A Physician-Based, Statewide Health Information System: One Year's Experience

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Summary

Communicable diseases account for a small fraction of all disease in the United States. To gain information on other conditions seen by physicians, an experimental statewide disease reporting system was operated for a year in Arkansas. Physicians participated on a rotating, randomly-allocated schedule, and each provided the age, sex, race, type of visit, county of residence, duration and type of condition for all patients seen in a 24-hour period. During a 13-month period, 43% of 1,343 eligible physicians participated despite the newness of the system and difficulties with computer turnaround time.

Information was obtained on 14,954 patient contacts. Office visits accounted for 76% of the contacts; 19% occurred in hospitals, 2% in emergency rooms, 1% in nursing homes, and 1% elsewhere. General and family practitioners saw 58% of the patients and internists 10%, with less than 7% in each of seven other major specialties. The most frequent reasons for patient-physician contacts were upper respiratory infection (9.3%), hypertension (5.5%), general preventive examinations (4.6%), mental and social problems (4.3%), obstetrics (3.9%), fractures (3.8%), cancer (3.4%), miscellaneous gastrointestinal conditions (3.3%), urinary tract problems (3.2%), and arthritis and connective tissue disease (3.1%). These ten diagnostic categories accounted for 44% of the diagnoses.

The system allows estimates of contacts per person for all conditions (4.1 per year) and for specific categories on a statewide and district basis. Time, place, and person can easily be determined for physician contacts; approximate incidence information can be derived by determining duration of illness. It is also possible to estimate the distance patients travel to obtain medical care in different parts of the state for various conditions. The system is a useful supplement to more narrowly focused traditional surveillance systems and could be an important part of a comprehensive statewide disease surveillance system.

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INTRODUCTION

As serious, acute communicable diseases occur less frequently in the United States, surveillance and epidemiologic analysis of other types of illness becomes increasingly important. In order to obtain better surveillance of disease in the state of Arkansas, a statewide system with the following features was designed:

1. All diseases were included.
2. All physicians in the state were asked to participate rather than depending on selected "sentinels." Each physician reported for a single randomly-chosen day during the year. The system supplemented, but did not replace, normal reporting of communicable disease.
3. The unit of reporting was the face-to-face patient-physician contact, regardless of location, and the results include both inpatient and outpatient data.
4. Age, race, sex, geographic region, and diagnosis were reported, but patients' names were not included.
5. Sufficient data accrued over a week or two to follow trends in the common diseases.

The system is quite similar to the National Ambulatory Medical Care Survey.[1] The operation of the system for a full year is described, along with examples of the kind of information which can be obtained.

METHODS

The project was a joint effort of the Arkansas Medical Association, the Arkansas Academy of Family Practitioners and the Arkansas Department of Health.

Licensed physicians in the state were assigned arbitrary numbers and each working day, five were selected by means of a random number table.

Each physician was assigned a single day in the course of a year and asked to provide data on all patients seen during that 24-hour period. Anesthesiologists, pathologists, radiologists and those not in the clinical practice were excluded. An introductory letter was sent to the physician, and further explanation was made by a secretary on the telephone. A package consisting of printed report cards (Figure 1), instructions, and a return, stamped envelope was mailed to the physician, and he was asked to complete one card for each patient seen on the reporting day. Suggestions were provided for efficient processing of the cards in the office routine. For hospital or nursing home visits it was suggested that the cards be carried in the physician's pocket and completed as visits were made.

Patient-contact Form

The reporting form completed for each patient contact is shown in Figure 1. A coversheet provided details concerning the physician's location, date of report, and specialty, and this information was added to each patient report card during data processing. Coding of counties, diagnoses, and other items was done by clerical staff at the Department of Health with assistance from epidemiologists. Diagnoses were coded according to a draft of the ICDA-8 compatible *International Classification of Health Problems in Primary Care* which has since been published in a form compatible with the ICD-9-CM coding system.[2] The cards were keypunched, and the data processed with the aid of a large computer. The output for each diagnostic category consisted of the number of cases per 1000 patient-doctor contacts, displayed by month for each of the five regions of the state. For each diagnosis, the age, sex, race, specialty of physician, location of visit, and duration were similarly tabulated.

