UC Berkeley

Title

Alcoholism in Medicine: A Critical Analysis of the Conception of Alcoholism as Disease

Permalink

https://escholarship.org/uc/item/24s7t3q2

Author

Johansson, Richard C

Publication Date

1992-04-01

Copyright Information

Descriptive Epidemiology, Case Mix, and Utilization
at an Urban Free Clinic

By

Richard Brian Ismach

A.B.   (Harvard University)   1985

THESIS

Submitted in partial satisfaction of the requirements for the degree of

MASTER OF SCIENCE

in

HEALTH AND MEDICAL SCIENCES

in the

GRADUATE DIVISION

of the

UNIVERSITY OF CALIFORNIA at BERKELEY

Approved: *Henrik L. Blum MD MPH* *1-14-91*
.... Chair .... Date
Mary Clare King 3/15/91
.... 3/15/91

****

Descriptive Epidemiology, Case Mix, and Utilization at an Urban Free Clinic

Copyright © 1989

Richard B. Ismach

Descriptive Epidemiology, Case Mix, and Utilization at an Urban Free Clinic

Doing More With Less

Richard B. Ismach

Health and Medical Sciences

University of California, Berkeley

May, 1989

This work is dedicated to the women, men, boys, and girls who depend
on the Haight-Ashbury Free Medical Clinic for basic health care, and to the
volunteers and staff who provide that care.

As much or more important to me has been ...

Preface

The work described in this report began in the fall of 1987 as a pilot project for the San Francisco Community Clinic Consortium (SFCCC) Uniform Database Project. Originally called the MIA Identification Project, planning grew out of the need to identify medically indigent adults (MIAs) being served by SFCCC member clinics and to make a valid estimate of the amount of uncompensated care being provided by those clinics (J Marley, personal communication, October 1, 1987). At that time, the eventual expansion of the project into a Consortium-wide data collection system was envisioned. A uniform clinical database, with pooling of data from each of the nine member clinics and compatible data elements used by all sites, would be useful for health services planning, research, fund-raising, lobbying, and other activities.

More important, documentation of services provided to MIAs might allow the SFCCC to convince San Francisco County to reimburse the clinics for that care. California reformed Medi-Cal eligibility in 1983, eliminating coverage for medically indigent adults and transferring responsibility for providing medical services to that population to the counties (Lurie et al., 1984). The counties were given bloc grants amounting to 70% of the estimated costs of providing care to MIAs in each county had the old Medi-Cal eligibility rules remained in effect. Although most counties in the state chose to reimburse

local community clinics for services provided to MIAs, San Francisco has not done so, instead channeling their entire bloc grant into the county health department. This has restricted the ability of some of the community clinics to provide care.

The SFCCC and the Haight-Ashbury Free Medical Clinic (HAFMC) have collaborated on a pilot implementation of the Uniform Database Project. The Free Clinic's data collection and management procedures have been evaluated and extensively revamped in the early phases of this project. The pilot program was implemented in April of 1989 for a subset of HAFMC clients: the homeless. As data from this system are collated and analyzed, a description of the Free Clinic's practice will be produced. The costs and utility of the system will be evaluated by the SFCCC before proceeding with development of a consortium-wide system.

This document describes the theoretical and practical considerations involved in the development of the Free Clinic's new data handling procedures. In addition, the methods of evaluation, data collection, computer software design, and associated activities will be described in detail. Included are the results of early, limited prototypes, giving some indication of what we can expect from later and more comprehensive studies. While certain aspects of the first month of operation of the new system will be presented and evaluated here, detailed analysis has not yet been performed for those newer data.

Acknowledgements

Of the many people who helped in the development of this thesis, I am perhaps most indebted to Ann Howell-Isom, the Haight-Ashbury Free Clinic's volunteer coordinator, for persistently encouraging me to become involved at the Clinic. My family and friends, especially Cat and Laura Staunton, Judy and Theresa Ismach, and Willard Johnson, have nearly earned co-authorship of this paper. All of the volunteers and staff at the Free Clinic have helped in their own ways, especially George Dykstra, Flash Gordon, M.D., Pam Olton, Roberta Rich-Johnson, and Elizabeth Oakley. Carroll Johnson, director of the San Francisco Community Clinic Consortium, was a constant source of advice and encouragement. Several past and present members of the Berkeley School of Public Health Community-Oriented Primary Care Project helped me to understand COPC, especially Julie Williamson and Suzanne Kotkin-Jabie. Ralph Silber and Ross Taub of the Alameda County Health Consortium were also generous with their time. Many of the original ideas for this project were the result of my discussions with Professor Mary Claire King. Doctor Art Reingold helped me to formulate the comparison of the Free Clinic's data with comparable figures published by San Francisco. Finally, and most importantly, Dr. Henrik Blum, professor emeritus at the Berkeley School of Public Health, was outstanding in his ability to help me cut through the myriad practical details of this project and maintain my vision of what it was meant to be.

Table of Contents

Chapter 1

Introduction

During the last two decades, a combination of economic, social, and political forces have severely strained the public health care system in the United States. Health care costs are spiraling ever higher. With nearly 40 million Americans uninsured, the burden on providers who provide uncompensated care has become enormous. County hospitals have closed, community clinic programs been eliminated or scaled back, and eligibility for programs like Medicaid tightened. The need to target high priority health needs has become evident, and a number of states and localities have followed Oregon's lead in examining explicit health care rationing as an alternative to the status quo. This paper describes another strategy in the quest for efficient, prioritized delivery of primary health care services.

The cost of health care in the United States has grown to be a dominant issue in health care planning (Schramm, 1987). Growth in medical costs has consistently been greater than the rate of inflation for many years. We now spend about 11% of out GNP on medical care, reaching $425 billion in 1985. That share is expected to reach 12% by the turn of the century. We spend more on health care per capita than other developed countries, but in many ways we seem to buy far less with our money. The cost of health care is not a new issue; in 1932 a national committee studied the problem of providing

basic health care for the American people (Committee on the Costs of Medical Care, 1932).[*] However, the magnitude of the problem has been growing at a rapidly accelerating rate during the last two decades.

There has recently been a rapid increase in the number of people without health insurance (Mullan, 1987b). In large part this is due to the increasing cost of health benefits to employers, who have endeavored to limit these costs in any way practical, including coverage of family members. There has also been an increase in the proportion of the work force employed part time or in other positions in which benefits are limited. The costs of health insurance for an individual or family can be prohibitive, with few purchasing such insurance if it is not included as a benefit of their employment. And eligibility for Medicaid has been steadily tightened in many states. The result has been that more and more Americans have no private health insurance, yet are not covered by the "safety net" of Medicaid. If they need to see a doctor for anything short of a life threatening emergency, they must pay up front.

At the same time that more and more people have become medically indigent in the United States, the resources devoted to providing free medical care have steadily diminished (Schramm, 1987). In the past, charity care was often paid for by overcharging other payors. Since the 1970s, both hospitals and physicians have been gradually forced to eliminate such cross-subsidization. Beginning in 1983 with Medicare's institution of diagnosis related groups (DRGs), there have been profound changes in the ways in which

---

[*] It is interesting to note that the final report of this committee suggested that medical care should be provided locally by multidisciplinary groups at "Community medical centers," and that there should be substantial involvement by lay members of the community in the planning of such services.

physicians and hospitals are reimbursed. Increasingly, providers must negotiate discounted rates with large insurers and government organizations. Medicaid reimburses only a small fraction of the costs of care, and Medicare's budget in real dollars is now being reduced. Other government programs for primary health care have either fallen by the wayside in an attempt to reduce our enormous budget deficits, or at least been dramatically shaved.

In the midst of this discouraging health care landscape, community clinics are struggling to provide services to those who fall through the cracks in our safety net. Since 1967, the Haight-Ashbury Free Medical Clinic in San Francisco has provided free primary health care to all comers (Seymour and Smith, 1986). The Free Clinic serves homeless people, transients, and the working poor - anyone who lacks the means to pay for health care. Relying on an ever-shrinking pool of state and local funding, supplemented by charitable contributions and generous amounts of volunteer labor, the Clinic is struggling to meet the need. Every day, many patients are turned away because of the Clinic's limited resources. In order to do the most good with what is available, an organization like this must ensure that it is using its resources where they are needed the most or can be of the greatest benefit.

One approach to increasing the efficiency with which scarce resources are spent on primary health care is Community-Oriented Primary Care (COPC). Developed in Israel and South Africa during the 1950s (Cassel, 1955), COPC is predicated on the development of health care programs that are based on knowledge of the needs of the target community. By making use of what has been called "Primary care epidemiology," COPC

creates a continuous cycle of studying a practice population, targeting interventions at the health care needs that are found in that community, and assessing the success of interventions through further epidemiologic studies.

The Uniform Database Pilot Project is an attempt to increase the efficiency of health care spending at the Haight Ashbury Free Medical Clinic by applying COPC principles and techniques. The original idea grew out of a proposal for developing a uniform database for use by the member clinics of the San Francisco Community Clinic Consortium (John Volanti, personal communication). This system, similar to that in place in Alameda county and some other municipalities, would provide comparable data on clients and their health problems from each site. Such data, it was hoped, would foster coordinated planning of health care services by the member clinics, based on a knowledge of the characteristics of the people being served.

Because of political and logistic barriers, the Consortium's uniform database project has remained in limbo. We have adopted the basic principle of their original proposal: that accurate and complete data on the demographic characteristics, medical problems, and utilization patterns of our clients must form the foundation for rational planning. This principle lies at the center of Community-Oriented Primary Care (Mullan, 1984). The next chapter reviews the literature of COPC, which forms the theoretical framework for the Uniform Database Pilot Project.

Rigorous epidemiologic studies can be very expensive - far beyond the means of most clinics. It is desirable, therefore, to make the most of those sources of information that are more readily at hand (Abramson, 1984). This can include census data, vital sta-

tistics, and local and state health department publications, as well as small scale epidemiologic studies (Stewart, et. al., 1987). Perhaps most importantly, and the main focus of this project, it can include the data routinely collected by most health care practitioners for every clinical encounter with a patient. Our main goal in the Uniform Database Pilot Project is to harness the information already inherent in the practice of medicine at the Haight-Ashbury Free Clinic.

