estimates requirements based on a normative judgment of the amount of services required either per capita or per unit area. **Demand-based** approaches compare available dental services to the “current levels of utilization of dental services, as well as current behavior patterns of consumers within the dental health marketplace” (Goodman and Weyant, 1990). Lastly, **need-based** methods evaluate dental supply and “the volume of dental treatment required to meet the current prevalence of dental disease” (Defriese and Barker, 1983).

**Figure 4: Overview of Workforce Planning Methodologies**

<b>Name of Methodology</b>	<b>Principal Data Requirements</b>	<b>Associated Shortage/Conception</b>	<b>Values Generally Associated</b>	<b>Strengths</b>	<b>Weaknesses</b>
Supply-Based:  Pop-to-provider ratios	1. Number of FTE Dentists 2. Population Size	Cannot Identify any particular shortage/ Undersupply, Maldistribution	Embraces aspects of Economic and Welfare POV.	Easy to use, Inexpensive.	An overview statistic without clear meaning
Demand-Based	1. Amount of Treatment Demanded 2. Treatment Capacity	Market Shortage/ Maldistribution	Economic: Dental Care is a Commodity	Applicability to the current fee for service climate.	Cannot identify underserved populations
Need-Based	1. Treatment required to meet need 2. Treatment Capacity	Total Shortage/ Underservice	Public Health: Dental Care is a Right.	Capable of identifying unmet clinical need	Expensive, Unrealistic: not suited to evaluating a free market

The following sections will examine each of these methods in detail. Examples will be given of each model, the strengths and weaknesses will be discussed, and particular methodological issues will be examined.

### **E. Supply-based Criteria**

Supply-based projects examine the amount of services available in an area and compare this to some normatively defined cutoff for adequacy. Most often, the metric used to define

supply is a ratio of the size of an area or population to the amount of available services (Goodman and Weyant, 1990). Population-to-provider ratios are virtually synonymous with supply-based methodologies (Capilouto et al., 1995), though other small-scale studies have been conducted using dentist-to-area ratios (Fryer et al., 1983). Supply-based models, then, predict the number of required dentists without explicit reference to need or demand (Goodman and Weyant, 1990; Douglass and Cole, 1979; DeFriese and Barker, 1982).

*Examples:* Population-to-provider ratios have been, and continue to be, the most widely used means of identifying health professional shortages, both in the US (Defriese and Barker, 1983) and abroad (Willcocks and Richards, 1977). In addition to its use in federal forecasting, these ratios are the principal indicator used in both the ADA and the AADS personnel forecasting models (Capilouto et al., 1995).

*Strengths:* The principal strength of this approach lies in its feasibility when compared to other models. As summarized by Born, “the best that can be said for the use of the dentist-to-population ratio is that it is extremely easy to compute, data are readily available, and ratios exist for nearly every county and have for decades”(Born, 1981).

*Weaknesses:* Back in 1970, Meskin and Martens wrote that “present knowledge indicates that the ratio...is usually not descriptive...They are easy to understand and use. [However] they have been shown to be rather crude and of limited use in comprehensive health planning on a large scale. Their insensitivity to the complexities of factors important in health planning make them useful in only the most circumspect situations.” Tiede and Born add: “It is a fickle statistic whose inadequacy is well-known” (Tiede and Born, 1975b).

The first issue that must be pointed out is that population-to-provider ratios do not explicitly reference need (Connor et al., 1994). This is not a so much a methodological flaw as it is a limitation. This issue of need only becomes a “flaw” when the population-to-provider ratio is used as an indicator in methodologies, such as DHPSA, which are intended to be able to reference unmet need. Population-to-provider ratios can be used as a rough indicator of distribution of dental resources. However, when the statistic is used to evaluate the ability of

existing oral health care resources to meet patient needs, it is being used in error (Cavanaugh, 1983).

The remaining flaws in the population-to-provider ratio result from the great number of unlikely assumptions that are made by proponents who see it as a demand to supply ratio (Cavanaugh, 1983). As argued by Defriese, the ratio approach makes so many assumptions about the data and within the methodology “that there may be serious questions raised about the utility of these projects.” (DeFriese and Barker, 1982)

First, proponents of the ratio assume that either productivity of dentists is constant, or that the measure of FTE dentists can be adequately corrected so as to ensure validity. However, it is clear that there is great variability in the amount of services produced by different dentists, and that this variability has a multitude of causes (Meskin and Martens, 1970; Goodman and Weyant, 1990; Chung and Striffler, 1980; Mcdermott, 1986). There is, for example, considerable variation in the number of hours dentists work. Dentists rely to varying degrees on auxiliary staff, which is known to increase productivity. There are dentists working in both the more efficient group and less efficient private practices. Different facilities have different technological advantages/limitations (Douglass and Cole, 1979). Age has been shown to affect productivity (Cole and Cohen, 1971), and there are differences in productivity between specialists and general practice dentists (Goodman and Weyant, 1990; Meskin and Martens, 1970; Odrich, 1985). Because of the large number of variables affecting dental productivity, even corrected measures – much less uncorrected ratios – are often viewed as suspect.

