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ABSTRACT

Professional requirements for physicians specializing in allergy were estimated to assist policymakers in developing guidelines for graduate medical education. In estimating service requirements for allergy, an allergy Delphi panel reviewed reference and incidence-prevalence and utilization data for 21 conditions that affect the ambulatory care practice of the allergist. After adjusting incidence-prevalence rates, panelists reviewed data on the percentage of persons with each condition requiring health care, and; in particular, the medical services of the allergist. Leading ambulatory problems were identified, and delegated visits by condition were estimated. The final estimates of the allergy Delphi panel implied 2,327 allergists required in 1990, not accounting for the impact of the pediatric allergist. Based on a generic adjusted-needs based model, a final estimate of allergists required for 1990 was between 1,900 and 2,200. Appendices include: lists of members of the Graduate Medical Education National Advisory Committee and members of other technical panels, information on the procedure for calculating internal medicine subspecialty ambulatory requirements, ambulatory care data from the Delphi panel, reference notes, and a bibliography. (SW)

PHYSICIAN REQUIREMENTS-1990

For Allergy

OFFICE OF
GRADUATE MEDICAL EDUCATION

U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service
Health Resources Administration

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U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
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Office of Graduate Medical Education

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FOREWORD

This document was developed by the Office of Graduate Medical Education (OGME) in follow-up of the deliberations of the Graduate Medical Education National Advisory Committee (GMENAC) and the Allergy Delphi Panel convened on its behalf.

The purpose of this enterprise was to provide exposition and an updated refinement of the GMENAC estimate of physician workforce requirements for 1990. GMENAC was chartered by the Secretary of Health, Education, and Welfare (currently Department of Health and Human Services) in 1976 to provide recommendations regarding changes in graduate medical education likely to achieve a balance in the specialty and geographic distribution of physicians, according to estimated needs of physician services. One of a series of specialty-specific monographs, this paper should serve as a resource to professional organizations, governmental planners and other groups of health policymakers in developing guidelines for graduate medical education, and planning for equitable access to health services for all segments of the United States population.

Jerald Katzoff, Chief of the Research and Analysis Branch of OGME, and F. Lewis Aumack, Social Science Analyst, were responsible for developing and organizing the materials and methodology which served as a basis for the entire study. In addition, F. Lewis Aumack had lead responsibility in coordinating the Delphi Panel groups and tabulating the results. Cheryl Birchette-Pierce served as coordinator for the dialogue with subspecialty organizations, and was involved in the collation and drafting of materials for this monograph series. Itzhak Jacoby, the former Director of OGME, was responsible for the initiation of the effort.

Comments regarding this monograph may be sent to the Office of Graduate Medical Education at the Center Building, Room 10-30, 3700 East-West Highway, Hyattsville, MD 20782.

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Several individuals have contributed significantly to the production of this monograph. Robert N. Thorner, Social Science Analyst, and Karen Rudi[illegible], Program Analyst, both of the Office of Graduate Medical Education (OGME) prepared this report which was edited by Edna Simon. In addition, Eleanor Wesolowski was responsible for reviewing the reference section. Robert E. Reisman has been most helpful in reviewing preliminary sections of the monograph. The expert panel of consultants in allergy put forth tremendous time and effort in determining needs for allergy.

Catherine Alexander, Carolyn Conrad, Beverly Leasiologi, Brenda Stansbury, Mickey Reed, and Ramona Scott of the secretarial staff of OGME provided invaluable support services in producing a series of revised tables and written summaries throughout the project. Sherry Whipple, administrative assistant, OGME, was responsible for coordinating and arranging the series of panel meetings which were held during the project term.

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I. INTRODUCTION

BACKGROUND

Over the past several decades, there has been a growing concern among the medical community, policymakers, and the public at large about the ability of the Nation to meet its health care needs. Initially, this took expression as a fear that a shortage would result from the combined effects of advancing medical knowledge, specialization, urbanization, and rising demand caused by greater public awareness. To offset the perceived shortage, many government programs were instituted in the 1960s to increase the supply of physicians.

Gradually, however, there grew an awareness that the problem was not so much one of undersupply as it was one of maldistribution of physicians, both by geographic area and by specialty, and that the expanding supply of physicians would not solve the problems related to poor distribution. As concern about the physician maldistribution grew in the 1970s, many people in both government and the private sector debated the programs and policies that should be pursued in the future to assure that the health care needs of the public would be best served. This debate was of great concern when the Comprehensive Health Manpower Training Act of 1971 (P.L. 92-157) expired in 1974. Two years of continued national debate ensued, during which time several proposals were made to regulate the number and distribution of residency training programs and positions in an effort to correct the perceived physician specialty maldistribution. During those debates, the Secretary of the Department of Health, Education, and Welfare (DHEW) 1/ submitted a plan to establish an "Advisory Council on Graduate Medical Education," using existing authority under section 222 of the Public Health Service Act. The culmination of those debates was the Health Professions Educational Assistance Act of 1976 (P.L. 94-484).

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

The task of alleviating maldistribution thus fell to the Secretary of the U.S. Department of Health, Education, and Welfare who chartered the Graduate Medical Education National Advisory Committee (GMENAC) on April 20, 1976. The charter, which originally was to expire on April 20, 1978, had twice been extended to April 30, 1980 and September 30, 1980. The Committee, as of September 30, 1980, consisted of 19 representatives from the private sector (13 physicians, 2 nurses, 2 attorneys, 1 hospital administrator, and 1 economist) and 3 ex officio Federal agency members.

1/ As a result of the creation of the Department of Education in May 1980, the Health and Welfare components of DHEW became the Department of Health and Human Services (DHHS).

As stated in the "Interim Report" (Department of Health, Education, and Welfare, 1979) the primary purpose of the Committee was to make recommendations to the Secretary regarding physician specialty and geographic distribution, and methods to finance graduate medical education. The Committee chose 1990 as its target date because by that date it was estimated that 30 percent of the current supply of physicians will have been replaced due to retirement, death or other causes, and 40 percent of the physicians in 1990 will have been trained since the inception of the Committee's work. Thus the opportunity existed to affect change by the Committee's efforts.

STRATEGIES FOR ANALYSIS

To fulfill its charter purposes, the Committee directed its analysis along three directions: (1) data analyses, (2) constitution of Technical Panels of Inquiry, and (3) models for forecasting future physician supply and physician requirements. For the most part, this monograph will deal with the third strategy for analysis. A few comments about the first two will, however, serve to provide a perspective of the total process.

The Committee examined all data available on students, interns, residents, and practitioners in both osteopathic and allopathic medicine. A detailed analysis of this data will be found in the Report of the Graduate Medical Education National Advisory Committee to the Secretary, September 1980, Volume One. The Nation's supply of active physicians is expected to continue to grow rapidly. This future growth will outpace U.S. population increases, so that the ratio of physicians to population will also rise. The number of physicians in primary care specialties is projected to increase relative to the total population. It is expected that the higher ratio of physicians to population will encourage the primary care physician to offer expanded hours of service in order to meet the competition of his colleagues. It is projected that this will result in a moderation of the increase of the total visits to emergency departments.

GMENAC's second strategy for analysis called for the use of technical advisory panels covering various issues. Five panels were formed: (1) Modeling Research and Data, which provided direction to the modeling efforts which will be described below; (2) Financing, which examined the effects of different means of financing medical education, housestaff training, and delivery of services and the effect of each on distribution and geography; (3) Nonphysician Health Care Providers, which examined the role of nurse practitioners, physician assistants, and other providers, and the implication of their existance on needs for certain categories of physicians; (4) Geographic, which examined the geographic and distributive considerations which need to be addressed to most effectively meet access problems related to both generalists and specialists; and (5) Educational Environment, which examined the impact of the institutional environments (medical school, teaching hospital) on specialty and geographic distribution of physicians. A full discussion of the work of the Technical Panels will be found in the Report of the Graduate Medical Education National Advisory Committee to the Secretary, September 1980, Volumes Two, Three, Four, Five and Six. In Volume One of the Report, a summary of the major tasks of GMENAC is presented.

GENERIC MODEL

GMENAC's third strategy for analysis involved determining the future need for physicians. A generic model was developed by the Committee for this purpose which is referred to as an "adjusted needs-based model" (see Figure 1). Existing epidemiological data and hospital utilization data were used as a starting point in determining service requirements or needs. Data on conditions that were known to be treated by physicians in a given specialty or specialty group were selected based on analyses of current practice content by self-designated specialists and estimates of the training content in each specialty. These data were adjusted by panels of experts to take account of poorly measureable variables. Panels of experts provided their advice at the points in Figure 1 shown as "P" using a modified Delphi process to reach consensus. A full discussion of the generic model may be found in the Interim Report of the Graduate Medical Education National Advisory Committee to the Secretary (HRA) 79-633, and the Report of the Graduate Medical Education National Advisory Committee to the Secretary, Volumes One and Two.

ALLERGY MODEL

A panel of expert consultants (Delphi Panel) was selected from a list of nominees and provided with briefing materials in order to estimate professional requirements in allergy. Although staff had the major responsibility for the design of the model and the selection of diagnostic conditions to be considered by the panel, the panelists had very significant input. They refined the model and reviewed the selected morbidity conditions, making additions, deletions and combinations which they considered appropriate. The Delphi Panel then made the appropriate estimates needed to implement the model and the results of their deliberations were presented to the Modeling Panel for its consideration. The Modeling Panel endorsed the Delphi Panel recommendations with modifications which were then presented to the GMENAC at a plenary session. The requirements for allergy were thus deliberated and adopted in the public arena.

At the time the generic model was conceptualized, it was recognized that it could not be fully implemented by each specialty, but that a series of closely related models would be developed. In the case of allergy, a model specific to ambulatory care was developed, since care is generally confined to the ambulatory settings. Like the generic model which it parallels, the allergy model used diagnostic codes specifically coded in terms of the International Classification of Diseases, Adapted for Use in the United States (ICDA) and utilized the Delphi Panel to provide advice at each point.