For larger providers like hospitals or federally funded clinics, insurance billing provides the framework for collecting and collating data regarding clients and their health problems. At the Free Clinic, however, almost all care is provided without charge to people who have no insurance of any sort. A necessary first step at our clinic was the revamping of our data processing procedures, which were initially quite rudimentary.

It is the *use* of such data that is important in COPC. Thus, many providers may collect extensive data regarding the demographic and clinical characteristics of their patients, but fail to analyze this data or make use of it in the planning process. It is the attempt to make use of routinely gathered information to try to understand the needs of the practice community that motivates this project. We hope to collect and process such data as a transparent part of day-to-day Free Clinic operations.

Integration of management functions can help make a clinic more efficient. At many institutions, activities such as quality assurance, grant reporting, grant application development, documentation of trainee experiences, and health care planning are all carried out separately. There is usually substantial duplication of effort involved, with parallel data collection and analysis but little compatibility or comparability. Accordingly, we

5

have sought to integrate these and other management functions, hopefully developing a flexible, easily adaptable system.

The information required for COPC activities is very similar to that needed for disease surveillance. The data collected at various community clinics might profitably be integrated for such purposes (Cubbon, 1987). Indeed, such networks of primary providers have been developed in Europe (Valleron, et. al., 1986). The demographic and other data collected here can also facilitate various epidemiologic and clinical research activities. In designing the Uniform Database Pilot Project at the Free Clinic, we have attempted to anticipate the requirements of such large scale disease surveillance systems and epidemiologic or clinical studies.

The Uniform Database Pilot Project, then, is an attempt to use routinely collected data for the planning of health care services at the Haight-Ashbury Free Medical Clinic. Drawing on the principles of COPC, we seek to make maximal use of such information with minimal additional costs. At the same time, we have attempted to integrate the information demands of COPC with other management functions and with disease surveillance on a larger scale.

Chapter 2

Community-Oriented Primary Care

The term *community-oriented primary health care* (C-O PHC) was coined by Sidney Kark to describe his integration of epidemiology and public health into primary care medicine (Kark, 1981; Kark and Abramson, 1981; Kark, 1974). The phrase was shortened to *community-oriented primary care* (COPC) within a few years of its introduction (Abramson and Kark, 1983). Working first in South Africa and later, with Joseph Abramson, in Israel, Kark pioneered the application of epidemiology in the setting of primary care (Nutting, 1987a). They identify two cardinal features of COPC:

1. The provision of primary medical care, with emphasis on continuity of care.

2. A focus on the entire community in planning health care services.

The assumption of responsibility for the health of an entire community, rather than merely providing medical care to those seeking such services, is a hallmark of COPC. This leads COPC practices to cross the lines dividing primary care medicine, community medicine, and public health, especially in the third world settings in which the philosophy of COPC was developed (Doron, 1984; Guerrero, 1983; Haber and Lunenfeld, 1984; Kark and Kark, 1983; Madison, 1983a; Mullan, 1982). In this discussion, the terms *practice population*, *practice community*, and *target population* will be used interchange-

ably to mean that defined population, or group of people, for which a given COPC practice assumes responsibility.

Kark and Abramson have gone on to define five *essential features* of COPC (Abramson and Kark, 1983):

1. The complementary use of epidemiologic and clinical skills.

2. Definition of a population for which the practice assumes responsibility.

3. Implementation of defined programs to address the health needs of that population.

4. Community involvement in all aspects of COPC and health policy.

5. Accessibility that is not limited by geography, finances, culture, society, communication, or other barriers.

Some of these features are disregarded by others in the field, but the first three are almost universal in the COPC literature. As Connor points out in her introduction to the Proceedings of a 1982 Institute of Medicine (IOM) conference on COPC, these individual features are not new (Connor, 1983). In a sense, then, COPC represents a new integration of old ideas and techniques into the practice of primary care (Mullan, 1984).

The theoretical basis of COPC has been expanded and developed at a rapid pace since the early 1980s, by many different investigators and in a wide variety of clinical, social, and cultural settings. Accordingly, I will briefly review the history of COPC, both

worldwide and within the United States, then discuss in detail the developing theoretical framework of COPC, including some alternative visions of the main focus of COPC.

Although COPC has tremendous intuitive appeal, there is comparatively little empirical evidence for a positive impact of COPC -- on either the health of communities or the costs to society of illness and health care (O'Connor, 1989). After reviewing the literature on the evaluation of COPC, I will discuss some practical aspects of implementing COPC. The opposing trends of increasingly sophisticated and technology-intensive medical care on the one hand, and widespread efforts at cost containment on the other, threaten to smother efforts in the field of community medicine. At the end of this chapter I comment on the viability of COPC in modern America.

The History of COPC

The term community-oriented primary care is less than 10 years old, and the discipline's theoretical basis has only begun to be thoroughly developed in the 1980s. The roots of COPC, however, can be traced back for centuries, into the mists from which the fields of epidemiology and public health were born. In his essay on the Devonshire colic, George Baker (1767/1958) observed that:

> A very small acquaintance with the writings of Physicians is sufficient to convince us, that much labour and ingenuity has been most unprofitably bestowed on the investigation of remote and obscure causes; while those, which are obvious and evident, *quæ ante pedes sunt*, which must necessarily be acknowledged as soon as stumbled upon, have been too frequently overlooked and disregarded. (p. 1)

Baker approached the community of Devon with the kind of integrated attention to environment, culture, society, and biology that is fundamental to our present concept of COPC. Similarly comprehensive approaches to human health are found in early reports on sanitary conditions in Great Britain (Chadwick, 1842/1965) and Massachusetts (Shattuck, 1850/1948). A classic example of the exercise of public health by a general practitioner is John Snow's study of cholera in mid-19th century London (Snow, 1855/1936). This naturalist's approach to the study of human disease, coupling medical practice with a pragmatic focus on prevention, is characteristic of much of the work of physician/epidemiologists before the turn of this century. A concise review of the history of epidemiology and its relationships to public health and medicine may be found in the Lilienfelds' Foundations of Epidemiology (Lilienfeld and Lilienfeld, 1980).

William N. Pickles, the "Grande Old Man of General Practice," is widely considered to be a pioneer in the application of epidemiology to primary medical care (Mettee, 1987b). A country doctor practicing in the Wensleydale district of Yorkshire, Pickles began in 1931 to record elementary demographic data, along with the diagnosis, for every patient with an infectious disease he treated. His studies were clearly focused on his practice community, and he encouraged extensive community involvement in the work. In presenting the results of seven years of observations, Pickles integrated the local geography and social structure in his discussion (Pickles, 1939). As the local Medical Officer of Health, he realized the marriage of epidemiology, primary care, and public health envisioned by the COPC movement (Mettee, 1987b; Mullan and Nutting, 1986; Kark and Kark, 1983).

Primary health care is certainly the foundation of COPC. A more obscure root lies in the criticism of Western medicine's efficacy at improving health. In what Hart calls "The radical critique," Cochrane, McKeown, Powles, Fuchs, and others have argued that medical care has contributed almost nothing to the improvement of life span (Hart, 1981). Instead, they claim that improvements in sanitation and nutrition are the main factors in the steady decrease in morbidity and mortality that the developed world has enjoyed over the last 100 or more years. To the degree that medical care has contributed to the improvement of health, a large part might be ascribed to preventive care rather than curative treatments. The implication for medicine is that the scope of care must be broadened to encompass these community-wide determinants of health -- just as COPC attempts to do (Hart, 1981).

A related critique of both medicine and public health is that traditional indicators of health status reflect only a small part of people's day-to-day lives, including their interactions with health care providers (White et al., 1961). Using data from Britain's *Survey of Sickness, 1943-1952*, White and colleagues estimated that out of 1000 adults, 750 would experience an episode of illness in any given month. Out of these, 250 would consult a physician, nine would be hospitalized, five referred to another physician, and one referred to a tertiary care hospital (fig. 1). With so much hidden illness (that is, illness not reflected in commonly used estimates of morbidity and mortality rates), our ability to evaluate the efficacy and efficiency of health care services is somewhat limited. One can argue that mortality and the more serious illnesses for which rates are usually estimated are legitimately the focus of public health and medical care; people get over their
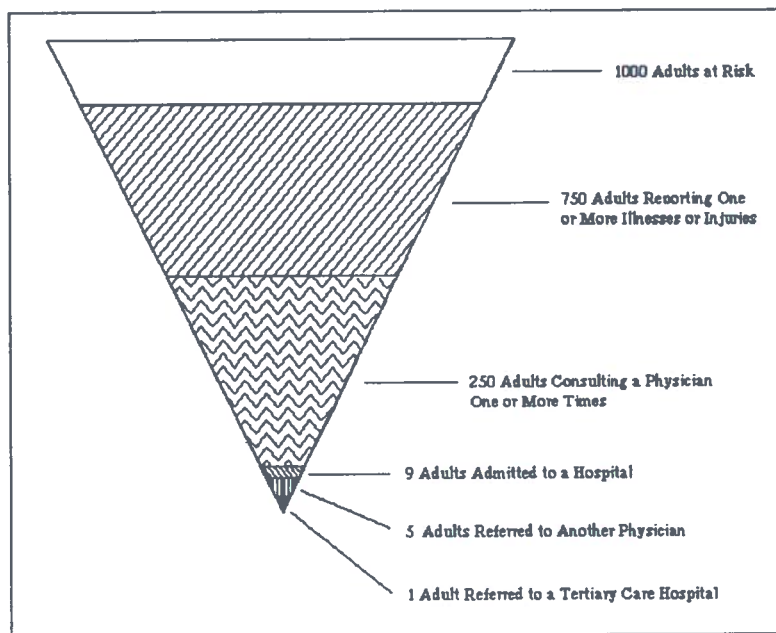
Figure 1. The Monthly Prevalence of Illness and Injury and the Proportion of Adults Seen by Physicians or in Hospitals. Adapted from White, et al., 1961.

colds, and their minor cuts and bruises heal without incident. But in any case there is a lack of empirical knowledge of the natural history of health care: what determines the course of an illness, either before or after contact with a physician, is largely unknown at present. A better understanding of how to measure and evaluate and measure outcomes is an especially critical need at present (Roper et al., 1988).