Second, the ratio assumes that demand-per-person is a constant value (Goodman and Weyant 1990; Meskin and Martens, 1970; Cavanaugh, 1983). Numerous studies, however, have documented the now widely accepted notion that utilization varies widely among populations according to race, ethnicity, class, SES, and other demographic variables. Market conditions have a large and idiosyncratic impact on utilization in different communities (Defriese and Barker, 1983; Davis, 1974; GAO, 2000; CDC et al., 2000; Mertz et al., 2000).

Third, the ratio is assumed to reflect the number of dentists accessible to the population measured. However, this is not the case in many areas. Many dentists do not take Medicaid or provide care to the indigent. Others will not take on populations with special needs. Population-to-provider ratios, however, are a gross measure without such fine distinction, and are therefore unable to account for the differential ability of populations to access a dentist’s

services. This failure to match providers with the effective population being served can lead to inaccurate assessments of adequacy, often obscuring underserved populations living in areas with available – though not accessible – services (Fryer et al., 1983).

Fourth, models that use this statistic must assume the existence of some ideal or normatively defined ratio of adequacy. Yet, there can be considerable disagreement on this score (DeFriese and Barker, 1982; Cavanaugh, 1983). Different interest groups may establish different thresholds for adequacy because of their different goals (Goodman and Weyant, 1990; Odrich, 1985). Educators, professional bodies, governments, health service agencies, and consumers are all likely to have different views of adequacy. This situation has led even the ADA to conclude that because “no ideal or proper ratio can be established” the ratio is an unsatisfactory statistic for evaluating personnel requirements (Goodman and Weyant, 1990; ADA, 1984; Odrich, 1985)

The population-provider ratio, then, becomes increasingly less valid “to the extent that demand and supply are affected by variables other than numbers of people and dentists” (Born, 1975). Further, because the ratio addresses demand and need only tangentially at best, it is difficult to extrapolate any useful information about causality (Connor et al., 1994; GAO, 1995). A high population-to-provider ratio does not explicate levels of untreated disease, potential demand or effective demand; it therefore reveals precious little information about the criticality of intervention or the character intervention should take. It is at best a general “overview” statistic. At worst, it is a malleable and ambiguous statistic capable of manipulating policy makers based on the values of whichever interest group is conducting the research (Goodman and Weyant, 1990; Meskin and Martens, 1970).

## **F. Demand-based Criteria**

Demand-based models compare the volume of dental visits that a given population will demand to the supply of visits available from practitioners to determine the amount of market shortage or surplus (DeFriese and Barker, 1982). In practice, demand models make use of various indicators of utilization, such as the expected number of dental visits, which in turn function as “surrogates” for demand (Odrich, 1985).

*i. Assumptions:* The basic assumption in these models is that effective demand is primary, in that it elicits supply, or would in the absence of other barriers. Shortage is from this perspective

defined as a “market shortage” or an “economic shortage” where effective demand outstrips supply. The market is, on the whole, viewed as an efficient and equitable means of allocating dental resources. Thus, the most appropriate basis upon which to plan for dental resource allocation is the current actual market behavior of the average dental care consumer (Defriese and Barker, 1983).

*ii. Examples:* Demand-based strategies embody a wide range of methodologies. Mumma (1974) and Henderson (1976) used separate surveys of dentists and of the population at large to compare the number of annual visits reported by a population with provider estimates of the local dental visits supplied. Rosenbaum et al (1975) used age, family income and race as proxy measures to estimate the number of dental visits that would likely be demanded by a community in Philadelphia and compared this to local dentists’ reports of visits per year. Mulvey et al. constructed the Dental Manpower Balance Model to calculate shortages and surpluses: “This model uses sociodemographic data to calculate the demand for dental services and age adjusted productivity measures to calculate the effective supply of dentists” (Mulvey et al., 1978).

At the state level, the Minnesota Dental Association, unsatisfied with NHSC criteria, developed their own (Tiede and Born, 1975a). The study used practitioner opinion surveys to obtain dental judgments of areas where demand for care exceeded supply. The Ontario Dental Manpower Survey, inspired by Mumma, constructed a “production function” based on professional reports of daily visits, busyness, and wait-times and compared this to a consumer index of demand based on survey data documenting number of visits, wait times, and type of dental insurance (Defriese and Barker, 1983).

Tennessee and Ohio both conducted demand-based studies using corrected national utilization data to estimate dental supply capacity (Defriese and Barker, 1983). Tennessee used per-capita dental office visits, estimated via national data, as the measure of demand. Demand was then compared to a production function based on four variables: current supply of practicing dentists; average number of patients seen per day; average number of days of practice per year; and number of additional patients per year that could be handled.

In 1973, the ADA established the Dental Planning Information System (DPIS). This “well calibrated tool” (Dolkart, 1978) uses demand variables such as “age , sex, level of education or race” and population size to estimate utilization rates (effective demand). A

production function is used to estimate supply. This function involves a large number of productivity measures, including: “Dentist’s chairside hours, number of chairs, hygienist chairside hours, dental assistant chairside hours, expanded duty assistants chairside hours, the number of years since dentist graduated, and the percent of dentists who are in group practice.” This tool was largely abandoned in the early eighties because data collection at the local level proved unwieldy (DeFriese and Barker, 1982).