Figure 1: Generic Adjusted Needs-Based Model Used by Specialty Delphi Panels to Estimate Professional Requirements for 1990

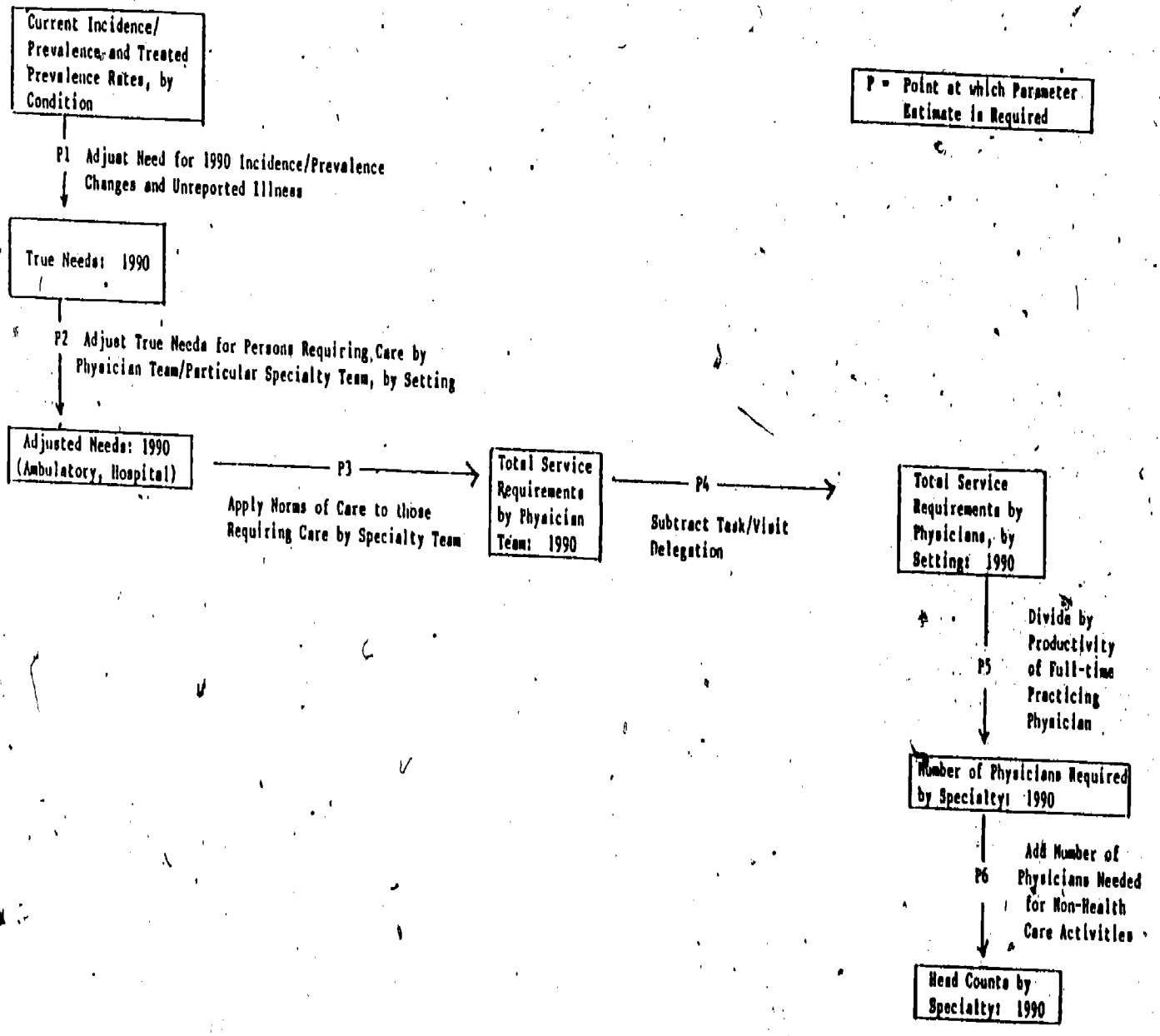


Figure 1 (Continued)

P1 - True need was based on changes made to existing epidemiologic data.

P2 - Adjusted need was based on the percentage of true need requiring health care which should be handled by a particular specialty.

P3 - Norms of Care were described in terms of visits for each specialty.

P4 - Delegation was in terms of the percentage of visits to the specialty team which should be delegated to nonphysician health care providers.

P5 - Productivity of specialists was determined in terms of number of visits provided within a week and hours spent in patient care. Productivity data on specialists should be adjusted for changes ensuing as a result of utilization of services, other than direct visits, provided by nonphysician health care providers.

P6 - Calculation of manpower requirements was made by changing FTE requirements into total requirements based on the proportion of a specialist's workload devoted to nonhealth care activities (e.g. teaching, research, administration).

As noted in Figure 2, the ambulatory care model consists of two tracks. Track 1 estimates the services provided to patients referred to the allergist by the general practitioner, family practice physician or general internal medicine specialist (a group henceforth referred to as "GFIM"). Track 2 estimates the services provided to patients who were not referred to the allergist from GFIM sources.

The model starts with the present incidence/prevalence rate per 100,000 population for each ICDA under consideration. The panelists were then asked how they thought this rate should change by 1990 and to estimate the rate that should require medical care in 1990.

At this point, the model divides into two tracks. In Track 1, the panelists were asked to estimate the rate of those requiring health care that should be seen by the GFIM. Of these, the panelists were asked to predict the rate that should be referred by the GFIM to an internal medicine subspecialist and the percentage of that rate which should be referred to the allergist in particular. The figure thus derived was multiplied by the norms of care which the panelists estimated as the number of visits required for the treatment of the particular ICDA. The product of these factors was then multiplied by the 1990 estimated adult population to yield the pre-delegated allergy services from Track 1. The panelists were then asked to estimate the percent of allergy services that should be delegated to the nonphysician provider. This was then multiplied by the total estimate of visits pre-delegated and then subtracted from the total pre-delegated visits to yield the post-delegated allergy services from Track 1.

In Track 2, the panelists were asked to estimate the rate of those requiring allergy care who were not referred from GFIM sources. This figure was then multiplied by the norms of care and the population factor as in Track 1 to yield the pre-delegated allergy services from Track 2. The percent delegation was then applied and subtracted from the pre-delegated estimate to yield the post-delegated services from Track 2.

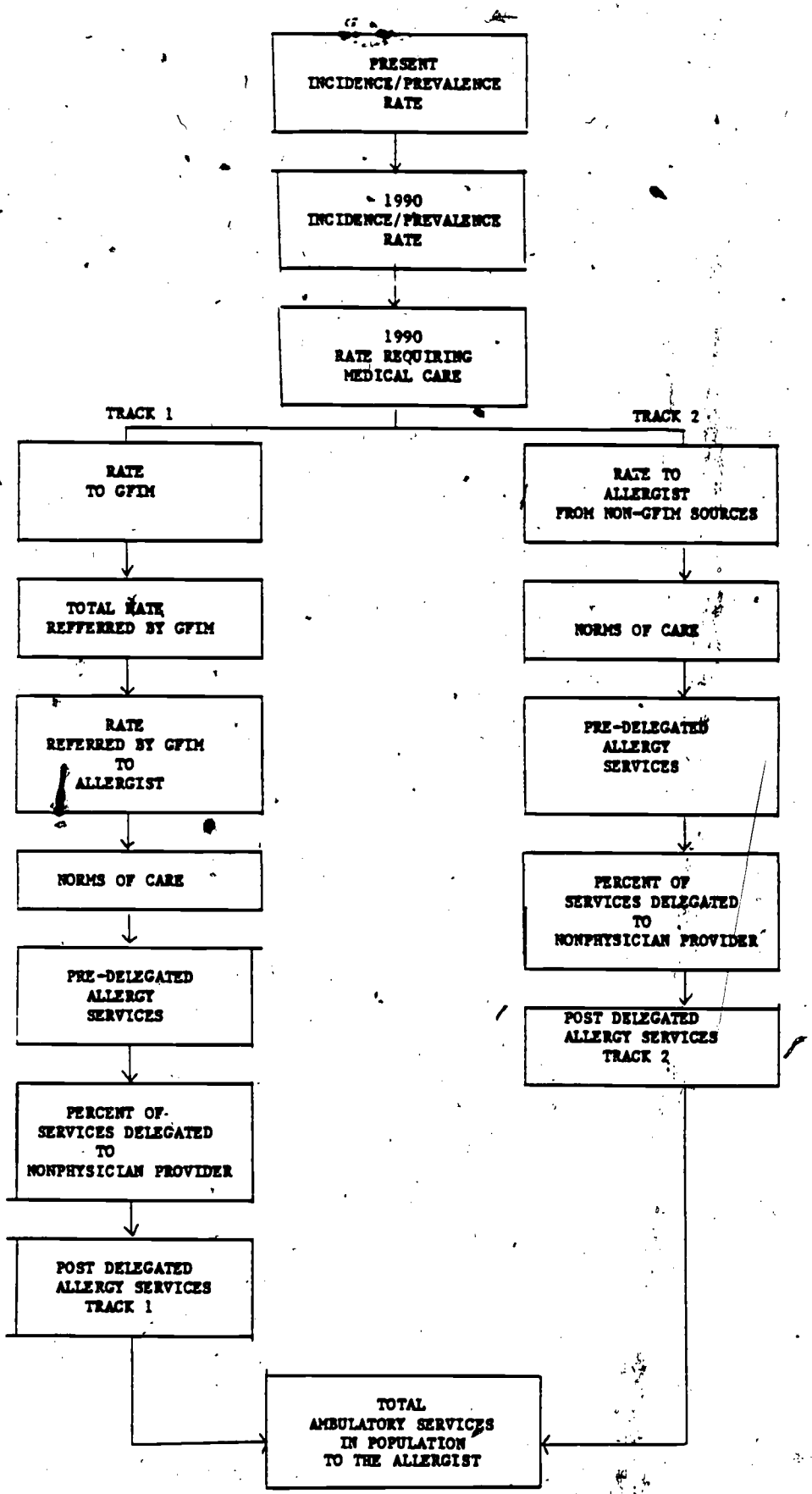
The total allergy services from Tracks 1 and 2 were then summed to yield the total ambulatory services. The model described thus far represents:

"V" in the expression $\frac{V}{SxP} \times (1+C) \times (1+G) + R = N_a$.

where: V = total, non-delegated visits
S = simultaneity factor
P = productivity
C = add-on for percent of patients less than 17 years of age
G = add-on for the percent for the requirements of general practice
R = add-on for the number required for research, teaching and administration
N_a = total number of allergists required (ambulatory model)

FIGURE 2

CONCEPTUALIZATION OF THE ALLERGY AMBULATORY CARE MODEL



The denominator of the fraction is the product of simultaneity and productivity. The simultaneity factor was defined by GMENAC as "average number of different conditions treated per office visit." Since a certain number of patients have multiple illnesses, and a physician can treat more than one illness per visit, this factor serves to reduce the total number of visits.