To a large extent COPC represents the combination and integration of old ideas, rather than the introduction of fundamentally new ones. Such integration of public health and clinical medicine is not new either; the early epidemiologists referred to above were physicians, and undertook their investigations out of concern for their own patients. Although the disciplines of public health and epidemiology have become somewhat separated from clinical medicine in this century, they still remain partners (Hart, 1981). That this partnership could profitably be more intimate was recognized even before the explo-

12

sive growth in medical technology that followed World War II. In 1932 a national committee concluded that medical care should be delivered locally by multidisciplinary group practices (*community medical centers*), with lay participation in decision making and with regional coordination of services (Committee on the Costs of Medical Care, 1932). The expansion of medicine's focus beyond the individual patient to the community was implicit in the committee's report (Madison, 1983b). The American Medical Association, in endorsing the minority report, insisted that individual patients consulting with their private physicians should remain the primary arena for health care in the United States.

The first conscious application of COPC as an alternative to traditional medical care was probably Kark's work in South Africa (Kark, 1981; Geiger, 1983). The Polela Health Center in Zululand was able to measurably improve the nutritional status of the target community (Cassel, 1955, pp. 15-42). Infant mortality was also substantially reduced. This project involved the classic elements of COPC: a defined population, epidemiologic study of that population to determine health needs, defined programs to address those needs, and evaluation of the efficacy of the interventions. It would be 1981, though, before the label *community oriented primary care* was applied (Kark, 1981).

Another early COPC project, the Navajo-Cornell Field Health Research Project, had developed out of a parallel concern for the health of the entire community (McDermott et al., 1960a, 1960b; McDermott et al., 1972). The integration of epidemiology and public health approaches into primary health care was integral to this project. Again, the uniqueness of the combination was not acknowledged until much later, when the term

COPC was introduced by Kark. The Indian Health Service (IHS) has retained COPC as a primary model for health services organization for more than 30 years (Rhoades et al., 1987).

Guerrero (1983) discusses the contribution of the family medicine, primary care, and community medicine movements to COPC. Family medicine and general practice have been extensively developed in the English National Health System. To some degree, health care in the United States involves referral from a family physician to a specialist for the care of complex or serious illnesses. The family physician cares for more mundane problems -- urinary tract infections, simple sprains, etc. Community medicine, on the other hand, aims to "identify the health problems and needs of defined populations, to identify means by which these needs should be met, and to evaluate the extent to which health services effectively meet these needs" (Last, 1983, p. 20). Community-oriented primary care is primarily the integration of community medicine into primary care general practice.

The primary care movement was defined at the Alma-Ata meeting of the World Health Organization and UNICEF in 1978 (World Health Organization, 1978). It seeks to replace the high-technology, hospital-based health care with simpler, more appropriate, and more cost-effective health care. Thus, primary care as defined at Alma-Ata places great emphasis on preventive health care. Although the primary care movement and COPC share many of their philosophical bases, the primary care movement omits an emphasis on a short feedback loop between epidemiologic studies and the planning, delivery, and evaluation of health care services.

Throughout the 1960s and 1970s, COPC was adopted in one form or another by dozens of medical practices in both the United States and abroad (Babitz, 1987; Deuschle, 1982, 1983; Furcolow et al., 1966; Kamerow, 1987; Mullan, 1987a). In most cases, COPC has been applied in the context of serving disadvantaged populations, either in the third world or in developed countries (O'Connor, 1989). It was only in 1982, however, when the Institute of Medicine of the United States National Academy of Sciences held a three-day conference on community-oriented primary care, that these diverse projects were brought together under the rubric COPC (Connor, 1983). This conference prompted the IOM to carry out a series of qualitative case studies of COPC practices (Institute of Medicine, 1984a, 1984b; Nutting and Connor, 1986; Nutting et al., 1985). Many of these projects and practices are described below.

COPC has not yet become the dominant model for health care services that many have hoped (Frame, 1989; Mullan, 1987b; Nutting, 1987e; Nutting and Connor, 1986; Rogers, 1982). Still, the field remains quite active, with new COPC projects being initiated and the gradual adoption of COPC principles and techniques into many practices (Nutting and Connor, 1986; Osborn et al., 1986; Steinbach, 1987; Trachtenberg et al., 1987). In Israel, Abramson and Kark have built COPC into a fundamental activity at the Hadassah Teaching and Research Center in Kiryat Hayovel, Jerusalem (Abramson et al., 1981; Kark, 1974; Kark and Kark, 1983). Their model for health care delivery has been so successful that COPC has grown to be an important underpinning of Israeli public health and medical care (Doron, 1984; Haber and Lunenfeld, 1984; Modan and Barell, 1981; Palti et al., 1982; Weitzman, 1983).

The Theoretical Basis of COPC

A rich theoretical basis for COPC has been developed, mostly since the early 1980s. Most of those publishing in the field have also been actively involved in COPC practices or projects as clinicians (Institute of Medicine, 1984a). Thus, the theoretical basis of COPC is very pragmatic and adaptable by nature. Various authors have emphasized one or another facet of COPC according to the special needs and circumstances of their own practice. I will, quite artificially, divide COPC into two schools: the older Israeli model, as defined by Kark and Abramson and practiced throughout much of the world (Kark, 1974, 1981), and the newer Institute of Medicine model, as reflected in the American literature since the March 1982 Conference on Community Oriented Primary Care (Connor, 1983).

The Israeli Model for COPC. With their colleagues at the Hadassah Teaching and Research Center in Jerusalem, Kark and Abramson have developed COPC both as a modus operandi for the Kiryat Hayovel Health Center and as the underpinning of a number of specific health interventions (Abramson and Kark, 1983; Kark and Kark, 1983). They describe COPC as "a strategy whereby elements of primary health care and of community medicine are systematically developed and brought together in a coordinated practice" (Abramson and Kark, 1983). The cardinal and essential features of COPC as defined by Abramson and Kark were listed earlier in this chapter. They emphasize that it is the integration of these features that constitute COPC: the *complementary use of epidemiologic and clinical skills*, applied to a *defined population*, with the goal of developing *defined health services programs* that benefit in their design and administration from *community*

16

involvement and to which *access is not limited* by geographic, social, cultural, or other factors.

COPC is based on the use of epidemiology to define health problems in a practice community -- a process that has been called *community diagnosis* (Kark and Abramson, 1981). Abramson (1984) stresses the pragmatic focus of epidemiologic studies in COPC. Rather than trying to determine the etiology of disease or the determinants of outcomes, such studies mainly try to answer less global questions. For example, knowledge of the distribution of illness in a practice community is important for the planning of health care services. The analysis of 18 Israeli general practices in a 1982 field trial of the International Classification of Primary Care (ICPC), a coding system developed by the World Organization of National Colleges and Academies of Family Medicine-General Practice (WONCA), is only one of many such examples (Doron, 1984; Lamberts and Wood, 1987). Another COPC study might try to identify the barriers to utilization of existing programs, again with the goal of providing better services (Osborn et al., 1986). Many more examples of such *primary care epidemiology* (Mullan and Nutting, 1986) will be found below.

A defined population, for the health of which a practice assumes responsibility, is a key element in most COPC models. Two different tasks are involved: the *definition* of a practice population or community, and the *characterization* of that population (Abramson and Kark, 1983). For rural or third world locations, the target population can usually be defined in terms of geography -- everyone living within a certain region will be served by what is often the only health care facility available. In urban settings, however, it

may be very difficult to define a population for which a practice will be entirely responsible. In many developed countries the national health care system includes the assignment of individuals to a specific practice, which then has a roster of potential and active patients. In Israel, for example, the Kupat Holim Health Insurance Institution provides health care to more than 80% of the nation's population (Doron, 1984). Another approach to approximating a defined population involves the iterative expansion of an initially small *defined area* until most or all of a practice's active clients are included (Abramson and Kark, 1983). The problem of defining a practice population in America's pluralistic health care system is discussed below.

Characterizing a population involves, first, the collection, collation, and interpretation of basic demographic data (Abramson and Kark, 1983; Kark, 1981). An obvious source of demographic information is the practice's own patient records. The chief problem with such practice-based data is the potential for selection bias, since the practice's active patient's may not be representative of the target population. Other data sources include the census, national surveys or epidemiologic studies, regional or local government statistics, as well as specific local studies conducted by or for the practice (Abramson, 1984). Abramson and Kark often don't distinguish between the demographic description of the practice population and the assessment of health status and needs in that population. The latter process can also draw on a wide variety of data sources. Abramson (1984) suggests that COPC in the end requires epidemiologic studies of the target population, conducted by the practice staff, but that larger scale surveys and studies can be used to select specific health problems for further investigation.

18

The prime mission of a COPC practice is not merely to determine the health needs of a community, but to do something about those needs. The interventions (*defined programs*) chosen will reflect the community's needs, the resources and skills available to the practice, and the presence and nature of any other health care services -- whether lay or professional -- in the community (Abramson and Kark, 1983; Kark and Abramson, 1981; Kark and Kark, 1983). Specific programs may involve individual health care, special investigations, household visits or community-wide health education campaigns, the initiation and maintenance of interagency coordination, or the use of recording procedures which facilitate community diagnosis (Abramson and Kark, 1983). Evaluation is an essential part of any defined program in COPC, allowing both the modification of the program for improved efficacy and efficiency and the adaptation of the practice to changes in the community.

Community-responsiveness is in part a function of this built-in evaluation process. More than any actions of the practice, however, community-responsiveness depends on community involvement (Kark and Kark, 1983). Community participation in health care planning and health promotion has been embraced by the international health community in the last decade (Nichter, 1984; World Health Organization, 1978). While this is a part of the rhetoric of COPC, it has seldom been a prominent feature of actual COPC projects (Hatch and Eng, 1983; Hauser, 1988). Some exceptions are the kibbutz in Israel (Kark and Kark, 1983) and the cooperative medical system in China (Bannister and Preston, 1981; Hsiao, 1984).