*iii. Strengths:* The strength of this approach lies in its applicability to the current private dental care market, in which supply and demand are the best indicators of the provision of services (Capilouto et al., 1995). As noted by Henderson in 1976, it is “effective demand, and not needs or wants that drives the [current American] system.” Defining shortages on the basis of excess effective demand, then, “provides some assurance to dentists moving into the defined ‘shortage’ area that their services will be utilized” (Henderson 1976).

*iv. Weaknesses:* There are three major flaws inherent to this approach. First, the assumption that increases in demand causes increases in supply – which is the basis for a focus on demand as a variable – is only partially accurate. The professionalization of health care has resulted in an imbalance of power between patient and providers in which patients need to have the “provider both to explain what is wrong with them and to suggest the appropriate cure” (Defriese and Barker, 1983).

Particularly in situations where acute distress is not the indicator of need, this monopoly on the knowledge base allows the supply side of the dental market equation to influence the demand for service. The market, then, may not be an appropriate model for the provision of health because of this “heavy dependence of consumer decisions on producer recommendations” (Hirsch and Killingsworth, 1975).

Second, demand-based estimates are like self-fulfilling prophecies; they will always define those services used as those that are needed (DeFriese and Barker, 1982). “Only those services that are [effectively] demanded are ever provided...this leads to the more or less automatic conclusion that the present system of care, whatever it may be, is precisely suited to the level of dental care needs of the population, irrespective of untreated disease” (DeFriese and

Barker, 1982). The only shortage these methods can detect are market shortages, which are generally self-correcting (Jeffers et al., 1971).

Unfortunately, because of the strong positive relation between socioeconomic status, dental care-seeking behavior and access to dental care, “demand for dental care services is often lowest among those individuals with the highest needs” (Goodman and Weyant, 1990). Demand-based assessments, which assume demand to directly reflect need, make it difficult to plan for the care of the underserved (Goodman and Weyant, 1990) and can tend to perpetuate the status quo in low-income areas. Demand-based statistics can be corrected to better approximate need by assuming a health care cost of zero or by assuming an average utilization rate irrespective of socio-economic characteristics. However, these corrections would expose the resultant ratio to the same types of “unrealistic” criticisms usually levied at need-based methods (Connor et al., 1994); and the ratio would still incompletely reflect need in that structural and attitudinal barriers to utilization would remain even if the financial barriers were removed.

The last problem with demand-based methods is that the requisite data are often difficult to define or expensive to obtain, and as a result, proxies are often used. Though it is not a criticism unique to demand-based estimates, it is nonetheless important to note that “when proxy measures are used, the assumptions that must be made to support their use further dilute the strength of” the analysis (Defriese and Barker, 1983). For example, demand and supply are often – for the sake of simplicity – estimated using national statistics, which limit the validity of the tool in local areas (Defriese and Barker, 1983).

Also, simple visits per year, often used as proxy for utilization and in turn for effective demand, fails to distinguish the type and quality of the visit – for example, emergency vs. preventive. Some authors have suggested that the former be constructed as an indicator of insufficient capacity, while the latter an indicator of adequacy. “The basic difficulty with visits as an output measure is their nonuniformity,” since the character of the visits can indicate very different types of demand (Hirsch and Killingsworth, 1975).

## **G. Need-based Criteria**

Need-based criteria compare the volume of dental treatment available to the amount of treatment required to meet the current prevalence of dental disease (Defriese and Barker, 1983). Schonfeld has identified four steps to conducting a need-based evaluation of services (Schonfeld

and Hicks, 1981). First, a study must assess the oral health status of a population, using any one of numerous standardized measures of oral health (Beck and Luebke, 1978; WHO, 1997; Cohen and Jago, 1976; Defriese and Konrad, 1981). Second, disease prevalence must be translated into need for services (Beck and Luebke, 1978; Sheiham, 1981). Third, an estimate must be made of the time required to provide the needed services. Last, the time required must be translated into an estimate of personnel required to provide the services.

This algorithm has also been referred to as the “health needs” approach to personnel planning. It is closely aligned with guidelines for personnel planning provided by the WHO and the British Association for the Study of Community Dentistry (Shanley and Hobdell, 1983). This method has particular appeal from a public health perspective, because it is the only one of the three methods that explicitly views health care services not as an end in themselves, but, rather, as a means of protecting, promoting, or restoring, health (Born, 1981; Birch and Chambers, 1993). Whether or not this method is more or less effective than other models is widely debated.

The premier example of a needs-based planning model is the Graduate Medical Education National Advisory Committee (GMENAC) Report on the physician workforce. Unlike most other physician planning models that were demand-based, the GMENAC study utilized a needs-based methodology to estimate requirements for practicing physicians. GMENAC projected physician need based on the prevalence of illness and estimates by provider panels of physician services required to manage these illnesses (COGME, 1996). When it was released in 1981 the GMENAC report suggested that there would be a glut of physicians by the year 2000. Twenty years later expert opinion differs widely on whether or not the GMENAC report predicted correctly (Iglehart, 2002).

*i. Assumptions:* An accurate specification of a population’s needs, as developed above, requires perfect knowledge of the state of its members’ health, the existence of a well-defined standard of what constitutes “good health” and perfect knowledge of what modern dentistry can do to improve it and by what means (Spencer, 1980).