Productivity was defined as the product of the number of visits per week seen by the allergist and the number of weeks per year that the physician works.

Throughout the model, the panelists' responses assumed only direct allergy patient care to adults. It was recognized, however, that the allergist does deliver some services to patients under the age of 17 as well as some general medical care in normal practice. It was also recognized that a certain number of allergists are primarily involved in research, teaching and administration. These professional activities were, therefore, treated as an add-on to the basic requirements.

DELPHI PROCESS

As in each specialty studied, a Delphi Panel was selected for allergy to provide advice on the application and implementation of an appropriate model to use in developing professional requirements for allergy. Because of the constraints of time, the panelists were selected from a list of GMENAC nominations. The Allergy Panel consisted of three members. A roster of the Allergy Panel is given in Appendix C. The panel then engaged in a modified Delphi process.

As noted by Delbecq et al. (1975), Delphi may be described as a method for structuring a communication process so that a group of individuals may effectively make judgments about complex issues. Delphi has been applied to a variety of situations requiring group communication, including situations whose principal purpose was classification and prediction.

During Delphi Panel deliberations, participants usually exchange views and comments anonymously through written materials. Anonymity protects the group from being dominated or influenced by strongly articulated positions, aggressive personalities, or peer pressure.

In determining manpower requirements, the allergy utilization of the Delphi was in modified form (as was the utilization by the other specialties studied). The Delphi was divided into three phases which took place during two two-day meetings separated by a phase that took place by mail. The first phase explored the subject being studied. The participants studied and refined the models, became acquainted with the reference data utilized, and made adjustments to the ICDA selections for study. The participants were then asked to individually complete their questionnaires and to return them to the staff for compilation. During the second phase, data from the first meeting were mailed to the participants together with the calculated median responses. The panelists then returned their new responses to staff for compilation and calculation of new medians. The third phase identified areas of agreement and disagreement among group members. An attempt was made to

reduce variance in panel estimates with the aim of inserting the consensus or median estimates into the models so that allergy professional requirements could be derived.

The modified Delphi, which was used in the study of allergy, offers several advantages as a method of obtaining expert opinion over the traditional Delphi. It imposes a minimum burden of time and expense on participants and reduces the number of group meetings, thus expediting the final result.

REFERENCE DATA SOURCES

The panelists were provided with several sources of reference data to aid them in their deliberations. In addition to the judgments of the Adult Medical Care Delphi Panel (AMC) and the Modeling Panel, they were provided with data from a number of studies. A detailed discussion of the data sources follows.

The Health Interview Survey (HIS) provides national data on the incidence of illness and accidental injuries, the prevalence of diseases and impairments, the extent of disability, the utilization of health care services, and other health related topics. The interviewees of this study are the patients themselves or their immediate family members. Because of technical and logistical problems several segments of the population are not included in the study. Persons excluded are: patients in long-term care facilities for the handicapped; persons on active duty with the Armed Forces; and persons who have died during the calendar year preceding the interview. The result is that the HIS data somewhat underestimate levels of disability and health services utilization when the total population is considered. Although the effect on allergy may be minimal, it should also be noted that there is severe underreporting of certain diseases such as mental illnesses and venereal diseases in the HIS data. This latter problem stems from varying prevalence estimates on patient as opposed to physician reported measures. Previous studies have indicated that patients often do not know or deliberately hide the precise diagnosis of their condition.

The Standards for Good Medical Care (Schonfeld) survey utilized peer judgments by a sample of physicians concerning various aspects of standards for good medical care. These judgments pertained to contacts and encounters in relation to location such as office or hospital, the number and purpose of the visits as well as the required hospitalization days and desirable specialist referrals. An important aspect of the study is that it focuses on what should be the standards for good medical care rather than on the present situation as it exists. Schonfeld data having particular relevance to the allergy study include norms of care and the percentage of patients which should be referred to the specialty from the generalist within one year. Several limitations of the study should be noted. A serious deficiency of the study is that only 242 diseases were studied. As a result, there were no data for many of the ICDA codes considered by the panelists. A related disadvantage for these deliberations resulted from the variations in the specificity of the disorders considered. Sometimes the Schonfeld study used a 4-digit ICDA, sometimes a 3-digit, and at still other times a composite across the entire classification system was used. The study specified 87 referral

specialties and subspecialties. Still another limitation of the Schonfeld study is the relatively small sample of primary physician internists interviewed. The median number of judges across all adult diagnoses was less than two.

The American Medical Association data on Profiles of Practice are based upon questionnaire responses to 11,121 non-Federal office-based patient care physicians. Data were collected from October 1975 to February 1976 on work patterns and practice characteristics of physicians. The data taken from the AMA survey relate to the questions on the productivity of physicians in both the ambulatory and hospital models. A serious limitation of the data source stems from the fact that the response rate of the survey was only about 50 percent. It has been hypothesized that the less busy physician is more heavily represented than the busier one. The data may, therefore, indicate a lower productivity rate than would be true if the sample were truly representative of the total physician population. Lastly, the AMA data base classifies physicians, not in terms of their board certification, but in terms of self-designation.

The University of Southern California, Allergy Practice Study Report is part of a series of studies that were conducted under contract to the Health Resources Administration. The reports describe the professional activities of the subspecialists on a national basis. The studies present information describing patient volume, the specific characteristics of physician/patient encounters, and the organization of the subspecialty practices based upon physician responses to a log-diary survey. Several limitations of the USC data should be noted. For example, there may be misspecification of diagnosis. Furthermore, there is a potential for observational bias, the extent of which is unknown. There is an undetermined number of diagnoses that were not reported in the study and the possibility exists that this may represent selective reporting on the part of the respondents rather than an occasional (random) failure to report data. The collection of data occurred at one point in time. In the case of allergy, the study was conducted in November 1976. There is the possibility that this time of year may not be representative of the typical practice of the allergist for the entire year. A further limitation of the data is that the estimates are only for working physicians. No adjustment was made for those who are on vacation or otherwise not professionally active, which may reasonably be expected to be about 8 to 12 percent. Lastly, the response rate for allergy was 68 percent and should be considered in interpretation of the data.

The National Ambulatory Medical Care Survey (NAMCS) is a national probability sample survey conducted annually by the National Center for Health Statistics to explore the provision and utilization of ambulatory care in the physician's office. It was designed and developed from 1966-1972 by a number of organizations and individuals in the medical community, the staff of NCHS, and contractors with acknowledged expertise. The survey is performed on a sample of physicians in non-Federal, office-based practice and therefore does not include encounters taking place in hospitals, nursing homes, the patient's home, or other institutional settings. In addition, care provided by the

physician on the telephone is not included. All specialties are included except the hospital-based specialties of anesthesiology, pathology, and radiology.

The questionnaire requests information from the provider on the following: date of visit; age; sex; race of patient; patient's principle problem(s), complaint(s), or symptom(s); major reason for the visit (i.e. whether acute or chronic, initial visit or follow-up, well care, family planning, counseling, referral, etc.); physician's principal diagnosis (ICDA) and other significant current diagnosis; diagnostic or therapeutic services rendered (18 categories listed); disposition of visit (eight categories listed), and duration of visit.

In 1977, of the 3,069 physicians who were eligible for the study, 80.5 percent responded. A total of 570.5 million office visits were reported. An estimate of 10 million extrapolated visits has a relative standard error of 7.5 percent (750,000 visits).

When extrapolated nationally, NAMCS visit rates to physicians appear lower than HIS visit rates because they exclude telephone, clinic, hospital, and emergency room visits. However, in designating the specialty of the physician, NAMCS data are probably more accurate, because the provider rather than the consumer (who must rely on recall in filling out the questionnaire) supplies the information.

In the Delphi, panel members may use NAMCS data in estimating the percent of patients with need requiring medical care in an ambulatory setting that should accrue to a particular specialist and in developing norms of care per condition. NAMCS data provide current estimates on the percent of ambulatory visits made to a particular specialist, to help in the former estimation and average number of visits made for specific conditions to assist in the latter.

II. OVERVIEW OF ALLERGY

SUMMARY

Historically, the specialty of allergy developed approximately 50 years ago with the recognition that hay fever, asthma and hives at times stemmed from the presence of abnormal antibodies within people. In the 1960s, the subspecialty of allergy broadened to incorporate immunology. Since 1969, when the subspecialty changed to allergy and clinical immunology, it has been uniquely characterized as having a semi-independent status. The American Board of Allergy and Immunology remains a conjoint board of the American Boards of Internal Medicine and Pediatrics.

The American Academy of Allergy is the largest organization and is the major representative of the academic and practicing allergists. The majority of the members are clinical practitioners. The American College of Allergy, the second largest organization, is mainly composed of private practitioners. They are self-identified as having achieved special expertise derived from practices dominated by patients afflicted with allergic and immunological defects. The American Association of Clinical Immunology and Allergy is an offshoot of the College and promotes the development of an independent board in Allergy and Clinical Immunology which does not require prior certification of its residents in internal medicine or pediatrics. Lastly, the American Association of Certified Allergists represents allergists certified under the old system and was formed to promote the highest goals in the field. All four organizations are loosely joined by the Joint Council on Allergy and Immunology, which represents the subspecialty in terms of social and economic matters in Washington, D.C. (Bloom, 1977 and Reisman, 1981).

CURRENT PRACTICE

At present allergy is a subspecialty characterized by two contrasting components. Clinical allergy has remained relatively stable in the past 40 years with concentration being placed upon treatment of atopic allergies (hay fever, rhinitis, asthma, etc.). Immunotherapy is the classical treatment modality adopted in the practice. In contrast to clinical allergy, clinical immunology is a more recent development in the field which places emphasis upon the accumulation and translation of fundamental knowledge of the immune system into treatment interventions. Within this new field, there are thrusts toward both clinical and laboratory practices. The former concentrates upon immunopathologically induced disease, immune competence and manipulations of immune functions of patients, and is usually restricted to an area of disease or a specific organ. Laboratory immunology focuses upon diagnostic testing, the preparation and administration of immunotherapeutic products and the study of pathogenetic mechanisms (Kniker and Mittelstaedt, Aug 1979).