The fifth "essential feature of COPC" according to Abramson and Kark (1983) is accessibility. Their concern with accessibility is certainly well-placed -- if health care services are not accessible to people, they can have little impact. In fact, several studies of COPC as an approach to health care services delivery have used groups to whom the COPC practice was inaccessible as controls (Abramson et al., 1981; Chabot, 1971; Gordis, 1973). However, accessibility to health care services has played little *theoretical* role in COPC projects to date, whatever its importance in practice.

Kark and Abramson have emphasized a number of other aspects of COPC. Prominent among these is the coordination of various health services, including primary care, hospital-based care, community medicine, and public health (Abramson and Kark, 1983; Kark and Kark, 1983). Central to such coordination is the development of multidisciplinary health care teams. One approach has been to promote the use of doctor-nurse teams, rather than having physicians work alone (Doron, 1984). Similar integration of health educators, community organizers, planners, epidemiologists, and other health workers, along with physicians and nurses, is at least implicit in most COPC projects. Such cooperation fosters a comprehensive approach to health. Related to accessibility is the need for outreach. This implies a certain mobility on the part of health care providers (Abramson and Kark, 1983). Outreach activities have been central to at least one COPC project (Colombo et al., 1979).

The approach to COPC that I've called the Israeli model is distinguished mostly by a paucity of formal structure. With their colleague Joseph Abramson, the Karks have continued to develop the theoretical framework of COPC in Israel. This theoretical frame-

20

work has been borrowed piecemeal by various workers in other parts of the world (Guerrero, 1983). Most of the COPC projects described in the literature share the main features of this Israeli model -- namely, community orientation, the marriage of epidemiology and primary care, and the attempt to precisely define a target population. Until the 1982 Conference on Community Oriented Primary Care, though, there was no clear operational definition of COPC, and accordingly no clear focus to the theory of COPC.

The Institute of Medicine COPC Model. The 1982 conference on COPC allowed the integration of the experience of various COPC practitioners from the United States and abroad with 20 years of public health, primary care, and community medicine efforts in the U.S. Out of this amalgam was made a new theoretical framework for Community-Oriented Primary Care (Connor, 1983). Developed more fully in the ensuing years, this model has been championed by Paul Nutting and Fitzhugh Mullan, among others. It adds to the Israeli model just described an explicit operational definition of COPC, a structured approach to the development of a COPC practice, and staging criteria for evaluating a practice's progress toward full implementation of COPC. Although I have chosen to treat this model separately from the preceding work of Abramson and Kark, most authors in the field continue to draw heavily and explicitly from that earlier literature (Nutting et al., 1985).

The IOM Committee on Community Oriented Primary Care describes two *structural elements* of COPC (similar to the two *cardinal features* of Kark and Abramson): a primary care medical practice and the assumption of responsibility for the health care of a de-

fined community (Institute of Medicine, 1984a; Nutting, 1987e). The expanded scope of the COPC practice -- from the diagnosis and treatment of patients seeking care to the diagnosis and treatment of the community in which the practice is located -- is as central to the IOM model as it is to that of Abramson and Kark (Connor and Mullan, 1983). They have broken the COPC process into four functions:

1. *Defining and Characterizing the Community.* This is the beginning of the COPC process; the remainder of COPC activities are centered upon the practice community (Mettee, 1987a; Nutting, 1987b; Strelnick, 1987). Ideally, an actual list of the people for whom the practice is responsible could be generated, along with basic demographic information for each. Besides ensuring accurate estimates of disease rates in the community, such a practice list facilitates outreach and preventive medicine. Such a definition is indeed possible in some settings, including health maintenance organizations (Colombo et al., 1979), government providers such as the Veteran's Administration or the Indian Health Service (Rhoades et al., 1987), and rural practices where there is only one provider (Babitz, 1987; Deuschle, 1982; Furcolow et al., 1966). In most practices that have tried to implement COPC, however, it has been much more difficult to define a practice population. Since there are multiple health care providers in virtually all parts of the U.S., it is usually unclear which practice might assume responsibility for any one person -- even when that person is an active patient of a certain practice, they may at times receive care elsewhere (Bass, 1976; Madison, 1983a, 1983b). It is nonetheless important to define the practice population as precisely as possible,

22

since the calculation of incidence and prevalence rates depend on this *denominator* (Hearst, 1987).

2. *Identifying Community Health Problems.* Before a practice can begin to address the health of its target population in ways other than simply providing medical care to those who seek it, the major health problems of the community must be identified, characterized, and their importance assessed (Institute of Medicine, 1984a; Nutting, 1987e; Rose, 1987). As with the definition of the community, it is possible to extrapolate from secondary data sets to identify health problems in the practice community (Harris et al., 1988; Stewart et al., 1987). Such extrapolation is at best imprecise, though, with local variation unaccounted for (Barell et al., 1988; Carstairs, 1981). Ideally a COPC practice conducts its own highly focused epidemiological studies of the practice community. It is here that epidemiology meets primary care, becoming *primary care epidemiology* (Morrell and Holland, 1981; Mullan, 1984; Mullan and Nutting, 1986). The use of epidemiological studies to help plan health care services is not unique to COPC (Haber and Lunenfeld, 1984; Kuller, 1988; Modan and Barell, 1981; Regier et al., 1984). The use of small, pragmatic studies in the planning of regional or local health services is also well established, although perhaps uncommon (Johnson et al., 1988; Mackenbach, 1987; White, 1972). But the use of epidemiology by and for a primary care practice is an idea belonging to the community-oriented primary care movement. Primary care epidemiology has special importance for the project described here, and will be discussed in some detail below.

3. *Modifying the Health Care Program.* Rationally altering the health care system to better meet a community's health needs is the primary goal of COPC. Fitzhugh Mullan expressed the rationale in 1982: "Systematic identification of medical problems on the level of the practice, with time and energy then spent on well-planned solutions, promises a maximal use of resources that a random medical response does not." Again, the specific interventions are not unique to COPC. Projects might include nearly anything: adjusting the hours of operation for improved access to the practice; aggressive, door-to-door outreach or immunization campaigns; computerized medical records systems that generate automatic preventive care reminders; the employment of local providers in an attempt to provide more culturally appropriate care; community-based health education efforts; or the modification of clinic protocols to more reliably identify high-risk individuals (Connor and Mullan, 1983; Mullan and Kalter, 1988; Rosser, 1987). What sets COPC apart from primary care is the willingness to extend beyond the bounds of the clinician/patient encounter, into the realms of community medicine and public health. A key role of the COPC practice may be the initiation of better cooperation and coordination between various health care agencies (Institute of Medicine, 1984a).

4. *Monitoring the Impact of Program Modifications.* In a sense, this COPC function is really the continuous and iterative execution of the first three functions. Community-oriented primary care is a dynamic process, the institutionalization of health care that is truly responsive to changes in the community (Geiger, 1983).

24

The ongoing nature of COPC practice implies the need for surveillance mechanisms, not just isolated studies. Abramson (1984) describes this continuous process of evaluation and modification as a "cybernetic planning cycle." The evaluation of the impact of COPC interventions is in many ways a form of quality assurance (Nutting, 1987c; Walker, 1987).

According to the Institute of Medicine Committee on Community Oriented Primary Care, the main point of distinction between COPC and primary care is the definition of the community (Institute of Medicine, 1984a). Noting that this distinction is easy to make when the COPC practice addresses a true community in the sociological sense, the Committee report warns that:

> ... the practice that is actively identifying the major health problems of its "active" patient population, modifying its primary care activities to address the problems, and monitoring the impact of program modifications may be practicing excellent primary care. It is not, however, necessarily engaged in COPC and its activities, while greatly improving the health care provided to the patient population, may or may not lead to better health care received by the larger community. Similar efforts can only be considered COPC if they are directed at the health or health care problems of a distinct community for which the practice has assumed responsibility. (p. 42)

Most U.S. authors implicitly reject this narrow definition of COPC (Frame, 1989). Instead, COPC is viewed as an approach to health care that employs a set of tools and approaches which can profitably be applied in small increments. Thus, the definition of a target population can begin with the practice's active patients, be widened with the use of secondary data sources, and eventually be precisely defined with more specific data sources (Abramson and Kark, 1983; Breckenridge and Like, 1987; Galazka and Zyzanski, 1987; Hawk and Calvert, 1987; Mullan, 1982; Nutting, 1987b; Rhyne et al., 1987;

25

Rogers, 1982; Strelnick, 1987; Zyzanski and Galazka, 1987). Such a broadened definition of COPC is essential if COPC is to be applied to such ill-defined populations as the homeless or the medically indigent (Ellerbrook et al., 1987; Lurie et al., 1984; O'Connor, 1989; Schwingl et al., 1987).

The Institute of Medicine's explicit operational definition provides a road map for developing COPC practices to follow. It also allows more meaningful comparisons of dif-

Table 1. Staging Criteria for Community-Oriented Primary Care Activities.
Adapted from Nutting, 1987e.

Function	Stage 1	Stage 2	Stage 3	Stage 4
Definition & characterization of community	Based on subjective impressions	Extrapolated from secondary data sources	Based on data sets specific for the population	Based on a current community database
Identification of community health needs	Based on subjective impressions	Extrapolated from secondary data sources	Based on data sets specific for the population	Routine mechanisms identify address problems
Modification of health care programs	Based on national or other initiatives	In response to external resource availability	Tailored to identified needs of the community	Targeted to specific groups; active outreach
Evaluation of program efficacy	Based on subjective impressions	Extrapolated from secondary data	Based on data sets specific for the	Specific to program objectives

ferent COPC practices and projects. The latter task is aided tremendously by the staging criteria developed by the IOM Committee on COPC (table 1). These criteria were developed in conjunction with the above operational definition for the use of IOM staff in evaluating seven case studies of U.S. COPC practices (Institute of Medicine, 1984a, 1984b; Nutting and Connor, 1986; Nutting et al., 1985). For each of the four fundamental tasks of COPC, a practice can be staged on a scale of zero to four, with stage four rep-

resenting fully developed COPC. Stage zero is simple primary care with no attempt at COPC. In general, higher stages reflect increasing epidemiologic specificity in the COPC process. These staging criteria have not been widely adopted as a uniform method for describing COPC projects, but will be applied here because they do provide an unambiguous scale for measuring progress in instituting COPC.