*ii. Examples:* A number of states, including New York, Iowa, Tennessee, and North Carolina have used need-based methods to evaluate dental personnel requirements (DeFriese and Barker,

1982; Cons et al 1983). The North Carolina Dental Manpower Study is probably the most extensive dental personnel study conducted to date. This study included five components (Defriese 1982, Defriese and Konrad, 1981): an epidemiological study; a conversion of epidemiological data into treatment needs; a study of workforce supply and distribution; a study of the productive capacity of dental offices; and a final synthesis of all of these components into a personnel estimate.

This study made use of a health needs approach, modified by a correction for utilization rates/effective demand for care. Though each stage required significant resources and the development of various unique survey instruments, by far the most expensive part of the study was the epidemiological survey that involved a random sampling of 1500 households. Survey teams of a dentist and a hygienist scored every member of a household on: a modified decayed, missing, and filled teeth (DMFT) index, a periodontal index and a simplified oral hygiene index (DeFriese and Barker, 1982; Defriese and Konrad, 1981; Cohen and Jago, 1976). Dental exams took about 5 minutes per person, reliability was assured via a two-week training and calibration program for all survey teams. Total cost for the study was 400 thousand dollars in 1976; in 2002, the same study would cost approximately 1.3 million dollars.

Both the Veterans Administration and the Indian Health Service use need-based models to determine personnel requirements (Collins et al., 1993; Niessen and Douglass 1985). The VA studies are based on demographic data from the US Military and age specific needs estimates from the National Health and Nutrition Examination Study (NHANES) in lieu of a full-scale epidemiological survey. Estimates of time needed per service are extrapolated from IHS estimates (Collins et al., 1993) and VA data on average cost of provider time (Niessen and Douglass 1985). Results are, like the North Carolina study, adjusted down for an expected difference between demand and need.

It is important to note that some studies have made use of proxy measures, such as race, age, and SES, which are known to correlate with oral health status, in lieu of epidemiologic evidence (Federal Register, 1998). Still other studies have been based on analyses of service or treatment records, and some need-based estimates have been based on the best judgment of professionals (Spencer, 1985).

*iii. Strengths:* Goodman and Weyant have argued that “only by using needs assessments can explicit health goals be developed and requisite personnel be determined.” (Goodman and Weyant, 1990). Through needs-based assessments, incidence/prevalence rates can be used to identify which conditions the dental care system is slow to address (Schonfeld, 1981). Annual treatment needs can be compared with annual treatment provided to discern gaps in care provision, and needs-based assessments can help identify need within specific subgroups who are underserved (Beagrie, 1988).

Shanley concludes: “If the numbers and types of oral health personnel are to be planned on a rational basis then that basis must be defined in terms of oral health goals which have been agreed upon by all parties concerned – consumers and providers” (Shanley and Hobdell, 1983). Such goals are difficult, if not impossible to discern without referring to needs-based criteria (Defriese and Barker, 1983; Spencer, 1985). From a health status perspective, needs-based criteria are indispensable in that they potentially provide a metric of how to allocate resources so as to maximize overall health “regardless of market conditions or consumer ability to pay” (Connor et al., 1994).

*iv. Weaknesses:* While many consider the needs-based approach to be the only viable means of identifying underserved populations and planning for unmet treatment needs (Beagrie, 1986; Goodman and Weyant, 1990), the approach has several limitations. First and foremost, full-scale epidemiological studies are difficult to conduct and are often prohibitively expensive. Neither national nor local data are readily available at the census tract level required from a policy perspective (DeFriese and Barker, 1982).

Second, it is difficult to translate raw epidemiologic data into treatment needs due to the lack of standardization in the provision of oral health care (Pickles 1970; Grembowski et al., 1990; Spencer, 1985; Eddie and Elderton, 1983). There is no national database providing treatment weights for various clinical levels of disease nor is there a nationally recognized practice standard for dentists (Defriese and Barker, 1983; Shoenfeld and Hicks, 1981; Capilouto et al., 1995). Typically, and in the public sector especially, financial considerations are a major determinant of treatment decisions (Nuttall, 1983). Shugars and Bader (1992) conducted a US study in which dentists disagreed on almost every treatment recommendation made on the basis of examinations of identical patients.

Likewise, Nuttall, in one famous longitudinal study, found 3.5 times as many surfaces were filled as were predicted on the basis of an epidemiological study. “These findings cast doubt on the usefulness of the epidemiological survey as a tool for predicting restorative treatment” (Nuttall, 1983). Spencer has pointed out that the problems in need-based assessments are not global; they stem specifically from the lack of standardization in diagnostics and dental treatment protocol. He therefore calls for more attention to be paid to this phase of the process (Spencer, 1985).

Another problem with this method is that provider impact on disease is not clear or constant. (Born, 1981; Jeffers et al., 1971; Spencer, 1985). Some reports have found that the more providers exist in an area, the more disease is ‘found’ (Born, 1981). Further, while restorative care is relatively easy to document, it is difficult to assess the provider impact derived from preventive treatment. It is therefore difficult to evaluate the relative impact of hygienists vs. dentists vs. assistants (Born, 1981) given that auxiliary staff have a larger role to play in the provision of preventive treatment.