A workshop conducted by prominent persons in the subspecialty concluded that the next ten years of the specialty will be primarily characterized by treatment of the same type of patient who frequents the clinical office at present, such as those with asthma, rhinitis, urticaria and hay fever. However, it was the consensus of participants at the workshop that the scope of the practice of allergy in the future should be broader and include expertise in the education of immune competence; familiarity with therapies affecting host-defenses such as anti-inflammatory, immunosuppressive and immunostimulating agents; and, the capacity to carry out and interpret a variety of procedures and tests which are not routine in usual laboratory services (Kniker and Mittelstaedt, Sep/Oct 1979).

The immunologic component of the subspecialty will continue to experience new discoveries relating the origin of diseases to immunologic deficiencies, such as dysfunctions of leukocytes. Knowledge in the prevention of or management of graft rejection after tissue or organ transplant should also be advanced as should be the entire field of tumor immunology, which focuses on the failure of immunologic surveilliance to reject abnormal growth in cells (Kniker and Mittelstaedt, Sep/Oct 1979). Others have indicated that immunologic treatments for cancer are now under development as are appropriate immunologic tissue typing and suppression of immunologic defense which are essential to the successful transplantation of organs. Lastly, in the near future some predict that there will be an increasing incidence of respiratory allergy to common plant pollens, molds and organic dust along with allergic problems due to chemicals, food preservatives and colorings which will increase the total number of allergic reactions in the population and concomitantly the need for substantial numbers of allergists to continue practicing along traditional atopic lines (Norman, 1979).

SUPPLY

Supply estimates developed for GMENAC indicate there were approximately 2,100 allergists in practice in 1978. Since this estimate was developed from baseline data obtained from the AMA physician masterfile, it applies to self-designated subspecialists. However, current estimates from the Joint Council on Allergy and Immunology list 2,800 self-designated allergists. According to the Joint Council of Socio-Economics of Allergy approximately one-half of allergists are board-certified (Norman, et al., 1978). In 1990, a total of 3,050 allergists are projected to be in practice; this figure includes 3,000 full-time physicians plus 150 residents and fellows, the latter of which provide approximately one-third the patient care activities of full-time practicing physicians (GMENAC Summary Report, 1981).

A questionnaire given to prominent allergists, training program directors, and members of the Board has revealed a belief within the field that the subspecialty is currently in undersupply. In order to appropriately treat the 15 percent of the population which has allergies, a rate of one allergist per 50,000 people is recommended. This equals a total of 4,036 physicians for the adult population in 1978, or one specialist per 7,500 allergic individuals, assuming that one-third to one-half of all persons with allergies require at least one consultation and that each specialist handles between 2,000 and 2,500 patients per

year. In addition, an average of between three to four subspecialists involved in teaching and research activities at 113 schools was recommended. Hence, approximately 400 allergists would be required for nonpatient care activities. Medical centers, furthermore, have a need for subspecialists trained in immuno-deficiencies, cancer and auto-immune diseases which would require an additional need for 1,000 clinical immunologists. Thus, a total of nearly 5,500 allergists, which is over twofold their present supply, are presently required according to respondents of the subspecialty survey (Norman, et al., 1978). These methodologies result in different projections from the GMENAC adjusted needs based model. The subspecialty currently faces a growth rate of 3.9 percent, the second lowest of all subspecialties (Tarlov, Schleiter, and Weil, 1979).

PRACTICE PROFILE

Available data collected on the practice profiles of allergists indicate that those graduating in the last five years in the 1970s were predominantly involved in patient care activities (Norman, et al., 1978). As seen below in Table 1, this coincides with data obtained on Canadian Allergists (Toogood, et al., 1974, 1975).

PRACTICE PROFILE DISTRIBUTION OF ALLERGISTS

ACTIVITIES	U.S. GRADUATES 1972 - 1978	1974/1975 CANADIAN ALLERGISTS
PRIVATE PRACTICE IN ALLERGY, IMMUNOLOGY	60.0	76.0
SPECIALTY PRACTICE IN ALLERGY, IMMUNOLOGY	10.0	
ACADEMIA	24.0	24.0
MILITARY	4.0	N/A
OTHER	2.0	N/A
TOTAL	100.0	100.0

The overwhelming percentage of allergists are involved in clinical practice. However, a substantial minority, near one-fourth, are academically based. This finding is similar in both the U.S. and Canadian data.

Current data on the practice of allergists are contained in the University of Southern California (USC) Allergy Practice Study Report (Mendenhall, 1978). Data obtained from the USC study show that 90 percent of the practice of allergists is concentrated in the ambulatory setting and that nearly 35 percent of the time is devoted to non-direct patient care activities. During the average 39.3 hour work week for allergists, an average of 89.7 outpatient visits and 7.5 inpatient visits are provided by each practitioner. In the ambulatory setting, specialist care is provided to 35.8 percent of all patients and principal care to 27.1 percent of all patients. The remainder of allergy care is devoted to episodic and consultative encounters. Hence, according to the USC

care classification system, the predominant focus in the practice concerns treatment for "regular" patients, in which a limited scope of care, as opposed to the majority of care, is provided.

DELPHI PANEL AND CONTEXT ISSUES

Delphi Panel Composition

Physician requirements for the subspecialty were estimated by a Delphi panel composed of three subspecialists. These requirements were derived for all physicians practicing in allergy and clinical immunology, be they board-certified or self-declared practitioners, as well as residents. Represented in the panel were two persons from academia and one from practice.

Context Issues

After estimating requirements for physicians in their subspecialty, the panel of experts met to discuss context issues facing their practices. Panelists discussed the dichotomy facing their field, which is charaterized by a polarization of atopic allergists and new "high powered" immunologists. In the allergy component of practice, the principal function was thought to be the clinical care of asthmatics and atopic disorders; however, a substantial number of allergists render general care. Their enhanced role is seen to be as a classifier of asthmatics, many of whom fall into categories requiring different types of interventions. Many of the clinical allergists have no formal education, but have arrived at the specialty through experience and/or short intensive courses of instruction. Some allergists prefer to maintain a broad clinical base and to separate their health care role from immunology. Breakthroughs in IgE or control of mediators were observed to be possible developments which could diminish the requirement for the allergist in the future.

The clinical immunologist discounts asthma and atopy and concentrates on new immunologic breakthroughs. She/he tends to be among the more recent alumni of fellowships and her/his future role is still undefined due to its dependence upon further developments in immunologic research. The immunologist relates to immunologic components of other disciplines such as nephrology, oncology and pulmonary medicine and has a significant dependence upon laboratory support.

In the next 10 years, Delphi Panel members envisioned that a substantial portion of the practice of the clinical allergist will continue to encompass care in asthma and other atopic disorders. Increases in allergic bronchospastic disorders may arise due to the growth in occupational pollutants. However, this may be muted by regulation of industrial-induced morbidity associated with pollution. The immunologic disorders, in contrast, may show increased tendencies to be treated by organ-specific subspecialtists, rather than allergists or clinical immunolgists.

Technologically, major increases in the understanding of the immune process are likely to be manifested in the following areas: pharmacologic interventions, suppression of IgE, control of cell-mediated immunity,

and the cloning of antigen-specific T-cell lines. In addition, there may be an improved understanding of other functions such as phagocytosis and lymphokinesis. The emergence of refined bone marrow transplantation will impact on high risk cancer patients and those undergoing chemotherapy. Modified and more highly specific antigens may permit more effective and less frequent immunizations and the improved development of pharmacologic mediator inhibitors may diminish the frequency of "chronic" visits. All of the above, plus potential gains in the delineation of generic determinants of the immune process, will serve to increase the need for successful intervention of allergists and clinical immunologists along with decreasing the need for long-term care. Hence, there is a tendency for future technologic and environmental factors to play both a stimulating and depressant role in the manpower needs of the specialty.

III. NARRATIVE DISCUSSION AND ANALYSES

AMBULATORY CARE REQUIREMENTS

Incidence and Prevalence of Disease

In estimating service requirements for allergy, the Allergy Delphi Panel reviewed reference incidence-prevalence and utilization data for 21 conditions that affect the ambulatory care practice of the allergist. Hospital estimates were not provided, due to the small amount of hospital-based care provided by allergists. However, the panel implicitly accounted for hospital care in the ambulatory model used by them. Panelists divided the number of non-hospital visits per week that should be handled by the average practicing allergist into the total number of ambulatory services required. This assumes that the average allergist handles hospital visits in excess of his/her productivity. A detailed listing of all conditions, the reference data, and the Delphi responses for each decision point are presented in Appendix E.

Panelists reviewed the reference data and began their exercise by adjusting incidence-prevalence rates per 100,000 for the population 17 and older from the HIS and NAMCS for 1977 and subsequently 1990. When morbidity rates from HIS were unavailable, the number of annual "first visits" to physicians' offices was taken from NAMCS and used as a proxy for morbidity. As seen in Table 1 changes in the reference data that were made resulted in a 19.8 percent decrease in incidence-prevalence from the reference rate of 34,419 to the panelists' adjusted rate of 27,591. This overall decrease in incidence-prevalence from the reference data is directly related to a reduction in the rate of chronic sinusitis which the Delphi Panel felt was grossly overreported at 13,789, and more probably was closer to a rate of 1,000. In contrast, all the other conditions that were changed from the reference data in Table 1 were adjusted upward due to the panelists' perception that the HIS data significantly undercounted these conditions. This undercounting may be due to the relatively low subjective morbidity which increases the likelihood of failure to report the condition. Notable among the diseases adjusted upward, were conjunctivitis and ophthalmia from 45 to 3,000, asthma from 2,930 to 4,000, and hay fever from 6,290 to 7,000.