What COPC is not. Community-oriented primary care draws heavily on the fields of epidemiology, primary care medicine, community medicine, and public health. Sometimes it is difficult to understand just what makes COPC different from the application of techniques from all these fields within a single medical practice. H. Jack Geiger (1983) has identified six "fallacies" regarding the constitution of COPC:

1. *The Geographic Fallacy.* COPC is not just the practice of medicine *in* a community. Thus, a county clinic in an underserved urban neighborhood, if it provides nothing more than primary medical care to patients who seek their services, is not practicing COPC.

2. *The Demographic Fallacy.* The collection of demographic, mortality, morbidity, and other descriptors of a population does not mean that such information is being used by the practice.

3. *The Organizational Fallacy.* The organized delivery of primary care, even when multidisciplinary teams exist and a management information system is used to analyze utilization, is not COPC. What is missing from such a practice is the assumption of responsibility for and direction of efforts toward a larger community.

4. *The Community Orientation/Awareness Fallacy.* The fallacy here is that the attitude one holds (being aware of and focused on the community) is all that matters. Such a community focus needs to be combined with an investment of resources in epidemiologic study, planning, and program development. Health care providers often find themselves trapped between their good intentions and the relentless demands of a busy primary care practice.

5. *The Community Involvement Fallacy.* Moving the focus of health out of the doctor's office and into the community cannot be accomplished by means of a community advisory board.

6. *The Epidemiologic Fallacy.* The conduct of an epidemiologic study at a primary care practice is not the same thing as the integration of epidemiologic techniques and primary care -- that is, the routine surveillance that COPC requires. Also, the results of epidemiologic studies must be *used* by the practice for COPC to take place.

In practice, COPC might be simply defined as a practice that makes the effort to move toward the ideal of a community-oriented primary care practice that makes full use of epidemiologic tools and extends its scope beyond the confines of the doctor-patient encounter to include all determinants of community health. In attempting to improve the use of very scarce resources for providing health care to San Francisco's medically indigent adults, we have been forced to move toward COPC in small steps.

Primary Care Epidemiology

Epidemiology plays a special role in COPC. It allows the characterization of the community and its health problems, and is central to the evaluation of program efficacy. The studies conducted by COPC practices are locally based and highly focused on specific, practical questions (Mullan and Nutting, 1986). The application of epidemiology in the setting of COPC requires different approaches than more traditional epidemiologic research. Thus, a new branch of epidemiology, *primary care epidemiology*, has been defined.

In A Dictionary of Epidemiology (Last, 1983), epidemiology is defined as "The study of the distribution and determinants of health-related states and events in populations, and the application of this study to control of health problems." As applied in most departments of epidemiology, the science has been concerned with elucidating the causes and determinants of diseases. Most epidemiologic research has been divorced from the practice of medicine; cases are often ascertained retrospectively, large secondary data sets are used to their full advantage, and even prospective studies usually enlist clinicians as instruments, with measurements being piggybacked onto routine care (Morrell and Holland, 1981; White, 1976). When epidemiology has been focused on the encounter between the clinician and the patient or on the outcomes of medical interventions, it has been called *clinical epidemiology* (Steinbach, 1987). This clinical focus is certainly required by COPC. However, clinical epidemiology has tended to be limited to the application of epidemiologic techniques to clinical research rather than the broader subject of health care services (Mullan and Nutting, 1986). Primary care epidemiology shares the

29

clinical focus and roots of clinical epidemiology, but seeks to address the broader range of questions that concern the primary care provider (McKay, 1988; Mullan, 1984; White, 1976).

A primary care epidemiologist, working in the context of a COPC practice, makes use of the same set of tools as any epidemiologist. Study designs can be cross-sectional or longitudinal, retrospective or prospective. The same biases and confounders apply. Statistical analysis can include the estimation of confidence intervals for rates and proportions, the calculation of relative risks or odds ratios, and the testing of hypotheses. But for all the similarities, there are some profound differences between primary care epidemiology and traditional epidemiology. Because of the focused nature and often small size of COPC studies, there will be a different blend of methodological problems. Also, the manner in which results are applied differs from the application of traditional epidemiologic research.

Pragmatically Chosen Research Questions. The research topics of COPC are dictated by the needs of the practice (Abramson, 1984). Their main purpose is to help the practice to plan and evaluate health care services. Thus, Mullan and Nutting (1986) suggest that: "The content of primary care epidemiology starts with the decisions needed to conduct a survey of the practice community." Other topics might include the teenage pregnancy rate or the prevalence of terminal cancer patients, so that the need for family planning or hospice services could be assessed (Mullan, 1984), barriers impeding access to care for homeless people (Osborn et al., 1986), or the prevalence of poorly controlled diabetes mellitus (Steinbach, 1987). Part of the subject matter of primary care epide-

miology is health care itself, as opposed to the health of populations (Nutting, 1987d). As Kerr White (1976) points out, however, this sort of applied epidemiology does not replace traditional epidemiologic investigation. I will suggest that the two sorts of epidemiology can be profitably integrated.

Creation of a Short Feedback Loop Between Research and Practice. This may be the most important attribute of primary care epidemiology. Traditional epidemiology has a delayed impact on medical practice, seldom affecting the health care of the subjects
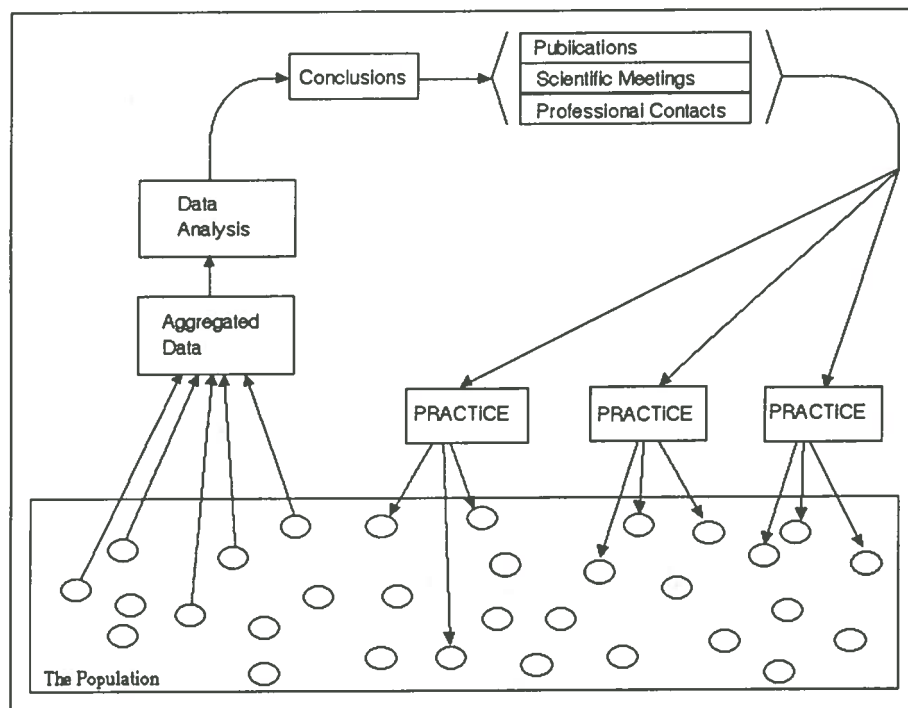
Figure 2. The Long Feedback Loop of Traditional Epidemiology. Modified from Mullan and Kalter, 1988.

of research (fig. 2). Conclusions drawn from research data must filter slowly through the literature, eventually being incorporated into medical practices -- *if* both applicable and publicized. In contrast, COPC and primary care epidemiology foster a short feedback loop (fig. 3) in which studies are carried out by the primary care practice and the results

rapidly incorporated into the planning process (Mullan, 1984; Mullan and Kalter, 1988; Mullan and Nutting, 1986). Thus, not only are the results of primary care epidemiology better matched to the information needs of the COPC practice, but much more timely
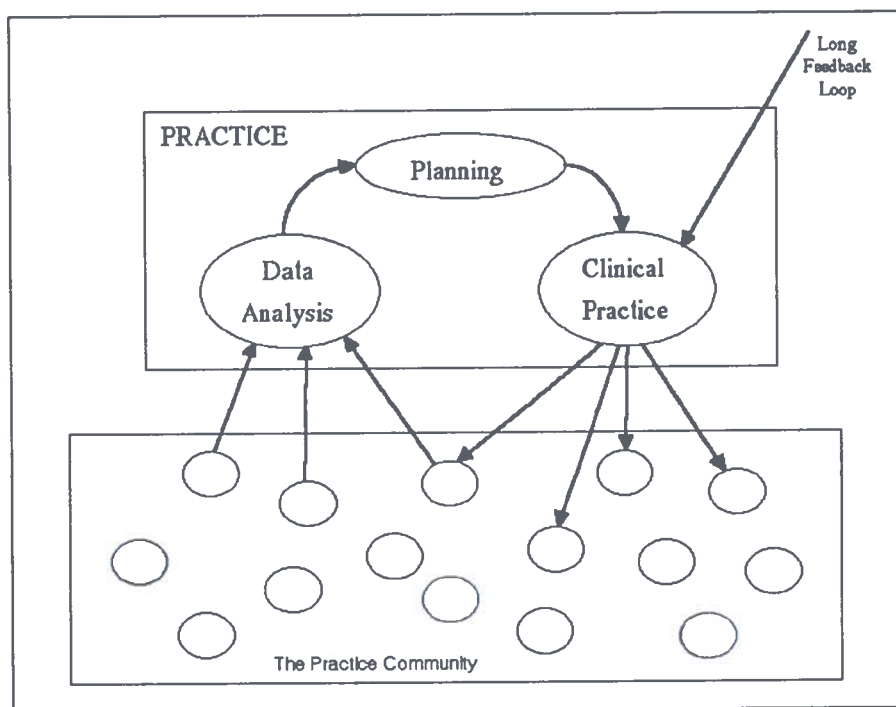

Figure 3. The Short Feedback Loop of Primary Care Epidemiology. Modified from Mullan and Kalter, 1988.

than the fruits of traditional epidemiologic research.