In the midst of these controversies, there still remains a lack of consensus surrounding appropriate population oral health goals. (Goodman and Weyant, 1990; Jeffers et al., 1971). While the use of needs-based criteria allows for the creation of health goals and standards, the criteria alone cannot set moral guidelines, and “Americans apparently do not consider attention to dental disease and related conditions as a particularly serious risk to health” (Defriese and Barker, 1983). Healthy People 2010 has indeed set basic oral health goals for the population. However, it remains to be seen whether there exists the popular consensus and the political will necessary to meet these goals

Lastly, needs-based criteria ignore the reality that, so long as expense is high and the perceived social cost low, there will remain a large gap between need and effective demand (Born, 1981). So long as the provision of oral health care is delivered primarily through a private delivery model in which out-of-pocket expense accounts for almost 50 percent of the expenditure (Ingargiola, 2000), personnel figures that do not correct down for demand will grossly over-estimate requirements. Some studies use demand adjustments to account for this deficiency and keep the estimates “realistic” (Defriese and Barker, 1983).

## **IV. GENERAL METHODOLOGICAL ISSUES IN CHOOSING NEW SHORTAGE CRITERIA**

### **A. Defining Shortages in DHPSA**

Decisions about the appropriate concept of shortage (market, normative, or total) and how to define adequacy are both necessarily made based on the values of policy makers and of the programs the criteria are intended to serve. Congress has made it clear that DHPSA criteria should be able to target unmet need in underserved populations. The NHSC, likewise, has undergone a conceptual revision, in which it has become understood that practitioners placed in shortage areas will not be able to retain a viable practice in the absence of subsidy (DHEW, 1980). The NHSC has thus retreated from a mission to serve in areas with “personnel shortages” towards their current mission “to deliver health care in underserved communities.” This shift implies attention to the community’s need for care, irrespective of the communities’ fiscal ability to retain it.

The DHPSA designation, then, is premised upon the assumption that health is a fundamental right and that unmet need should be targeted for intervention irrespective of financial, attitudinal, or structural barriers to accessing services. DHPSA methodology should ideally embody public health values. It should ideally define shortages as total shortages in which professionally derived estimates of treatment need exceed the willingness and/or ability of local resources to provide care. Adequacy should be defined from a health status perspective in which the objective is to maintain the health of the entire population and minimize oral health disparities (Chung and Striffler, 1980).

### **B. Availability of Data**

“The fundamental problem in all health manpower research is not the lack of statistical and analytical tools with which to conduct these studies, but rather the difficulty of acquiring the appropriate data” (DeFriese and Barker, 1982). Dental personnel planning is a process of continual “suboptimization” – that is, “making the best of what data are available” (Odrich, 1985). One of the main issues for collecting data for DHPSA designations is that a full census of information is required at a local level (referred to as a rational service area), as opposed to survey results that are more widely available but are not useful for geographic analyses. In addition, the definition of “local level” is not standardized; some states create their own rational

service areas while others use county or census boundaries. The following is a partial list of the data required to estimate supply, demand, and need along with notes on the possible sources and availability of that data at a rational service area level.

### C. Supply Indicators

Dental professionals include dentists, hygienists, assistants and laboratory technicians. Measuring the supply of these professionals through their licensing information has not been effective given the current model for collecting license data, and data collection at the local level have been tedious at best. Therefore numerous proxy indicators have been used to produce a “production function” of dental productivity or to correct the raw number of dentists and establish an effective number of FTE dentists (Defriese and Konrad, 1981).

**Figure 5: Requisite Data for Assessing Supply**

<b>Indicators</b>	<b>Source</b>	<b>Availability</b>
<i>Actual Supply Measures</i>		
Number of dentists (FTE)	ADA membership files, HRSA (Area Resource File), State Health Departments (License Boards)	Raw numbers available at local level, FTE harder to compute, not all data is publicly available
Number of allied dental professionals (FTE)	ADA Surveys, HRSA, ADHA, AADS	Association memberships, National & regional averages.
Annual appointments	ADA Surveys	National & regional averages
<i>Proxy Measures</i>		
Dental appointments (Tiede & Born, 1975b)	ADA Surveys	National & regional averages
Intent to Retire (Byck et al, 2002)	Periodic Local or State Surveys	Varied
Age of dentist / years since graduation (Tiede & Born, 1975b)	ADA Surveys	National & regional averages
Distance to nearest dentist (Tiede & Born, 1975b) (Sloan, 1977)	Local communities & health departments	None
Dentists’ chair-side hours (Dolkart, 1978) (Kushman et al., 1977)	ADA Surveys	None
Hygienists & assistants chair-side hours (Dolkart, 1978) (Kushman et al., 1977)	ADA Surveys	National & regional averages
Percent of dentists in group practice (Dolkart, 1978)	ADA Survey	National & regional averages
Business indicators (Henderson, 1976)	Periodic Local or State Surveys	None
Number of patients per FTE dentist	ADA Survey	National & regional averages

## D. Demand Indicators

Demand for dental care has been measured primarily by utilization for services by population group stratified by age, race and gender. This has been quantified nationally and regionally through health surveys, but is generally not available at the local level. There are a few proxy measures that could be used to quantify potential demand, but there are currently no mechanisms for collecting this type of data.