Table 2 deals with the changes in incidence and prevalence of conditions to the allergist between 1977 and 1990. The panel estimated that there would not be any decreases in the incidence and prevalence to those conditions between 1977 and 1990. However, the panel estimated that the incidence and prevalence would increase for six conditions ranging from 2 percent for asthma, to 10 percent for general adverse drug reaction. A dramatic increase of 400 percent to 1990 was estimated for persons receiving prophylactic innoculation and vaccination. The Delphi Panel's total incidence and prevalence rate for 1990 was 6,217 greater than for 1977. The condition of persons receiving prophylactic

TABLE 1

COMPARISON OF REFERENCE DATA AND PRESENT INCIDENCE/PREVALENCE OF DISEASE AS ESTIMATED BY THE ALLERGY DELPHI PANEL

Condition Group	1977 Reference Incidence/Prevalence Data	1977 Allergy Delphi Panel
Mental Disorders		
300 Neuroses	601	1,016
Diseases of the Nervous System and Sense Organs		
360 Conjunctivitis and opthalmia	45	3,000
Diseases of the Circulatory System		
446 Polyarteritis nodosa and allied conditions	4	4
Diseases of the Respiratory System		
493 Asthma	2,930	4,000
503 Chronic sinusitis	13,789	1,000
505 Nasal polyp	367	500
507 Hay fever	6,290	7,000
Other respiratory diseases 1/	4,670	4,670
Diseases of the Skin and Subcutaneous Tissue		
692 Other eczema and dermatitis	3,364	4,000
Other skin and subcutaneous tissue diseases 1/	1,205	1,205
Diseases of the Musculoskeletal System and Connective Tissue		
734 Diffuse diseases of connective tissue	14	56
738 Other deformities	1,140	1,140
TOTAL	34,419	27,591

Note: The numbers in this table are rates per 100,000.

1/ The "Other" diseases include all other ICDAs within the condition grouping that were addressed by the panel but are not specified on this table.

TABLE 2

INCREASES IN INCIDENCE/PREVALENCE BETWEEN 1977 AND 1990 BY THE ALLERGY DELPHI PANEL

Condition Group	1977 Incidence-Prevalence Rate/100,000	Percent Increase 1977-90	1990 Incidence-Prevalence Rate/100,000
Mental Disorders			
300 Neuroses	1,016	10	1,118
Diseases of Respiratory System			
491 Chronic bronchitis	3,217	5	3,378
493 Asthma	4,000	2	4,080
Special Conditions			
NOS-2 Adverse drug reaction: general	5,000	10	5,500
Y-01 Skin immunity and sensitization tests	50	5	52
Y-02 Persons receiving prophylactic innoculation and vaccination	1,343	400	6,715
SUBTOTAL	14,626	42.5	20,843
Other conditions	12,965	0.0	12,965
TOTAL	27,591	22.5	33,808

Note: The "other conditions" include all other ICDAs that were addressed by the panel.

innoculation and vaccination is expected to increase 5,372 in 1990, which accounts for 86.4 percent of the total 22.5 percent increase in incidence and prevalence to 1990.

Delegation in Ambulatory Care

After adjusting incidence-prevalence rates, panelists proceeded to review data on the percentage of persons with each condition requiring health care, and in particular the medical services of the allergist. Appropriate norms of care (in terms of average number of annual visits per condition) were assigned to those requiring care by an allergist. The final step in estimating total services (visits) for a condition was to adjust the percentage of visits or visit equivalents which should be delegated in 1990. Visit equivalents are visits shared between the allergist and nonphysician provider, and are not total visits which accrue solely to nonphysician providers. Delegation of a full visit or a percentage of a visit is dependent on the practice style of the practitioner as well as the severity of the condition. Table 3 is a compilation of all delegated visits by condition. Total delegation was estimated to account for only 3.3 percent of all visits. This is understandable since the subspecialty would be more likely to handle the more severe disorders specific to allergy. Hay fever with 9.1 percent of visits delegated was perceived to account for 52.5 percent of all delegated visits. Hymenoptera (insect bite) reaction is the second leading delegated condition accounting for 41.8 percent of delegation, while 88.0 percent of these visits were estimated by the panel to be delegated.

Leading Ambulatory Problems

After subtracting out delegated visits from all visits accruing to the practice of allergy, it is possible to develop a distribution of significant conditions in the practice of the subspecialist. The five leading ambulatory problems requiring care by an allergist in 1990 as perceived by the panel are displayed in Table 4. For purposes of comparison, the percentage of all ambulatory projected visits for 1990 are compared to their percentages in 1977, as derived from the USC study (Mendenhall, 1978). Asthma comprising 35.9 percent and hay fever, 15.5 percent, are the two leading conditions projected to require care in 1990 and are perceived to account for slightly over 50 percent of the practice. In contrast, in 1977 hay fever was the leading condition accounting for 46.3 percent and asthma the second leading condition comprising 27.0 percent. Collectively, asthma and hay fever accounted for approximately 75 percent of the practice in 1977 as opposed to about 50 percent projected for 1990. The fourth and fifth leading conditions for 1990 were perceived to be chronic bronchitis and other chronic interstitial pneumonia, combining to comprise 13.0 percent of the practice in 1990, as opposed to less than 1 percent in 1977. One possible explanation for these discrepancies between 1977 and 1990 is that the allergist will be involved with the more severe conditions of asthma and hay fever which will lessen the percentage of visits required by the allergist for these conditions, and concomitantly yield more time for involvement in other chronic respiratory conditions such as bronchitis and pneumonia. It appears that the allergist of the future as perceived by the Delphi Panel will continue to render care in the treatment of atopic disorders.

TABLE 3

DELPHI PANEL ESTIMATES OF DELEGATED VISITS BY CONDITION

Condition		Number of Delegated Visits	Percent of Visits Delegated	Percent of All Delegated Visits
360	Conjunctivitis and opthalmia	8,670	20.7	4.8
507	Hay fever	95,526	9.1	52.5
NOS-1	Hymenoptera	76,089	88.0	41.8
Y-01	Skin immunity and sensitization tests	1,720	50.0	0.9
	TOTAL	182,005	3.3 1/	100.0

Note: These data do not include correction for simultaneity across co-existing conditions and pertain to care provided persons 17 and older.

1/ This percentage was developed by dividing delegated visits by the total pre-delegated visits accruing to an allergist not including general practice, since the latter estimate was provided solely as an increase to the allergist (post-delegated) visits.

TABLE 4

COMPARISON OF THE FIVE LEADING AMBULATORY PROBLEMS TO THE ALLERGIST FROM PROJECTED 1990 GMENAC PROFILE WITH 1977 PROFILE DERIVED FROM USC ALLERGY STUDY (POST DELEGATION)

	Percentage of Visits	
Condition	1990 GMENAC	1977 USC Study 1/
493 Asthma	35.9	27.0
507 Hay fever	15.5	46.3
General Practice 2/	15.0	N/A
491 Chronic bronchitis	6.6	0.5
517 Other chronic interstitial pneumonia	6.4	N/A
SUBTOTAL	79.4	74.3
Other conditions 3/	20.6	25.7
TOTAL	100.0	100.0

Note: These data do not include correction for simultaneity across co-existing conditions and pertain to care provided to persons 17 and older.

1/ Source: University of Southern California School of Medicine, Division of Research in Medical Education (R. Mendenhall) Allergy Practice Study Report, DHEW Contract No. (HRA) 231-77-0115 (and the Robert Wood Johnson Foundation), Feb 1978.

2/ General practice includes all conditions not specified by the Allergy Delphi Panel.

3/ Other conditions include all other conditions specified by the Allergy Delphi Panel requiring care by an allergist.

AMBULATORY PRODUCTIVITY AND PHYSICIAN HEADCOUNTS

In order to convert service requirements into professional headcounts, the total number of non-delegated visits after adjustment for simultaneity of care provided for adults 17 and older across multiple conditions must be divided by the annual average number of visits handled by an allergist. The Delphi panelists estimated the simultaneity factor for ambulatory visits to be 1.20 in 1990 meaning that on the average 1.20 different conditions will be treated per ambulatory visit. The Delphi Panel estimated 3,525 nonhospital visits for the average allergist per year. This estimate is based on working 47 weeks a year and 75 patient encounters per week. The requirements were increased to account for 20 percent of patients less than 17 years of age and 15 percent of the allergists' time devoted to general practice. The total number of allergists were further increased by 500 to account for the number needed for teaching, research, and administration.

The final estimates of the Allergy Delphi Panel implied 2,327 allergists required in 1990, not accounting for the impact of the pediatric allergist, as evidenced in Table 5. The Modeling Panel modified the Delphi Panel judgments in two ways. First, the estimate of the proportion of patients age 16 and younger to be seen by the allergist was reduced from 20 percent to 10 percent of total patients because of the projections of pediatric allergists and their role in meeting the needs of younger allergy patients. Second, 776,943 annual visits were subtracted from adult patient care, on the grounds that pediatric allergists would continue to see a number of patients past the age of 16. These changes combined to reduce requirements by 462 to 1,865 total required allergists. Thus, the Modeling Panel's final estimate of manpower requirements in allergy was between 1,900 and 2,200 allergists to be required for 1990. The GMENAC committee adopted this recommendation.

COMPARISON OF SUPPLY PROJECTIONS AND GMENAC REQUIREMENTS RECOMMENDATONS

The supply projections were developed on the assumption that one resident performs the equivalent of 35 percent of patient care activities of a practicing physician (GMENAC Summary Report, 1981). Thus, the supply projections developed for GMENAC indicate that in 1990 there will be 3,000 allergists in practice and an additional 150 residents and fellows for a projected supply of 3,050 allergists. GMENAC endorsed the recommendation of 2,050 allergists which is the midpoint of the range of projected requirements for 1990 of 1,900 to 2,200 allergists. Since the projected supply was about 50 percent greater than the projected requirements, GMENAC estimated a surplus of allergists for 1990.

COMPARISON OF CURRENT AND 1990 PRACTICE PROFILES OF ALLERGY

A comparison of the current and projected 1990 practice profiles of allergists is presented in Table 6. Table 6 shows the distribution of problems to the allergist in 1990 that was recommended by the Allergy Delphi Panel and endorsed by GMENAC in comparison to the 1977 practice profile in allergy (see Girard, R.A., et al., 1979). It should be noted that the 1977 practice profile includes conditions seen in both the hospital and ambulatory setting. Hospital care accounted for

TABLE 5

ALLERGY SUMMARY REQUIREMENTS

AMBULATORY CARE DATA (1990)	(6-11-80) Final Delphi	(7-13-80) Modeling Panel
Total Diagnostic Visits	5,437,794	5,437,794
Total, Non-Delegated Visits (96.7%)	5,255,789	5,255,789
Simultaneity Factor	(1.2)	(1.2)
Total Non-Delegated Patient Visits	4,379,824	4,379,824
Productivity: 47 weeks x 75 visits/wk	(3,525)	(3,525)
Basic Number, Patient Care Physicians	1,243	1,243
Patients < 17 years of age (20% = 0.25 add on)	311	(10% = 0.111) 138
Subtotal	1,554	1,381
General Practice (15% = .176 add-on)	273	243
Total Patient Care Allergists	1,827	1,624
Research, Teaching & Administration add-on (absolute number)	500	500
TOTAL REQUIRED ALLERGISTS	2,327	2,124 1/

Note: Above estimates do not include impact of pediatric allergists on adult allergy care.