Emphasis on Surveillance. After the target community and its health problems or needs are assessed, the focus shifts to long-term monitoring of the community and the health care services provided by the COPC practice (Mullan and Nutting, 1986). Such surveillance is necessary to maintain the short feedback loop described above. Effective surveillance depends on the careful choice and definition of the problem to be monitored, the sensitivity (often very low) and specificity of the system, and its timeliness (Klaucke

et al., 1988). Most surveillance systems, whether passive or active, suffer to at least some degree from underreporting. Many also suffer from a lack of timeliness. For primary care epidemiology, surveillance may involve the monitoring of data routinely collected by the practice or other local health care agencies (Cubbon, 1987; Johnson et al., 1988; Marcus, 1988). It may also take the form of repeating studies on an annual or semiannual basis (Abramson et al., 1981).

Practical Constraints on Study Design. Even simple epidemiologic studies can be expensive to carry out, but the COPC practice may have only very limited resources to devote to the study of the community (Madison, 1983a; Rogers, 1982). Except under unusual circumstances (e.g., the joint conduct of a study for both research and COPC purposes), expensive data collection methods will be precluded. The expertise and time required for analysis and interpretation with complex study designs will probably not be available. Thus, simpler studies will be most suitable for the COPC practice. As Mullan and Nutting (1986) point out: "Care and precision remain important factors in the use of data in the short loop, but the techniques and analyses are generally straightforward and pragmatic."

This constraint on resources places a premium on the efficient use of routinely collected information (Abramson, 1984; Block and Brennan, 1988; Cubbon, 1987; Freeman, 1987b; Johnson et al., 1988; Marcus, 1988; Yekutiel, 1981). Sources of routinely collected data include the practice's medical records (Farley, 1987) and its billing system (Jacobs, 1987). The growing use and decreasing costs of computers in medical practice has the potential to facilitate the collection and processing of patient data tremendously

33

(Coulter and Daniels, 1988). A wide variety of secondary data sources can also be drawn upon, including hospital discharge data summaries, vital statistics, tumor registries, and so on (Cubbon, 1987; Stewart et al., 1987). Surveillance can be closely integrated with patient care, as in the case of tuberculosis registries for homeless patients in Boston (Schwingl et al., 1987) or patient tracking systems aimed at improving the continuity of care (Doyle, 1987; Nichols et al., 1986).

The pragmatic, straightforward epidemiology of COPC may be a major hazard. Even the best epidemiologic research needs to be interpreted very carefully, with constant vigilance for potential confounders and biases. A recent example is the case of research on poppers and the acquired immunodeficiency syndrome (AIDS). Poppers are amyl nitrate inhalants, often used by gay men to enhance sexual pleasure. Early epidemiologic studies of AIDS, conducted before the isolation and characterization of human immunodeficiency virus (HIV), found the use of poppers to be a strong risk factor. Multiple lifetime sexual partners, now known to be a major risk factor for AIDS, seemed to be less strongly associated with AIDS. When a multiple regression model including both the use of poppers and the number of lifetime sexual partners was constructed, the odds ratio for amyl nitrate use increased while that of multiple sexual partners decreased. It was thought at the time to be biologically plausible that amyl nitrate use could cause immune system damage. In the early 1980s, then, the rigorous application of epidemiology, with interpretation guided by our knowledge of biology, led us far astray (Vandenbroucke and Pardoel, 1989). Obviously, primary care epidemiology must be applied with tremendous caution in the planning of health care services and interventions.

Evaluation of COPC

Although COPC has tremendous intuitive appeal as a rational approach to the delivery of health care services, it has proven difficult to demonstrate the impact of COPC on a community's health. Kark's early work in South Africa is widely considered to have had a tremendous positive impact on the health of the practice's community, but a comparative evaluation of the program's efficacy was not made (Geiger, 1983; Kark, 1981). Similar comments can be made regarding most published accounts of COPC practices and projects; few rigorous attempts to evaluate COPC as a means of delivering health care have been made (O'Connor, 1989). What follows is a brief review of the literature on the efficacy COPC.

China's Barefoot Doctors. Before the revolution in 1949, the life expectancy at birth in China was on the order of 20 to 25 years. By 1975, life expectancy had increased to 61.7 - 64.4 years (Bannister and Preston, 1981). It is astounding that one of the poorest countries on earth could accomplish this. While it is difficult to separate the effects of improvements in nutrition, housing, sanitation, and health care, it is clear that the cooperative health care system has had a tremendous impact. The community for a given practice is usually easy to define: China is still a largely rural nation, and each cooperative has its own health care plan. Based on simple appraisals of health needs, mass campaigns of health education, environmental sanitation, immunization, and infectious disease control have been carried out (Sanders and Carver, 1985, p. 157). The near eradication of schistosomiasis, accomplished mainly by mobilizing communities to bury the snails that are a vector for the disease, is one of the most striking accomplishments to

35

date. The Chinese system has many parallels with COPC, especially in the disintegration of the boundaries between medical care and public health, but I will not attempt to categorize it according to the IOM staging criteria. It is unclear what effect the economic Westernization of China will have on health care (Hsiao, 1984).

The Navajo-Cornell Field Health Research Project at Many Farms. In 1955 responsibility for the health of Native Americans -- in the form of the Indian Health Service -- was transferred from the Department of the Interior to the Public Health Service. The Navajo-Cornell Field Health Research Project established a primary care and community medicine practice in the Manyfarms-Rough Rock area of the Navajo reservation in Arizona (McDermott et al., 1960a, 1960b). From 1956 to 1962 this practice provided primary care and public health services and conducted a variety of anthropological research studies. The project began with a comprehensive demographic survey/census and an effort to perform a complete health interview and physical examination for each of the 2000 residents of the 800 square mile area. Health care services included a physician-staffed health center, as well as a Navajo teacher and four Navajo *auxiliary health workers*. The latter were trained by the project staff to provide culturally appropriate health care and education, often in the home. Planning was done with extensive input from the community, along with a multidisciplinary team including physicians, nurses, sociologists, and anthropologists. Evaluation involved continuing health problem surveillance, based primarily on the records of the practice.

By Institute of Medicine Criteria, this was a stage IV practice in each of the four primary COPC tasks (table 2). The success in terms of reducing morbidity and mortality

was marginal: transmission of *mycobacterium tuberculosis* was clearly reduced, as was the incidence of otitis media in children under the age of five (McDermott et al., 1972). Overall mortality declined slightly, but the decline was not statistically significant. Infant mortality, the biggest component of overall mortality, was not appreciably changed at 70 per 1000 live births. Because of possible underreporting of perinatal deaths and the imprecision of estimates of mortality rates before the project began, the trends in mortal-

Table 2. Selected COPC Projects Classified According to Institute of Medicine Staging Criteria

Practice	Definition of Community	Identifying Health Problems	Modifying Health Care	Monitoring Program Impact
IHS Manyfarms	IV	IV	III	III
IHS Papago/Sells	III	III	IV	IV
IHS Injury Project	II	II	II	II
PROD, Jerusalem	IV	IV	IV	IV
CHAD, Jerusalem	IV	IV	IV	IV
Denver DHH	II	II	II	II
Baltimore	II	II	II	III
Kaiser, Portland	IV	IV	IV	IV

ity rates are difficult to interpret. The authors attributed their failure to reduce infant mortality to the extremely poor quality of housing in the Manyfarms area (McDermott et al., 1972). The usual dwelling in this sometimes harsh climate was the hogan, a window-

less mud-and-log dwelling with a dirt floor, no latrine, and a central smoke hole. The leading cause of morbidity and mortality in children under five years of age was the *pneumonia-diarrhea complex*, an illness that we would now class as viral because of its unresponsiveness to antibiotic therapy. One can speculate that, had oral rehydration therapy (Sanders and Carver, 1985, p. 193) or resources for improving housing conditions been available, the impact of the Manyfarms project might have been different.

Gastroenteritis in Arizona's Papago Indians. Given limited resources for medical care and public health, the Indian Health Service has sought to target high-risk infants as a more efficient means of reducing infant mortality and morbidity. One of the most common causes of morbidity and mortality had been gastroenteritis. In 1972, a method of predicting risk level was tested at the Sells Service Unit of the IHS in south central Arizona (Nutting et al., 1975). This COPC practice was one of the seven case studies in the IOM study. The project described here represented stage III or IV in the different COPC tasks (table 2). Based on a comprehensive community-based database (Institute of Medicine, 1984b), all Indian infants less than 1 year of age living on the main Papago Reservation and receiving primary health care from the IHS were included. Risk factors including birth weight, age of principle guardian, area of residence, infant's weight, and household crowding were used prospectively to calculate a *risk level*. Preventive education provided by Papago Tribal Health Workers was the experimental intervention. Assignment to experimental and control groups was nonrandom, so that confounding with the factors determining receipt of the intervention is a concern. Nonetheless, the reduction in morbidity due to gastroenteritis in treated high risk infants, when compared to un-

treated high risk infants, was significant (fig. 4). The peak in November reflects seasonal variation in the incidence of diarrheal diseases. While the authors did not explicitly address seasonality, the data for the treated high risk infants show a reversal of the seasonal
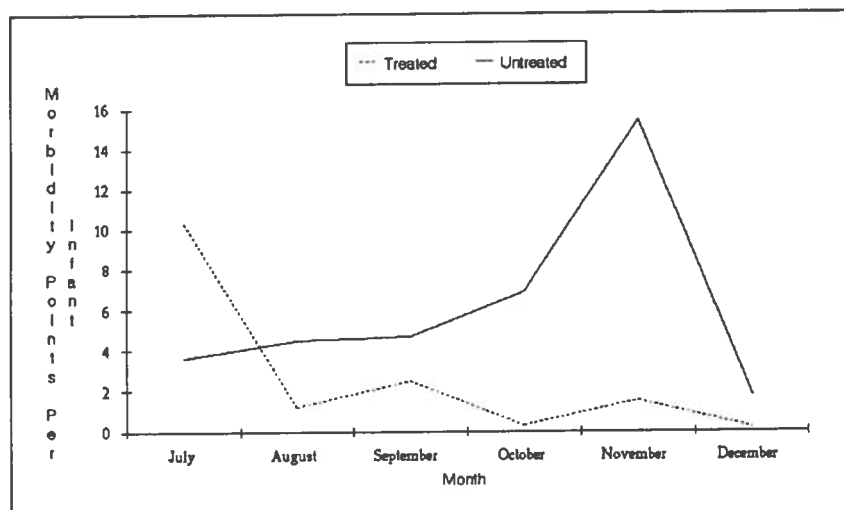

Figure 4. Gastroenteritis Morbidity in High Risk Papago Infants, 1972. One point was assigned for every episode of gastroenteritis, and four for every hospitalization for gastroenteritis. The treatment, a health education program, was carried out in August and September. Modified from Nutting et al., 1975.

trend observed for the untreated high risk, treated low risk, and untreated low risk infants.