**Figure 6: Requisite Data for Assessing Demand**

<b>Indicators</b>	<b>Source</b>	<b>Availability</b>
<i>Actual Demand Measures</i>		
Population count and characteristics (Mulvey et al., 1978)	Census Bureau	RSA Level
Dental visits per year, stratified by age, race,	CDC (NHANES, NHIS), HRSA, HHS, ADA	Survey data
Desire to see a dentist (Mumma, 1974)	Unknown	Unknown
<i>Proxy Measures</i>		
Dental IQ (Tiede and Born, 1975b) (DeFrieze and Barker, 1982)	None	None
Public Attitudes	None	None
Dental Insurance (Connor et al, 1994)	State data from BRFSS, Medicaid	No RSA level data

## E. Need Indicators

There are no readily available comprehensive national data on oral disease prevalence at the census tract level (USDHHS, 2000). The California Oral Health Needs Assessment was conducted in 1993-94 in a sample of California schools. The National Oral Health Surveillance System (NOHSS) is CDC's rudimentary – but “to be expanded in the future” – surveillance system. It is based on national surveys – the National Health and Nutrition Examination Survey (NHANES), the National Health Interview Survey (NHIS), and the Fluoridation Census – and state-based surveys – the Behavioral Risk Factor Surveillance System (BRFSS), the Youth Risk Factor Surveillance System (YRFSS), and the Association of State and Territorial Dental Directors (ASTDD's) Basic Screening Survey and annual State Synopses – which include some data on utilization, hygiene and disease prevalence (CDC, 2000).

**Figure 7: Requisite Data for Assessing Need**

<b>Indicators</b>	<b>Source</b>	<b>Availability</b>
<i>Proxy Measures</i>		
Percentage below poverty (Health Research Group, 1975)	Census Bureau	RSA level
Standard economic indicators (Birch, 1996)	Census Bureau	RSA level
Local employment base (Connor et al., 1994)	BLS, State Labor Departments	RSA level
Ethnicity (Baird, 1970) (Federal Register, 1998)	Census Bureau	RSA level
Percent living in rural areas (Federal Register, 1998)	Census Bureau	RSA level
Fluoridation (Lee, 1979)	CDC, State/Local Health Depts.	variable
Wait times (House, 1987)	ADA Surveys	National & regional averages
Travel times (Sloan, 1977)	Local Agencies	Variable
Age distribution (Birch and Chambers, 1993) (Hirsch & Killingsworth, 1975)	Census Bureau	RSA level
Community satisfaction (Pamenter, 1986)	Local agencies	None
Sale of toothbrushes and floss (Beagrie, 1986)	Unknown	Unknown
Average estimates of treatment need	NHANES Survey	Survey data only
Oral hygiene behaviors	NHIS	Survey data only

These state and national survey data, however, do not go down to the local level. Some states – New York, Illinois, and Michigan – have been given CDC moneys to conduct statewide oral health needs assessments. California is considering the use of Tobacco Tax moneys to fund a statewide oral health needs assessment. However, all of this data will only be available on a state-by-state basis and could not, therefore, be used to inform federal criteria.

**F. Data Summary**

There is no shortage of potential indicators for supply, demand, and need. However, very little of these data are currently collected at the local level required for designation purposes. One methodological issues that comes up repeatedly is that data is available by ZIP code, but not by Census area, and the two boundaries do not conform. This may present less of a challenge in the future, as the Census Bureau has developed a new Zip Code Tabulation Areas, or “ZCTA”, which it can provide census data for, defined as the closest approximation of the ZIP code’s population by census block, as well as by tract and minor civil divisions (US Census Bureau, 2001).

The Census Bureau collects demographic data on the general population. The BLS and local labor departments collect labor statistics, and some general health indicators are available through the National Center for Health Statistics. However, there is no national database that collects information on dentists, dental productivity, utilization, or disease prevalence.

The ADA collects national survey data that include most of the above data, but not at the individual dentist and local level of specificity that would be required for policy purposes. Local dental associations do conduct surveys periodically in response to internal policy requirements. Collecting data on dental hours, number of annual visits and many other demand and productivity measures could be incorporated into the licensing process, and is done so in a variety of states already.

Conducting epidemiological assessments at the local level would be incredibly costly and there is neither the infrastructure nor the political will at this time to begin such an undertaking. It would seem, then, that if need-based methods are to be used in identifying DHPSA's, the identification of more readily available proxy indicators for need should be a priority.

#### **G. Attention to Demand versus Need**

Demand-based estimates can identify market shortages, and are therefore indispensable when evaluating possible interventions in the private market. However, this cannot estimate demand that would exist in the presence of subsidies nor can it determine relative need. "From a public health standpoint, a health needs approach to estimating personnel may be preferable to other techniques because it identifies not only disease levels, but also permits treatment to be prioritized and allows evaluators to track movement toward health objectives" (Goodman and Weyant, 1990). Need-based criteria can identify normative or total shortages. It is with the latter type of shortage that DHPSA criteria are ultimately concerned (DeFries and Barker, 1982; Jeffers et al., 1971).