1/ This estimate was reduced to 1,865 total required allergists to account for the impact of pediatric allergists (776,943 visits) on adult allergy care.

TABLE 6

COMPARISON OF 1990 GMENAC ALLERGY SERVICE REQUIREMENTS AND CURRENT PRACTICE PROFILES OF ALLERGY BY CONDITION GROUPING

Condition Grouping	Percentage of Total Practice	
	1990	1977 1/
Diseases of the Circulatory System	0.1	2.2
Diseases of the Respiratory System	72.6	78.8
Diseases of the Musculoskeletal System	4.1	1.0
Mental Disorders	0.3	0.8
Diseases of the Nervous System and Sense Organs	0.5	2.3
Diseases of the Skin and Subcutaneous Tissue	4.6	5.8
Special Conditions and Examinations Without Sickness	2.8	2.2
General Practice 2/	15.0	N/A
Other Conditions 3/	N/A	6.9
TOTAL	100.0	100.0

1/ Reference: Girard, R.A., et al. A national study of internal medicine and its specialties: I. An overview of the practice of internal medicine, Annals of Internal Medicine, (Table 8), 90(6):965-975, June 1979.

2/ General practice pertains only to the GMENAC data. It refers to conditions other than those specified in the detailed condition - specific estimates of GMENAC.

3/ Other conditions apply only to the national study data and include Diseases of the Digestive System (0.7 percent), Neoplasms (0.5 percent), Diseases of the Blood and Blood-Forming Organs (0.1 percent), Endocrine, Nutritional, and Metabolic Diseases (0.9 percent), Diseases of the Genitourinary System (0.4 percent), Infective and Parasitic Diseases (0.9 percent), Accidents, Poisonings, and Violence (1.9 percent), and Symptoms and Ill-Defined Conditions (1.5 percent).

approximately 10 percent of the practice in 1977. In both studies diseases of the respiratory system was by far the leading ranking condition in the practice of allergy comprising 72.6 percent in 1990 and 78.8 percent in 1977. Diseases of the skin and subcutaneous tissue were projected to be the next leading condition as they were in 1977, comprising 4.6 percent in 1990 compared to 5.8 percent in 1977. In contrast, diseases of the musculoskeletal system and diseases of the circulatory system were determined to currently comprise 1.0 percent and 2.2 percent of the practice respectively, compared to 4.1 percent and 0.1 percent that GMENAC recommends for 1990. One partial explanation for the differences may stem from diagnostic classification discrepancies between the two studies, especially regarding the classification of general practice (15 percent) utilized by GMENAC but not by Girard et al. from which the data on the current practice profiles were derived.

LIMITATIONS OF THE PHYSICIAN REQUIREMENTS MODELING PROCESS

The mathematical model for estimating physician requirements for 1990 has an uncertain range of error. The designation of either surplus or shortage is believed by GMENAC to be correct; however, the magnitude of the surplus or the shortage is less certain. Some errors can be corrected with an exacting review of the many volumes of data. Other errors will be discovered in the future as experience confirms or refutes the estimates. Although an attempt was made to assess the impact of epidemiological trends and technological advances in allergy, there is no way to measure the accuracy of these predictions at the present time. Meanwhile, GMENAC advised that the numerical size of the aggregate estimates for 1990 be considered tentative until the new methodology developed by GMENAC undergoes critical evaluation (GMENAC Summary Report, 1981).

It should be noted that GMENAC estimated the number of allergists that primarily render care to the adult population separately from the number of allergists required for the pediatric population. However, presently most allergists will see both children and adults, but GMENAC designated further divisions into adult or pediatric allergy.

Although the Delphi Panel was provided with the most complete data available, it was recognized that it was not without limitations. It must be recognized that the GMENAC effort represents an advance in manpower planning, but that further studies must be conducted to validate its results and to extend knowledge in the field.

One problem that is encountered across all subspecialty recommendations concerns "turf" issues. Many of the subspecialties focus attention to particular parts of the body (e.g. gastroenterology, nephrology, cardiology). Others devote care to conditions across systems (e.g. allergy/immunology, infectious diseases). Since many subspecialties are new, it presently remains unclear whether or not the subspecialists involved in system specific care will be able to provide immunologic or allergic disease care which is specific to particular body systems. Consequently, requirements may shift in the future as the roles across subspecialties become more defined.

One set of limitations inherent in the modeling process deals with trends in medical care which may influence, in particular, the productivity of physicians, and hence affect the total requirements of the specialty. For example, it has been hypothesized that physicians will work fewer hours in the future. Graduates of medical schools in the future do not anticipate working the long hours which had been characteristic of their predecessors.

In addition, the increase of women in the practice of medicine may have an affect on specialty distribution practice hours. Current research seems to indicate that a convergence in specialty selection is occuring between men and women in medicine (Weissman, et al., 1980). If this convergence occurs the specialty differences between the sexes will decline and more women will go into subspecialty practice. This can be expected to impact on the average productivity of the practice.. Women have traditionally had greater family responsibilities as well as a greater appreciation of cultural development outside of professional responsibilities. It is unclear at present how increasing numbers of women entering the medical profession will affect work hours and hence productivity. However, currently women do work fewer hours than men. Future research should consider these changes in work habits, modes, and attributes which physicians in the 1990s are likely to embrace.

CONCLUSIONS AND RECOMMENDATIONS

The issues addressed by GMENAC will influence allergy manpower requirements beyond 1990. Because of the state of the art and a lack of uniform data on physician workforce, some of the issues raised by GMENAC may not be resolved or given specific policy formulation until additional data are available. Moreover, GMENAC suggested that the specific numerical recommendations may change, depending on further study and updated refinements of data. Perhaps the most important contribution of the GMENAC report is the detailing of a comprehensive process of determining physician manpower requirements utilizing input from private sector clinical practitioners, academicians, as well as government policy-makers. The reports will be considered to have achieved GMENAC's goals if the publications produce dialogue and improvement in the states of the art of manpower modeling.

It is uncertain what the impact of an oversupply of specialists will be. Fees may be lower, as physicians engage in aggressive competition for business; or they may increase as physicians attempt to maintain a target income in the face of fewer patients per physician. The quality of care may be improved, as physicians spend more time with patients, turn to preventive care, or substitute their services for those of less well-qualified alternatives. However, the quality of care may be lower, as physicians perform unnecessary and high risk procedures or as the reduced number of procedures per physician reduces physician proficiency.

An oversupply of subspecialists and other practitioners could have negative consequences for health care delivery and consumption. The tremendous cost of medical care in an era of austerity and limited monetary resources requires a reduction of the unit costs of equitably providing medical services to those in need of health care. Substantial

savings may result from training a balanced specialty mix of physicians and from lessening the application of sophisticated technology for routine diagnoses.

In relation to the above, the subspecialists, themselves, have made the following recommendations, as quoted by Dr. Alvin Tarlov, Chairman of the Graduate Medical Education National Advisory Committee.

> "On December 16, ten subspecialty internists met jointly with the adult medical care panel. The subspecialists agreed by vote of 9 to 1 (the latter being an infectious disease subspecialist) on the following concept:
>
> In 1990, subspecialty practice should be even more concentrated in the respective subspecialty than it is at the present time. True, for some patients the subspecialist does, and should continue to, provide broad comprehensive and longitudinal care for selected patients. But those selected patients should be ones having major disorders in the respective organ system of the subspecialist. The subspecialty internist should not provide primary care for an unselected population.

Functionally, therefore, a consensus emerged that for diabetes, continuing the example of the previous day, the vast majority of patients should be cared for by either the family physician or the general internist. For some, the family physician would use the general internist in consultation when indicated. A small minority of the diabetic population might require consultation with the subspecialty internist - often an endocrinologist. A small subset should have their continuing and comprehensive care by that subspecialist over a long period of time.

The subspecialty internist's practice, therefore, should be largely with patients whose major problems fall within the discipline of his/her subspecialty. The subspecialty internist's practice should be more than 50 percent in consultative practice. However, the subspecialty internist should follow a selected group of patients continuously and comprehensively. The subspecialty internist ought not participate as a primary care physician in the same way as family physicians and the general internists do."

APPENDIX A

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APPENDIX D

PROCEDURE FOR CALCULATING INTERNAL MEDICINE SUBSPECIALTY AMBULATORY REQUIREMENTS

I. Referrals from GFIM* Specialists

A. Total Visits

1. I/P Rates (Variable #1) (Col. 3);

2. Multiplied by % Changes (Col. 4 plus 1.00);

3. Multiplied by % Need from HSP** (Col. 5);

4. Multiplied by % to GFIM (Col. 6);

5. Multiplied by % Referred by GFIM (Col. 7);

6. Multiplied by % GFIM Referrals to I.M. Subspecialty (Col. 8);

7. Multiplied by appropriate Population Factors (Aged 17 or more for either Male, Female, or Total);

8. Multiplied by Average Number of Visits (Col. 9).

B. Delegated Visits

Total Visits multiplied by % Delegated (Col. 10).

C. Non-Delegated Visits

Total Visits minus Delegated Visits

II. Practice Based on Sources other than GFIM Referrals (Referrals from non-GFIM specialists, non-medical referrals, "walk-in" etc.)