The Indian Health Service's Injury Prevention Programs. As infectious diseases were brought under control in U.S. Native American populations, injuries have emerged as a leading cause of death. Noting a late-1970s mortality rate from injuries that was twice that of U.S. whites or blacks, the IHS in 1982 initiated community injury control programs in each of its service units (Robertson, 1986). Making use of hospital data tapes and extrapolating 1980 census figures (with adjustment for births and deaths), the IHS calculated crude incidence rates for major injury types. Rates of "people trained or

equipment distributed per 100 population" were calculated from the responses to questionnaires by 54 of the IHS's 124 service units. Although the large population served does not seem like a community, the project really amounts to numerous parallel COPC projects that were coordinated and analyzed in the aggregate. This is basically a stage II COPC practice. The results of multiple regression analysis were disappointing: although a clear decrease in hospitalizations due to falls could be attributed to specific interventions, the magnitude of the change was small (the rate decreased from 6.1 per 1000 population in 1980 to 4.1 per 1000 in 1984), and only 35% of the decrease could be explained by specific interventions that were included in the regression model. The impact on other types of injuries was minor.

Other Achievements of the Indian Health Service. The Indian Health Service, which has maintained a strong commitment to the delivery of COPC, has been successful in most of its attempts to improve the health of Native Americans and Alaskan Natives. Life expectancy at birth for American Indians increased from 60 years in 1950 to 71.1 years in 1980, just 3.3 years less than that for whites (Rhoades et al., 1987). Similar trends have been documented for infant mortality rates, maternal deaths, tuberculosis death rates, and other indicators of health status. However, with the exception of the studies discussed above, little information that allows one to evaluate the efficacy of COPC has been published.

Integrated Child Health Services in Jerusalem. Kark and his colleagues at the Hebrew University-Hadassah School of Public Health and Community Medicine in Jerusalem began the program for Promotion of Growth and Development (PROD) as a COPC

demonstration project. Because the primary care practice at which the project was based carried out more active surveillance of its population than neighboring practices, and because the investigators feared that randomization into experimental and control groups could lead to "contamination" of the control group, a "time sample" was chosen (Palti et al., 1982). More than 95% of children in the practice's catchment area are seen during their first two years of life in this stage IV COPC practice (table 2). All children born in the practice area between September 1, 1975 and December 31, 1976 were included in the intervention group. Children born between August 1, 1974 and May 1, 1975 served as controls. Because there was 15% population mobility per year, and because changes in the practice, the community, and the region are not controlled for, this may be a source of confounding. The intervention was the addition of time to scheduled well-baby visits for structured discussion of mother-child interaction and for training in verbal stimulation, play interaction, etc. Effectiveness was assessed by measuring the Developmental Quotient (DQ) at 24 months of age. When initial results showed no significant differences between the experimental and control groups, the researchers recruited three colleagues to subjectively rate the nurses who carried out the educational intervention as 'good,' 'intermediate,' or 'poor' in the quality of stimulation provided. When the data were analyzed separately for children whose mothers were provided with 'good' stimulation by their nurse, a significant increase in DQ was found for children of mothers with eight or fewer years of education ($p < 0.01$) and for those whose mothers came from North Africa or Asia ($0.01 < p < 0.05$). The magnitude of these differences was small, however (fig. 5).
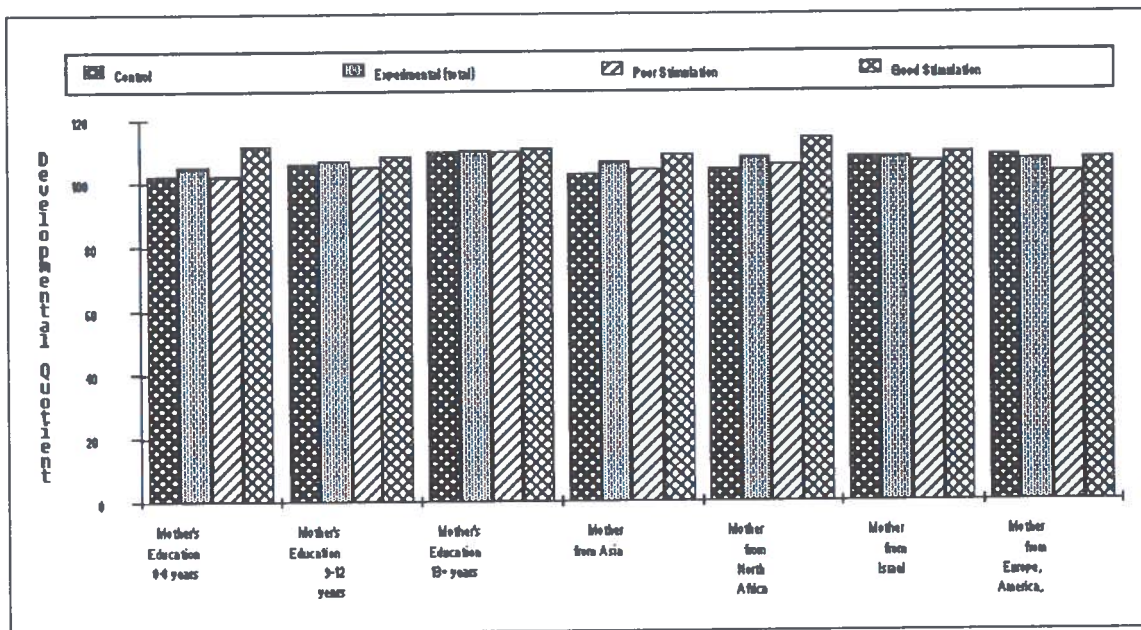
Figure 5. Mean DQ Scores at 2 years of Age According to Mother's Characteristics and Exposure to Intervention, PROD Program. Adapted from Palti et al., 1982.

The CHAD Program in Jerusalem. In 1971 the Department of Social Medicine of the Hebrew University-Hadassah School of Public Health and Community Medicine instituted a program to address the community syndrome of *h*ypertension, *a*therosclerosis, and *d*iabetes (CHAD). The program was instituted as an integral part of the University's COPC practice in Kiryat Hayovel, West Jerusalem, thus drawing on that practice's community survey data as well as clinical records. The target high risk population (and experimental group) were the adult residents (age 25 or over) of four housing projects. Controls were the residents of an adjacent neighborhood. The selection of both groups was population based (i.e., random), not a convenience sample. Both experimental and control populations were examined in identical health examination surveys in 1970 and 1975 (Abramson et al., 1981). Each group had free access to primary health care in their neighborhood. In the 1970 survey, 79.1% of residents of the two neighborhoods aged 35

42

or older were interviewed and examined (n=2679). In the follow-up survey of 1975, 524 members of the CHAD population and 1,512 members of the control population were examined. The respective response rates were 91% and 83%, with attrition due to mobility or death in the two groups accounting for the rest of the decrease in sample size. The authors chose to include 38 people who moved out of the CHAD neighborhood during the five year study with the control population for analysis, assuming a conservative bias from the switch. This assumption seems reasonable -- if the intervention had any positive effect on those individuals, their inclusion with the controls for analysis would diminish the difference between the CHAD and control populations. But the authors cannot exclude other biases from this and other sources of attrition in the study populations. The arbitrary inclusion of 38 people originally in the experimental group with the controls probably didn't change the conclusions drawn from the study, but does reflect a sometimes lax attitude toward study design.

The intervention, planned from the results of this community diagnostic study, was based on primary care with an emphasis on preventive medicine. High risk individuals were identified as part of the initial survey and during ongoing surveillance at the clinic. Individual care plans were focused on the control of hypertension, the reduction of serum cholesterol to below 200 mg/dl, weight reduction, and smoking cessation. Counselling by physicians and nurses was augmented with optional participation in support groups for some patients. The medical treatment of hypertension was according to a standard stepped-care protocol, beginning with a diuretic and with the addition of a beta blocker or other drugs as needed. Control of serum cholesterol was mainly by diet, but clofibrate

was used for some patients. Over 90% of the respondents in the CHAD neighborhood had participated in the program, indicating the effectiveness of the practice's outreach efforts. Overall reductions in the prevalence of hypertension, hypercholesterolemia, ciga-
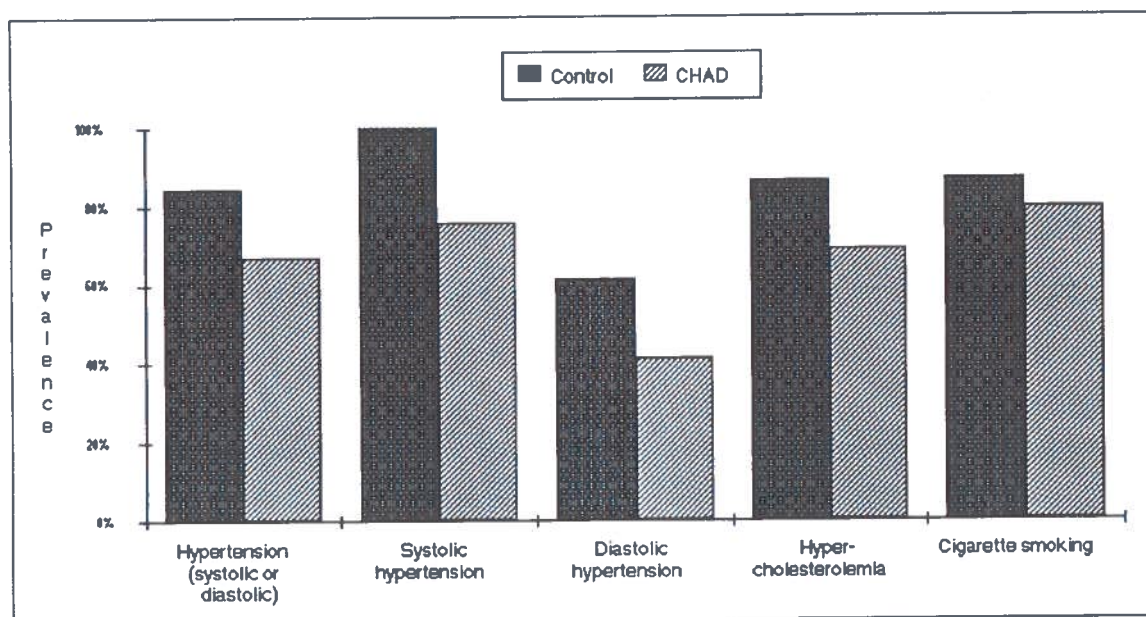