Figure 1

ARKANSAS DISEASE SURVEILLANCE SYSTEM

			Seen In	
Age ___	Male 1___	White 1___	Office	1___
	Female 2___	Black 2___	Nur. Home	2___
		Other 3___	Hospital	3___
			EP	4___
			Other	5___

County of Residence _____

Main Diagnosis (Problem) For Which Seen Today

1) _____

2) _____

Duration of Condition	(1)	(2)
less than 2 weeks	1___	1___
2 weeks to 1 year	2___	2___
1 year or more	3___	3___

RESULTS

Reports were collected from January, 1976 to March, 1977. A total of 16,992 diagnoses were reported for 14,954 contacts. Incorrect or incomplete information invalidated 369 cards (2.5%). During this time, 575 (43%) of the state's approximately 1,343 eligible physicians provided data from one day of practice. The average number of patients seen was 26, leading to a statewide estimate of 4.1 physician contacts per year for each of Arkansas' 2,100,000 citizens. Two diagnoses were recorded for 13.6% of the visits. Seventy-six percent of the contacts were in offices or clinics, 19% in inpatient hospital settings, 2% in emergency rooms, 1% in nursing homes, and 1% elsewhere; contacts were distributed among specialties as seen in Table 1.

The state was arbitrarily divided along county lines into five geographic regions with roughly equal populations. The response rate of physicians ranged from 35% to 48% in the five regions. Internists had the highest rate of participation (59%) and psychiatrists the lowest (36%) among the specialties.

The 20 most frequent diagnostic categories are shown in Table 2. The first 20 categories accounted for 70% of all visits. The remaining 30% were distributed among 68 other disease groups which were created from several hundred diagnostic code categories.

Information which can be obtained from the system will be illustrated by presenting selected

Table 1

Specialty	Percent of Reported Diagnoses
General or Family Practice	58.0
Internal Medicine	10.3
Surgery	6.8
Pediatrics	5.5
Obstetrics & Gynecology	3.8
Orthopedics	1.9
Psychiatry	2.5
Eye-Ear-Nose-Throat	3.8
Dermatology	1.2
Other	5.6
TOTAL	99.4%

Distribution of contacts among specialties.

characteristics of visits for upper respiratory infections, hypertension, and physical examinations – the three most common "diagnoses."

Upper Respiratory Infections (URI)

This highly seasonal condition was the single most frequent reason for physician-patient contacts despite its usually self-limited course. Using data from the Arkansas Disease Surveillance System (ADSS), a map can be constructed (Figure 2) portraying the rise and fall of rates in various parts of the state. Such information is valuable during influenza outbreaks and would give a detailed picture of any widespread respiratory disease epidemic, including the age, sex, race and location of the groups affected. Systems such as ADSS, if combined with active virologic sampling in areas found to have a high incidence of URIs, could provide specific information on the patterns of viral disease in the general public.

Table 2
THE TWENTY MOST FREQUENT CAUSES OF PHYSICIAN CONTACTS IN ARKANSAS, JANUARY 1976 TO MARCH 1977

Diagnostic Category	Percent of Total Visits
Upper Respiratory Infection	9.3
Hypertension	5.5
Examination, General Preventive	4.6
Mental and Social Problems	4.3
Obstetrics	3.9
Fractures	3.8
Malignant Neoplasms	3.4
Gastrointestinal Diseases (excluding neoplasms, peptic ulcer, appendicitis, and choleystitis)	3.3
Diseases of the Urinary Tract	3.2
Arthritis and Connective Tissue Diseases	3.1
Orthopedics (excluding fractures and arthritis)	3.1
Symptoms Without Diagnosis	2.9
Diabetes	2.8
Lacerations, Open Wounds	2.7
Eye Conditions (except allergy and infection)	2.6
Infectious Disease (except gastrointestinal)	2.5
Noninfectious Skin Diseases	2.5
Ear Diseases	2.3
Chronic Ischemic Heart Disease	2.2
Allergy	2.2
TOTAL	70.2%

Hypertension

Hypertension was listed for 6.2% of all contacts. Of the 925 such contacts, 90% were in a physician's office, 8% in the hospital (inpatient), 1% in a nursing home, and 1% in other places. General or family practitioners reported 75% of the hypertension contacts and internists 18%; all other specialties accounted for 7%.

Sixty-five percent of the patients were female and 35% male. Visits for hypertension were 1.6 times commoner among blacks than whites. The duration of the hypertension was: 0-2 weeks (4%); $>$ 2 weeks to 1 year (15%) and $>$ 1 year (72%).

Although only 4% of the cases were newly diagnosed (within two weeks), this leads to an estimate of 21,000 newly diagnosed hypertensives per year or about 1% of the population on a statewide basis. An estimate of the number of hypertensives in Arkansas is available from the National Center for Health Statistics. Using this figure, the 407,155 estimated hypertensives had, in addition to their "normal" 4.1 physician contacts during the year, an additional 1.05 office visits and 0.09 hospital visits per person.

Physical Examinations

Nearly 5% of the contacts were recorded as physical examinations, and this was the second most frequent reason for a physician contact. At first glance this seems excessive, but further study discloses that 31% of the physical examinations were for children $<$ 5 years old and 41% for women of childbearing age.

The estimated number of examinations for children $<$ 5 is 111,000 per year or 0.67 examinations per child per year. Information of this nature, collected uniformly over a period of years, could be invaluable in planning and evaluating educational and other efforts to stimulate or influence preventive activities such as periodic physical examinations for groups with special risks. More specific information about the type of examination could be obtained by including specific questions on the report card.