A. Total Visits

1. Number of patients from GFIM sources (Entry from step I.A. 7);

2. Multiplied by % Patients from non-GFIM Sources (Var. #5) divided by 1.00 minus % SS Patients = $\frac{\%\text{ SS Patients (Col. 11)}}{1\text{-Col. 11}}$

3. Multiplied by Average Number of Visits (Col. 12);

B. Total Visits - Sole Component. This replaces I A and II A where all visits come from non-GFIM sources

1. I/P Rates (Col. 3)

2. Multiplied by % changes (Col. 4 plus 1.00)

* General practice, family practice, internal medicine
** Health Service Provider

3. Multiplied by % Need HSP (Col. 5)

4. Multiplied by % of SS Patients from Non-GFIM Sources (Col. 11)

5. Multiplied by appropriate Population Factors (Aged 17 or more for either Male, Female or Total)

6. Multiplied by Average Number of Visits (Co. 12).

C. Delegated Visits

1. Total Visits multiplied by % Delegated (Col. 13).

D. Non-Delegated Visits

1. Total Visits minus Delegated Visits

III. Total Practice

A. Total Visits

1. Sum of Step I. A. 8. and Step II. A. 3. or Step II. B. 5.

B. Total Delegated Visits

1. Sum of Step I. B. 1. and Step II. C. 1.

C. Total Non-Delegated

1. Step III A minus Step III B.

APPENDIX E

AMBULATORY CARE DATA FROM DELPHI PANEL

ABBREVIATIONS FOR TABLES 7 and 7A

GFIM = General Practice/Family Practice/Internal Medicine

HIS = Health Interview Survey

NAMCS = National Ambulatory Medical Care Survey

AL = Allergy Delphi Panel

NPP = Nonphysician provider

NOTE: A detailed explanation for each column of Tables 7 and 7A can be found in the footnotes on pages 54 and 55.

Table 7

AMBULATORY ADULT MEDICAL CARE: ALLERGY

MEDICAL CONDITIONS		2/	3/	4/	5/	6/	7/	Patients from GFIM Referred		
ICDA 1/	Diagnosis	Data Source	Incidence-Prevalence (Rate/100,000)	Percent Change 1977-90	Percent Requiring Medical Care	Percent Seen by GFIM	Percent Referred by GFIM	8/ Percent Referred to AL	9/ Average Number of Visits	10/ Percent Visits to NPP
I.	MENTAL DISORDERS (290-315)									
	Neuroses, personality disorders, and other nonpsychotic mental disorders (300-309)									
	300 Neuroses *	HIS	601		91					
		AL	1,016	10	90	90	15	5	1.2	0
II.	DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS (320-389)									
	Inflammatory diseases of eye (360-369)									
	360 Conjunctivitis and ophthalmia	HIS	45		95					
		AL	3,000	0	10	90	20	25	1.0	0
III.	DISEASES OF THE CIRCULATORY SYSTEM (390-458)									
	Diseases of arteries, arterioles, and capillaries (440-448)									
	446 Polyarteritis nodosa and allied conditions	HIS	4		100					
		AL	4	0	100	90	80	25	4.0	0

Table 7A

AMBULATORY ADULT MEDICAL CARE: ALLERGY

MEDICAL CONDITIONS			11/ Patients from Non-GFIM Sources			14/ Medical Health Care Visits	15/	16/	17/
ICDA 1/	Diagnoses	Data Source	Percent AL Patients	Average Number of Visits	Percent Visits to NPP	Total Required	Total Delegated to NPP	Percent Delegated	Total Required by AL
I.	MENTAL DISORDERS (290-315)								
	Neuroses, personality disorders, and other nonpsychotic mental disorders (300-309)								
	300 Neuroses	AL	10	1.0	0	16,197	0	0	16,197
II.	DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS (320-389)								
	Inflammatory diseases of eye (360-369)								
	360 Conjunctivitis and ophthalmia	AL	15	4.0	50	41,903	8,670	20.7	33,233
III.	DISEASES OF THE CIRCULATORY SYSTEM (390-458)								
	Diseases of arteries, arterioles, and capillaries (440-448)								
	446 Polyarteritis nodosa and allied conditions	AL	20	10.0	0	8,515	0	0	8,515

Table 7

AMBULATORY ADULT MEDICAL CARE: ALLERGY

MEDICAL CONDITIONS		2/	3/	4/	5/	6/	7/	Patients from GFIM Referred		
ICDA 1/	Diagnosis	Data Source	Incidence-Prevalence (Rate/100,000)	Percent Change 1977-90	Percent Requiring Medical Care	Percent Seen by GFIM	Percent Referred by GFIM	8/ Percent Referred to AL	9/ Average Number of Visits	10/ Percent Visits to NPP
IV.	DISEASES OF THE RESPIRATORY SYSTEM (460-466)									
	Bronchitis, emphysema, and asthma (490-493)									
	491 Chronic bronchitis	HIS	3,217		92					
		AL	3,217	5	50	95	25	25	2.0	0
	492 Emphysema	HIS	964		97					
		AL	964	0	80	95	20	10	2.0	0
	493 Asthma	HIS	2,930		95					
		AL	4,000	2	75	85	25	75	2.0	0
	Other diseases of upper respiratory tract (500-508)									
	502 Chronic pharyngitis and nasopharyngitis	HIS	26		86					
		AL	26	0	90	90	20	25	1.0	0
	503 Chronic sinusitis	HIS	13,789		70					
		AL	1,000	0	90	95	30	10	1.0	0

Table 7A

AMBULATORY ADULT MEDICAL CARE: ALLERGY

MEDICAL CONDITIONS			11/ Patients from Non-GFIM Sources			14/ Medical Health Care Visits			17/
ICDA 1/ Diagnoses	Data Source	Percent AL Patients	Average Number of Visits	Percent Visits to NPP	Total Required	Total Delegated to NPP	Percent Delegated	Total Required by AL
IV. DISEASES OF THE RESPIRATORY SYSTEM (460-466)								
Bronchitis, emphysema, and asthma (490-493)								
491 Chronic bronchitis	AL	10	2.0	0	405,474	0	0	405,474
492 Emphysema	AL	10	2.0	0	59,247	0	0	59,247
493 Asthma	AL	20	2.0	13	2,218,417	0	0	2,218,417
Other diseases of upper respiratory tract (500-508)								
502 Chronic pharyngitis and nasopharyngitis	AL	25	1.0	0	2,555	0	0	2,555
503 Chronic sinusitis	AL	50	1.0	0	93,342	0	0	93,342

Table 7

AMBULATORY ADULT MEDICAL CARE: ALLERGY

MEDICAL CONDITIONS		2/	3/	4/	5/	6/	7/	Patients from GFIM Referred		
ICDA 1/	Diagnosis	Data Source	Incidence-Prevalence (Rate/100,000)	Percent Change 1977-90	Percent Requiring Medical Care	Percent Seen by GFIM	Percent Referred by GFIM	8/ Percent Referred to AL	9/ Average Number of Visits	10/ Percent Visits to NPP
IV.	DISEASES OF THE RESPIRATORY SYSTEM (460-466)									
	Other diseases of upper respiratory tract (500-508)									
505	Nasal polyp	HIS	367		91					
		AL	500	0	50	75	50	50	2.0	0
507	Hay fever	HIS	6,290		75					
		AL	7,000	0	50	90	15	100	1.0	0
	Other diseases of respiratory system (510-519)									
517	Other chronic interstitial pneumonia	HIS	384		99					
		AL	384	0	100	95	75	20	2.0	0
518	Bronchiectasis	HIS	79		96					
		AL	79	0	100	90	25	20	1.0	0

Table 7A

AMBULATORY ADULT MEDICAL CARE: ALLERGY

MEDICAL CONDITIONS			11/ Patients from Non-GFIM Sources			14/ Medical Health Care Visits			17/
ICDA 1/	Diagnoses	Data Source	Percent AL Patients	Average Number of Visits	Percent Visits to NPP	Total Required	Total Delegated to NPP	Percent Delegated	Total Required by AL
IV.	DISEASES OF THE RESPIRATORY SYSTEM (460-466)								
	Other diseases of upper respiratory tract (500-508)								
	505 Nasal polyp	AL	50	2.0	0	341,164	0	0	341,164
	507 Hay fever	AL	10	2.0	50	1,050,784	95,526	9.1	955,258
	Other diseases of respiratory system (510-519)								
	517 Other chronic interstitial pneumonia	AL	50	2.0	0	398,261	0	0	398,261
	518 Bronchiectasis	AL	50	1.0	0	12,937	0	0	12,937

Table 7

AMBULATORY ADULT MEDICAL CARE: ALLERGY

MEDICAL CONDITIONS	2/	3/	4/	5/	6/	7/	Patients from GFIM Referred		
ICDA 1/ Diagnosis	Data Source	Incidence-Prevalence (Rate/100,000)	Percent Change 1977-90	Percent Requiring Medical Care	Percent Seen by GFIM	Percent Referred by GFIM	8/ Percent Referred to AL	9/ Average Number of Visits	10/ Percent Visits to NPP
V. DISEASES OF THE SKIN AND SUBCUTANEOUS TISSUE (680-709)									
Other inflammatory conditions of skin and subcutaneous tissue (690-698)									
692 Other eczema and dermatitis	HIS	3,364		87					
	AL	4,000	0	80	80	10	25	2.0	0
698 Pruritis and related conditions	HIS	1,169		63					
	AL	1,169	0	50	85	10	10	1.0	0
Other diseases of skin and subcutaneous tissue (700-709)									
708 Urticaria	HIS	36		100					
	AL	36	0	90	90	20	50	2.0	0
VI. DISEASES OF THE MUSCULOSKELETAL SYSTEM AND CONNECTIVE TISSUE (710-738)									
Other diseases of musculoskeletal system (730-738)									
734 Diffuse diseases of connective tissue	HIS	14		100					
	AL	56	0	100	90	50	25	4.0	0

Table 7A

AMBULATORY ADULT MEDICAL CARE: ALLERGY

ICDA 1/	MEDICAL CONDITIONS Diagnoses	Data Source	11/ Patients from Non-GPIM Sources: Percent AL Patients	12/ Patients from Non-GPIM Sources: Average Number of Visits	13/ Patients from Non-GPIM Sources: Percent Visits to NPP	14/ Medical Health Care Visits: Total Required	15/ Medical Health Care Visits: Total Delegated to NPP	16/ Medical Health Care Visits: Percent Delegated	17/ Medical Health Care Visits: Total Required by AL
V.	DISEASES OF THE SKIN AND SUBCUTANEOUS TISSUE (680-709)								
	Other inflammatory conditions of skin and subcutaneous tissue (690-698)								
	692 Other eczema and dermatitis	AL	10	2.0	0	258,779	0	0	258,779
	698 Pruritis and related conditions	AL	5	1.0	0	9,516	0	0	9,516
	Other diseases of skin and subcutaneous tissue (700-709)								
	708 Urticaria	AL	20	2.0	0	13,264	0	0	13,264
VI.	DISEASES OF THE MUSCULOSKELETAL SYSTEM AND CONNECTIVE TISSUE (710-738)								
	Other diseases of musculoskeletal system (730-738)								
	734 Diffuse diseases of connective tissue	AL	50	4.0	0	91,705	0	0	91,705