In America the private market dominates while the public market struggles. Instead of working in tandem to ensure care, "a costly two-tiered system of health care has evolved ...growing numbers of the poor are increasingly unable to obtain needed medical and dental care, while the swelling number of health providers concentrate their treatment and marketing energies in the wealthy portion of the population" (Goodman and Weyant, 1990). Shortage criteria methods must take into account the differences in the public and private markets.

Three target groups may be considered in policy development; 1) those who can afford care regardless of insurance status, 2) those who have insurance generally covering 50 percent of costs, who must weigh the benefits of paying the other 50 percent with their other priorities, and 3) the uninsured who cannot afford to pay the full cost of their care. The private market is taking care of group 1 and the portion of group 2 who seek care, and the government subsidizes a portion of group 3 through a combination of Medicaid, NHSC, and other state and federal programs. The number of dental students produced then should meet the demand of the portion of group 1 and group 2 seeking care, and the portion of group 3 the government will subsidize.

Therefore, DHPSA personnel “requirements are best thought of as that numerical volume of health personnel located somewhere between the estimates derived from demand-based and need-based estimation techniques” (DeFriese and Barker, 1982). Even if the government were to develop a conservative method for estimating unmet need, the number of dental FTEs needed to supply care in all dental HPSAs will far exceed the supply available through the NHSC. Prioritizing need, then, becomes an additional requirement in order to distribute limited resources.

## **H. The Politics of Reform**

As with any proposed change in federal regulations, there are academic arguments for best practices and policy, and then there are the real world consequences and politics of those actions. One lesson learned from the first attempt to revise the primary care HPSA methodology is that consideration should be given to the effect a new method will have on existing designations. While the primary care HPSA designation involves many more practitioners, programs and ultimately, federal dollars than does the dental HPSA designation, the issue of “losing” designations still looms as a political sticking point in adoption of a new method. A concern for many communities is that a new designation process may render their existing designation null. Another concern is that if additional resources are awarded to a community that already has a NHSC placement, and they use it to increase services, they may lose their designation as well.

Attention should also be paid to the relative effect of the programs that use the designation, and the role they play within the broader dental safety net. This report has focused very narrowly on the Dental HPSA designation and what it is intended to measure, however,

dental public health resources are allocated through a wide variety of federal and state programs, some of which do not use the HPSA designation at all. Medicaid is one of the primary funding mechanisms for dental care for low-income persons, particularly children. The historical failures of this program, including low enrollment and lack of adult coverage, difficult paperwork, and below market payment rates, have far more of an impact on access to care than does the NHSC. That said, finding a solid method to quantify and map unmet need across communities may have an impact far greater than its original intent.

Finally, dental education plays a key role in the number and diversity of providers entering the field. Increasing access through NHSC or state loan repayment placements depends on having providers willing to serve in these programs. Dental schools efforts in recruitment, training, retention and placement of students has an effect on the practice patterns of providers and their willingness to serve the underserved.

These factors are part of the broader socio-political environment that influences the effectiveness and usefulness of DHPSAs. Involving the multitude of stakeholders in the process of revising DHPSA methodology to ensure both accuracy and functionality will be a key factor to its success. It is through differing viewpoints that the relative import of methodological and political factors will be determined.

## **I. The Role of Dentists/Professional Organizations in Shortage Designation**

Abraham Flexner's Report on Medical Education (1910) largely shaped the current perception of the ethics, roles and responsibilities of the health professions. In it, Flexner argues that one of the defining characteristics of a profession is that its members "view themselves as organs contrived for the achievement of social ends rather than as bodies formed to stand together for the assertion of rights or the protection of interests and privileges of their members."

Other authors, however, have pointed out that the ethical imperative of professional responsibility has been challenged in modern America by the imperatives of the free-market (Starr, 1982). Many, most notably Paul Starr, have argued that organized dentistry, as well as organized medicine, has been more concerned with securing the fiduciary interests of its membership – through its efforts to preserve the free-market – than it has been with preserving the public's health (Starr, 1982; Goodman and Weyant, 1990).

Regardless of philosophical position, the fact remains that health professionals hold much of the information necessary for planners to develop effective programs and therefore have a role to play in personnel planning. As such, the roles of government and private industry in personnel planning should ideally be “complementary” (DeFries and Barker, 1982). The professions could provide the government with up-to-date information on the needs and demands of the population, as well as relevant information on dental productivity and other relative factors, through simple licensure surveys and through participation in local and regional dental societies.

According to the ADA’s “Access to Care” web page, “the ADA is committed to reducing...disparities by supporting initiatives that broaden access to dental care for people who otherwise cannot afford it and encourage more dentists to practice in designated underserved areas” (ADA, 2002). Government agencies as well as the ADA and state and local dental societies have been focusing on public-private partnership to address the issue of access and disparities in oral health. It is likely that only through these partnerships will change come about, as neither the public sector nor the private sector is equipped to handle the problems alone.