DISCUSSION

The earliest attempts to describe disease patterns statistically, such as that of John Graunt in 17th century Britain, were concerned with mortality. Death certificate data remain, in most states, the only all-condition information on disease patterns, although in some geographic areas large data files on hospital charges, medicare or medicaid patients or Blue Cross-Blue Shield

subscribers can be pieced together to provide some reflection of morbidity data as opposed to mortality data.

Large scale office-based physician data collection systems for morbidity have been implemented in Great Britain,[3] Australia,[4,5] and Canada.[6,7] In the United States, several morbidity surveillance systems have been undertaken using the office-based physician as the primary source of data. One such effort was that of the Department of Family Practice of the Medical College of Virginia.[8] For a two-year period, 118 family practice residents and physicians recorded all patient problems evaluated, yielding a data bank of 526,196 health-care problems. Analysis of these was aimed at redesigning family practice residency curricula and redesigning patient-care systems in the area served by the participating physicians (in teaching and nonteaching practices in rural, suburban, and urban communities).

On a broader scale, the National Ambulatory Medical Care Survey (NAMCS),[1] begun in 1973 and carried out by the National Center for Health Statistics, provides data on the extent and type of ambulatory medical care provided by office-based physicians throughout the United States. Although NAMCS-generated morbidity data are useful for planning and policy-making purposes on the national scale, they are considerably less useful for individual states or their geographic subdivisions, and published reports do not appear until several years after data collection. One example of an effort to provide more precise, meaningful and inexpensive local data on the utilization of office-based physician services is the Michigan Ambulatory Medical Care Survey which uses