Table 7

AMBULATORY ADULT MEDICAL CARE: ALLERGY

MEDICAL CONDITIONS		2/	3/	4/	5/	6/	7/	Patients from GFIM Referred		
ICDA 1/	Diagnosis	Data Source	Incidence-Prevalence (Rate/100,000)	Percent Change 1977-90	Percent Requiring Medical Care	Percent Seen by GFIM	Percent Referred by GFIM	8/ Percent Referred to AL	9/ Average Number of Visits	10/ Percent Visits to NPP
VI.	DISEASES OF THE MUSCULOSKELETAL SYSTEM AND CONNECTIVE TISSUE (710-738)									
	Other diseases of musculoskeletal system (730-738)									
738	Other deformities	HIS	1,140		85					
		AL	1,140	0	75	90	20	25	2.0	0
VII.	SPECIAL CONDITIONS									
NOS-1	Hymenoptera	N/A								
		AL	6.6	0	100	100	90	100	8.0	88
NOS-2	Adverse drug reaction: general	N/A								
		AL	5,000	10	20	75	10	50	1.0	0
Y-01	Skin immunity and sensitization tests	NAMCS	47		N/A					
		AL	50	5	100	75	2	90	2.0	50
Y-02	Persons receiving prophylactic innoculation and vaccination	NAMCS	1,343		N/A					
		AL	1,343	400	100	10	1	90	1.0	0

Table 7A

AMBULATORY ADULT MEDICAL CARE: ALLERGY

MEDICAL CONDITIONS		11/ Patients from Non-GPIM Sources			14/	15/ 16/ Medical Health Care Visits		17/
ICDA 1/ Diagnoses	Data Source	Percent AL Patients	Average Number of Visits	Percent Visits to NPP	Total Required	Total Delegated to NPP	Percent Delegated	Total Required by AL
VI. DISEASES OF THE MUSCULOSKELETAL SYSTEM AND CONNECTIVE TISSUE (710-738)								
Other diseases of musculoskeletal system (730-738)								
738 Other deformities	AL	15	2.0	0	164,722	0	0	164,722
VII. SPECIAL CONDITIONS								
NOS-1 Hymenoptera	AL	0	0	0	86,465	76,089	88	10,376
NOS-2 Adverse drug reaction: general	AL	50	1.0	0	150,112	0	0	150,112
Y-01 Skin immunity and sensitization tests	AL	25	2.0	50	3,439	1,720	50	1,719
Y-02 Persons receiving prophylactic innoculation and vaccination	AL	0	1.0	0	10,996	0	0	10,996

Internal Medicine Subspecialty Footnotes:

Ambulatory

Allergy

Footnotes:

Ambulatory Adult Medical Care: All data refer to the subset of the total U.S. population aged 17 years or older. Medical practice requirements for the younger population are accounted for later by means of an estimated add-on.

1/ International Classification of Diseases, Adapted for Use in the United States, Eighth Revision (ICDA): Currently the most commonly accepted international categorical classification system for medical diseases. Most Internal Medicine (I.M.) subspecialty panels utilized the "3-digit" level of aggregation (e.g. 019, 135, etc.), with occasional use of the "4-digit" level.

2/ Data Source: Data relating to various parameters of medical practice requirements were obtained from the following sources.

Reference data: Major empirical survey data included the Health Interview Survey (HIS), National Ambulatory Medical Care Survey (NAMCS), or others specified in subsequent footnotes.

3/ Incidence/Prevalence, Rate per 100,000: Composite of incidence and prevalence data, primarily from HIS; all HIS data pro-rated to base year of 1977, necessitated by special chronic surveys of different body system/disease groupings in different years.

NAMCS data presented in absence of HIS data; other data presented in addition when presumed more valid.

Panel estimates based on median judgments of members present at Delphi meetings.

4/ Percent Change, 1977-1990: Panel estimates of predicted change in rate from 1977 to 1990; based on projected changes in the population, psychosocial parameters, medical practice, scientific advances, etc.

5/ Percent Requiring Medical Care: Panel estimates of the percent of persons with a given ICDA condition who should be seen by the health care system in 1990.

Reference data, when available from the HIS, indicates the percent of survey respondents who stated they actually saw a physician for the condition under consideration.

6/ Percent Seen by GFIM: The percent of those who should be seen at all by the health care system (reference 5/) who should be seen specifically by General, Family or General Internal Medicine Practitioners (1990).

7/ Percent Referred by GFIM: The percent of persons seen by GFIM physicians (reference 6/) who should be referred elsewhere (1990).

8/ Percent GFIM Referrals to Allergy: The percent of persons referred by GFIM (reference 7/) who should be referred specifically to an Allergist (1990).

9/ Average Numbers of Visits to Allergist: Panel estimates as to the average number of visits required per year in 1990 to treat a given occurrence of a given ICDA disorder for those patients obtained from GFIM channels.

10/ Percent of AL Visits to Nonphysician Providers (NPP): Panel estimates of the percent of all visits to the Allergy physician that should be delegated in 1990 to some kind of supervised nonphysician health care provider.

11/ Percent AL Patients from Non-GFIM Sources: Panel estimates of the percent of patients comprising the typical Allergist's office practice in 1990 who should come from sources other than GFIM referrals; this percent could include referrals from non-GFIM physicians, referrals from nonphysicians, and "walk-ins."

12/ Average Number of Visits to Allergist: Panel estimates of the average number of visits required per year in 1990 to treat a given occurrence of a given ICDA disorder for patients obtained from other than GFIM sources.

13/ Percent of AL visits to Nonphysician (NPP): Panel estimates of the percent of all visits to the Allergist that should be delegated in 1990 to some kind of supervised nonphysician health care provider.

Medical Health Care Visits

14/ Total Required: Computation of total number of visits required of Allergy physicians, directly or indirectly, from all sources.

15/ Total Delegated to NPP: Computation of the total number of visits that the Allergists of 1990 should delegate to nonphysician health care providers.

16/ Percent Delegated: A "weighted-average" calculation of delegation estimate from GFIM (reference 8/) and non-GFIM (reference 13/) sources.

17/ Total Required by AL: Computation of the total number of visits that should be handled directly and solely by Allergy physicians in 1990.

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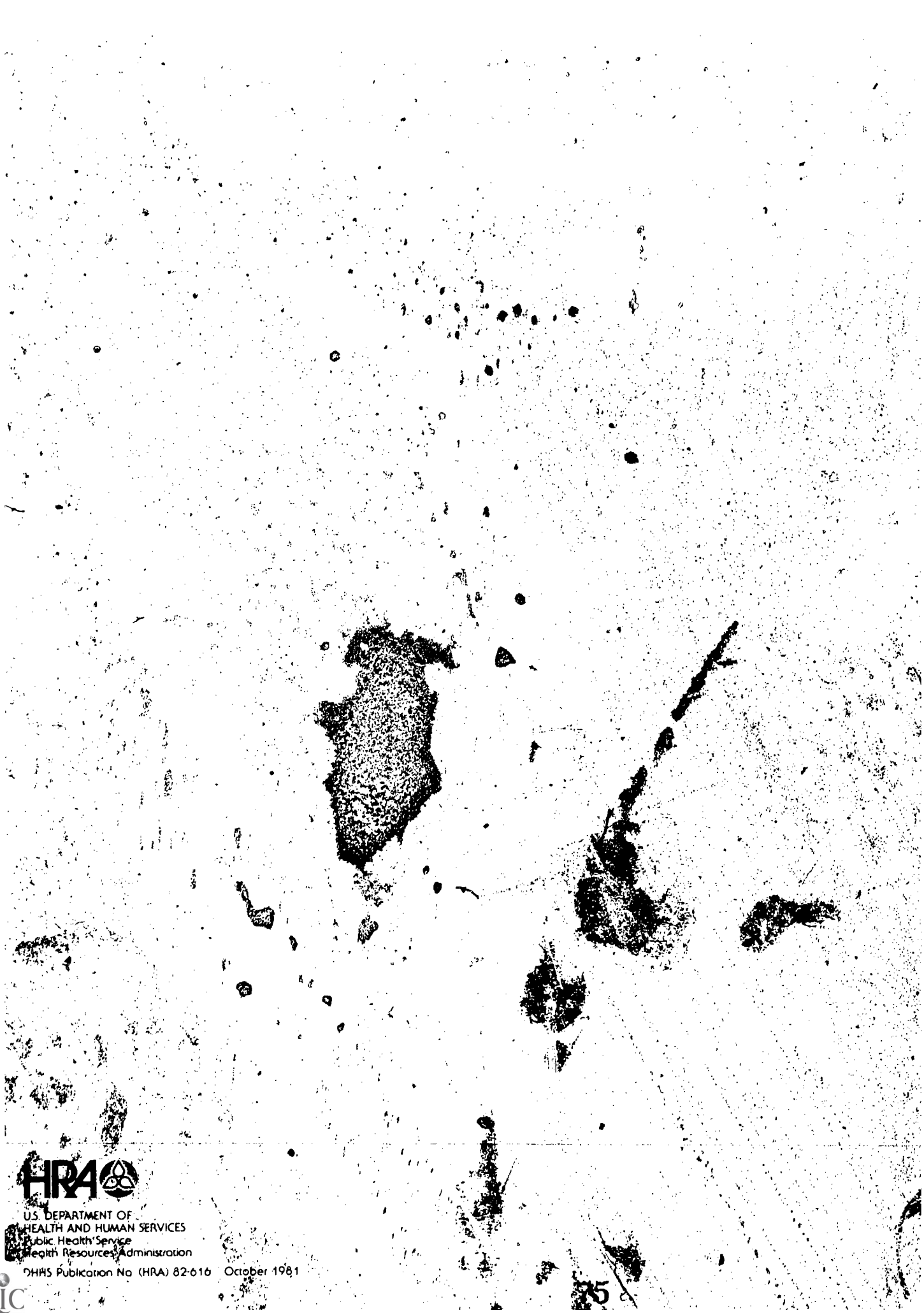

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