## **J. Next Steps**

Goodman and Weyant have noted that “the choice of a model is based on either the availability of data to support the model or on the political or philosophical basis of those doing the evaluation.” In the ideal, criteria should be based on both. The data required for the population to provider ratio are readily available, and it is for this reason that it has continued to be used as the DHPSA criteria’s principal metric for 30 years. In establishing new criteria, the difficulty will be to define a politically feasible criterion that is simple, feasible, accurate *and* consistent with the public health goal to designate underserved populations. This is a daunting task. Evaluating need in a large population is a complex process, and the goal of generating the most meaningful indicators for the least amount of effort will necessarily involve compromise.

The importance of this task should not be under-estimated. It has been argued that the choice of DHPSA criteria is irrelevant in so much as the criteria are imbedded in a crumbling dental public health infrastructure. However, the efficient allocation of goods and services, it should be noted, becomes more critical as resources become increasingly scarce. Further, shortage criteria can be and have been used to evaluate the efficacy of the oral health delivery system as a whole. During the seventies and eighties, the ADA and others relied heavily on

oversupply projections derived from the population-to-provider ratio to convince lawmakers to curtail spending on public dentistry (Waldman 1983; Goodman and Weyant, 1990; Capilouto et al., 1995). A more accurate and less politically driven measurement of unmet need is necessary if dental public health planning is to be more equitable and effective.

## **RECOMMENDATIONS**

These recommendations are distilled from the opinions and professional feedback of a broad based advisory group that included members of the practice community, academia, facility administrators, professional organizations, policy analysts, and state, federal and local shortage designation authorities. Information was gathered primarily through a one-day guided discussion with stakeholders, but members of the advisory group also participated via phone interviews and written responses.

### **Recommendation 1: Increase the responsibility of State/Federal agencies and decrease the burden on local communities**

HRSA's commitment to "0 percent disparities and 100 percent access" implies a state and federal responsibility for both the data collection and data analysis of shortage designation criteria. If the state is invested in improving oral health, it cannot make rational policy decisions without a clear, current, and comprehensive understanding of the needs of local populations.

When shortage area legislation and programs were first developed, there were state agencies that administered these programs. These no longer exist, leaving the full burden of data collection on local communities. Counting the number of local and contiguous dentists is very labor-intensive, and communities needing the designation rarely have the extra staff needed to develop the proposals.

For both of these reasons – implied federal responsibility and the logistical barriers posed by the current application system– the advisory group recommends that a new methodology be developed in which federal or state authorities proactively determine eligibility and assign designations.

**Recommendation 2: Construct an Index of Dental Underservice (IDU) as a new measure for determining shortage designations**

The current methodology does not adequately incorporate indicators of need so as to target dentally underserved areas. The advisory group therefore recommended the development of an **Index of Dental Underservice (IDU)**. This index would be a summary statistic made up of weighted indicators of need, demand, and supply; similar to the current proposal by HRSA for designation of primary care HPSA's. These indicators would have to be nationally available and specific to evaluating the dental market. Some suggestions for proxies included:

- Income, education level, minority presence, number of emergency procedures, and age distribution as indicators of need and demand
- Number of dentists, hygienists and other auxiliaries serving underserved populations and procedures per hour as proxies for supply

It was also noted that it would be useful for this index to be capable of distinguishing/ weighting the characteristics of the preventive and restorative markets, in part based on workforce characteristics and emergency room data.

**Recommendation 3: Using state licensure and renewal mechanisms, develop requisite data collection methods and tools to measure the supply, distribution, composition, and practice characteristics of the professions themselves.**

Comprehensive provider data is not available at the local level although provider information is helpful in all areas of health planning, from education to practice to financing. Regardless of what final methodology is chosen, some measure of provider supply and distribution will be necessary. It is recommended that each state actively create the infrastructure to collect data on the supply, distribution, composition and practice characteristics of the dental professions. This could be done with minimal financial investment by requiring dental professionals to document practice characteristics when applying for licensure.

**Recommendation 4: Include an alternative designation process for hard to measure areas/populations not designated with reference to the Index of Dental Underservice**

Even a well-constructed indicator would be unable to identify small underserved populations living in otherwise adequately served areas. Special needs populations such as the elderly, the developmentally disabled, and the mentally ill should therefore be targeted using a separate population-specific designation process.

**Recommendation 5: Allow presumptive DHPSA eligibility for providers documented to serve underserved populations.**

Safety net institutions, even those serving in a rational service area that is otherwise adequately served, should be given a “presumptive” or automatic DHPSA designation if they can document a realized commitment to serving underserved populations. In this manner, FQHC’s, Community Health Clinics, and other institutions whose mission it is to serve the underserved would avoid the administrative difficulties of obtaining a geographic designation. This designation process should also include some mechanism for setting priorities among providers/facilities based on criticality of intervention, similar to current NHSC criteria.

**Recommendation 6: Develop Rational Service Areas Specific to the Dental Market**

There are already some states that have developed rational service areas specific to the provision of oral health care. Others rely on county divisions or rational service areas defined for medical services as the de-facto guidelines for dental service provision. Rational service areas should be preserved as they allow for the automation of the designation process and are a good starting point for allocating resources. However, rational service areas should be specific to the provision of dental services. New methods for designing these areas should be explored to improve the accuracy of the methodology and provide standardized results.

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