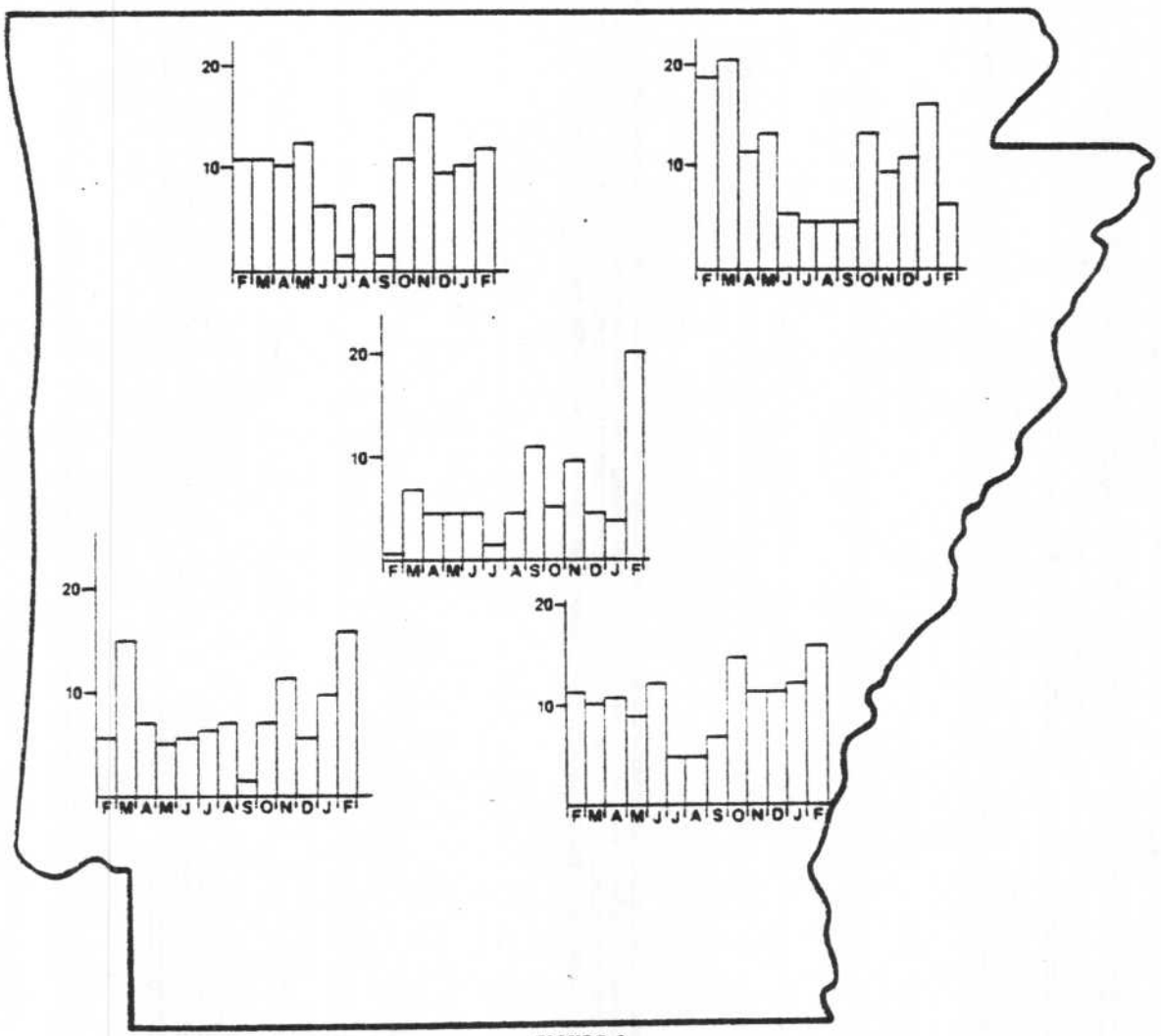

FIGURE 2.
Upper respiratory infections as percentage of total reported visits, by month and region in Arkansas – February 1976 - February 1977. The total number of upper respiratory infections reported was 1,583. The vertical axes show percent of total visits in the region. Months are represented on the horizontal axes.

NAMCS forms and procedures with sampling adapted to provide state-specific information.[9]

Although we were not aware of the NAMCS when the ADSS was first implemented, there are remarkable similarities in both methods and results. The fact that NAMCS is able to obtain an 80% response rate from physicians in contrast to the 43% experienced in Arkansas suggests that better response is an attainable goal with sufficient resources and organization.

The ADSS was remarkably inexpensive in contrast to house-to-house interviewing, as in the National Household Interview Survey which requires thousands of personal visits by professional interviewers. The entire ADSS was operated by a half-time clerical employee with consultation from the state epidemiologist as needed. Data processing costs, including programming through a private firm, were $2,800 for the first six months. Postage, printing and telephone costs were an estimated $3 to $5 per responding physician, depending upon the number of report cards and use of low-cost telephone (WATS) service. The total cost of the system in a state of 2 million people was in the range of $10,000-$20,000 annually, including personnel, supplies, postage, and data processing. Greater resources, particularly in data processing, would be desirable to make the system function smoothly, provide information soon after receipt of the cards, and feed this information in understandable and useful form back to the physician, the community and the public.

In proposing a new system of data collection it is appropriate to ask "What good is it?" Examples of the kind of data which can be obtained are given above. For each reasonably common disease, estimates of its frequency, distribution, pattern of care, and other features are available in more comprehensive form than from classical communicable "disease reporting" systems or even, in most states, from piecing together hospital discharge data, medicare-medicaid and private insurance data. Since in the ADSS only about one of 581 of all cases seen were sampled, the system is not useful for surveillance of diseases for which public health response is directed toward individual cases – gonorrhea or syphilis for example. It can be used for checking the completeness of reporting of such diseases. Gonorrhea cases in Arkansas estimated from the random system were 19,754 per year compared with 3,864 cases officially reported from private physicians and 8,087 from the public clinics in 1976. Hence, at least 40% of the gonorrhea cases are not reported through normal channels, and the actual figure may be closer to 80% if one assumes that the random system detected only private cases.

Potential uses of data generated by the system include the following:

1. Providing a weekly or monthly statewide "disease map" (similar to weather maps in newspapers) which shows diseases and conditions common in various parts of the state.
2. Formulating measures which are more complete and timely than those using mortality data alone, of incidence and prevalence of specific diseases and conditions for a given geographic area.
3. Aiding practicing physicians and medical educators in identifying education needs which are closely related to the content of local practice.
4. Determining distances that patients must travel to obtain medical care and as indicators of the amount of care received by individuals in medically underserved areas.
5. Providing a basis for a wide variety of epidemiologic studies to examine relationships of specific diseases to air pollution, urban/rural population status, amount of medical care services available, and to other diseases or conditions.
6. Determining the effectiveness of existing (and the need for new) public health and private health and medical care programs (e.g., V.D. control, immunization, blood pressure screening).
7. Assessing the number of visits physicians devote to individual diseases and conditions (e.g., the common cold, hypertension) and to diseases preventable by such means as immunization or pure water supplies. Public health and/or educational programs could then be directed specifically at the most common problems and the results assessed by measuring changes in the number of visits.

In addition to the data obtained from the ADSS, it would be desirable to obtain information on incidence, prevalence, and level of disability for conditions resulting in physician contacts. Prevalence of risk factors for chronic disease such as smoking and alcohol intake is also

of increasing interest for public health and educational efforts. By obtaining information on the number of contacts during the past year and the date of the last physician visit for each patient, it is possible to obtain estimates of all these variables. A system giving incidence, prevalence, and days of disability as well as contacts with physicians for each major disease would provide a great deal of information useful to physicians and public health agencies in conducting balanced programs of disease prevention and control.

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