Figure 6. Risk Factor Prevalence in CHAD and Control Populations, 1975, as the Percent of the Prevalence in 1970. After Abramson et al., 1981.

rette smoking, and obesity were observed in both the CHAD and control populations (fig. 6). Reductions were greater in every case for the experimental group. Statistical testing for significance involved stratification by age and sex, one-tailed tests, and nonparametric tests appropriate for paired observations. The *net* decrease in prevalence (the difference between the decrease in prevalence for the experimental group and the control group) was statistically significant for systolic hypertension ($p < 0.025$; fig. 7) and for diastolic hypertension ($p < 0.05$). The *net* reduction in blood pressure was 3.4 mm Hg systolic and 1.9 mm Hg diastolic. The net reduction in the prevalence of obesity was also significant ($p < 0.025$; fig. 8). Statistically significant reductions in hypertension

44

(diastolic and/or systolic) and cigarette smoking were found for men, but not for women (probably reflecting the limits of the study's power). Interestingly, diabetes mellitus is not discussed in the pa-per. Despite some methodologi-

Figure 7. Change in Prevalence of Systolic Hyperten-sion, CHAD and control Groups. From Abramson et al.,

cal irregularities in the study, it is a convincing demonstration of the efficacy of COPC-based preventive care in reducing risk factors .
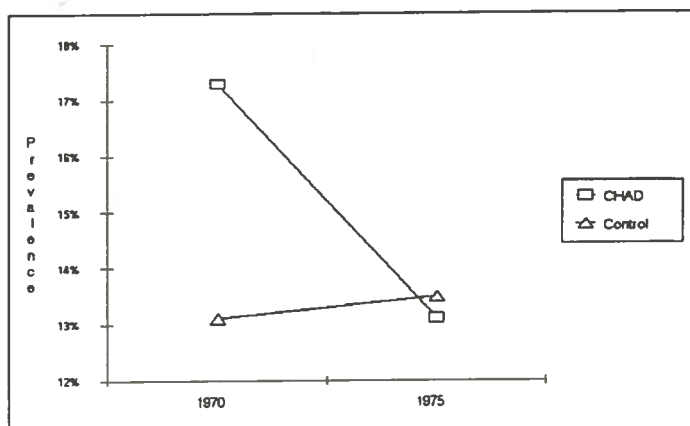
The next two studies, one from Denver and one from Balti-more, were not true COPC proj-ects. Each attempted to measure the impact of comprehensive pri-mary health care services on the health of poor and disadvantaged

Figure 8. Change in Prevalence of Obesity, CHAD and control Populations. After Abramson et al., 1981.

people. The intervention in each case was the establishment of multiple primary care facilities in inner city neighborhoods with the aid of new federal and state funding. Both of the studies were population based and primary care oriented. In a sense, then, they were COPC taking over at the evaluation phase. Since they are of-ten cited as support for the viability of COPC, they are reviewed here.

Infant Mortality in Denver. During the 1960s a wide variety of Federal and State programs were instituted in the hope of meeting the health care needs of poor and disadvantaged people. Because most individual projects covered only a small segment of the population and because authority was fragmented among several agencies, these efforts were often poorly coordinated and difficult to evaluate. In 1964 the Denver Department of Health and Hospitals (DDHH) began to develop a comprehensive family-centered health care program for 130,000 needy residents of Denver (Chabot, 1971). The plan provided two Neighborhood Health Centers and 12 satellite Health Stations which in 1969 served 66,000 patients. To assess the impact of the program, DDHH researchers compared infant mortality rates in 25 lower socioeconomic census tracts with the rate for Denver's 75 other census tracts. In 1964 the rates were 34.2 per 1000 live births and 23.5 per 1000 live births, respectively. By 1969, the rates were 24.5 and 19.2 -- no longer statistically significant. This reflected a 39.8% decrease in the infant mortality rate for Denver nonwhites between 1964 and 1968; more than twice the nationwide decrease, giving Denver the second lowest rate of U.S. cities of 400,000 to 1,000,000 population in 1968. Limited data from federal welfare programs and other sources showed no major changes in socioeconomic status or demographic makeup in these 25 census tracts over the study period. This study would be graded at stage II (table 2), relying chiefly on geographic comparisons to evaluate efficacy.

Prevention of Rheumatic Fever in Baltimore. One of the most convincing demonstrations of the potential effectiveness of COPC was a study on the effect of four inner-city comprehensive care programs in Baltimore on the incidence of rheumatic fever

(Gordis, 1973). Eligibility for the programs was determined by census tract of residence. The 1968-1970 and 1960-1964 annual incidence rates of rheumatic fever for black children five to 14 years old in eligible census tracts was compared with the incidence rates for adjacent census tracts, for all noneligible tracts in the city, and for noneligible tracts that were at least 90% black. Cases were ascertained by a chart review of all Baltimore area hospital discharges with a primary diagnosis of rheumatic fever during the study periods. The annual incidence of rheumatic fever for residents of eligible census tracts decreased by 60.4% to 10.6 cases per 100,000 per year between the two periods (p < 0.005;
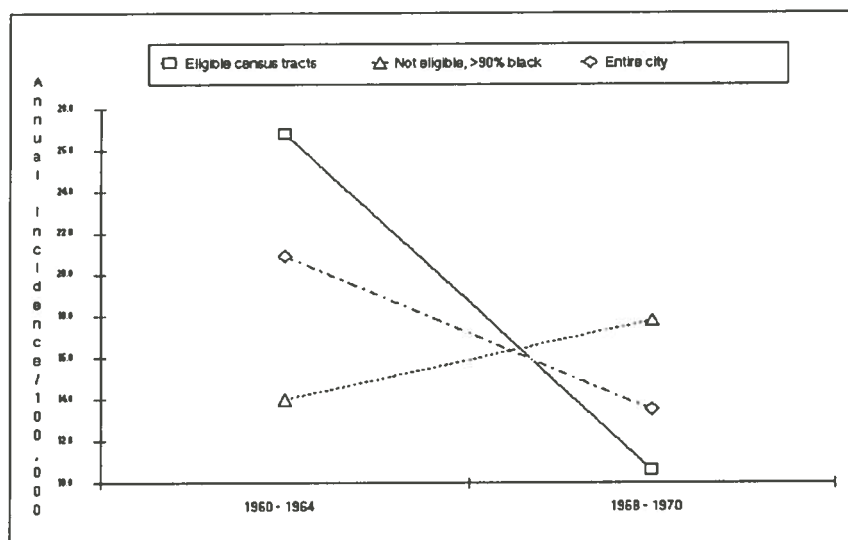
Figure 9. Changes in the Incidence of Rheumatic Fever in Baltimore, 1960-64 to 1968-70. Eligible census tracts received comprehensive primary health care.

fig. 9). In other black areas in Baltimore, the incidence actually increased. The city-wide incidence decreased by 35.4% to 13.5 cases per 100,000 population per year, a rate higher than that achieved in the impoverished areas served by comprehensive primary care practices. The city-wide decline was entirely attributable to a decrease in the incidence of rheumatic fever preceded by an identifiable respiratory infection -- in other

words, cases preventable by primary medical care. This was basically a stage II COPC project, although the data used in evaluating the efficacy of comprehensive primary care were specific to the target population (table 2).

Outreach by Kaiser-Permanente, Portland Oregon. One of the first neighborhood health centers opened with Office of Economic Opportunity funding in 1967 was the Kaiser-Permanente Neighborhood Health Center Project in Portland. The program provided medical care and outreach services to approximately 7,000 low income people enrolled in the Kaiser Medical Care Program, a health maintenance organization. Kaiser researchers conducted a study from September 1, 1972 to August 31, 1973 to assess the efficacy of outreach services at increasing the use of preventive services by preschool children (Colombo et al., 1979). This was a true stage IV COPC practice, with a practice community defined by Neighborhood Health Center membership. Based on population-specific data showing that poor clients underused preventive services, a clinical trial of targeted outreach services was undertaken. This is one of the few examples in the literature of a COPC project with stage IV evaluation. High risk families were randomly assigned to either a control group with no outreach or to an experimental group in which neighborhood health coordinators (residents of the target community hired by Kaiser as outreach workers) provided information to their clients regarding the benefits of vaccination and other preventive care. During the study year the average number of "primary procedures" per 100 person-years was 227 for the experimental group and 146 for the control group ($p = 0.01$). Since the "primary procedures" measured were mainly immu-

nizations, which are known to reduce the incidence of infectious diseases, this was claimed to be a demonstration of a positive effect on health.

The Institute of Medicine Case Studies. Although the stated objective of the Institute of Medicine's COPC study was "to critically assess ... the existing data/evidence that describe the operation, costs, and impact of the various expressions of COPC in the United States" (Institute of Medicine, 1984a, p. 1), the report was primarily a detailed description of the seven case studies. They observed that each of the study sites had at least one highly motivated physician who provided the drive behind COPC development (Nutting and Connor, 1986). The study also found that none of the sites had much community involvement in planning; COPC reflected provider rather than community desires. Financial support for COPC overhead was seen as crucial (Nutting et al., 1985). As is the case with the studies reviewed above (some of which were IOM case studies), few health problems targeted in COPC practices are discovered as part of the COPC process. Instead, they are problems that were appreciated well *before* a targeted epidemiologic study was used as part of the planning process. Another feature common to all COPC practices is the support of an *active data system* which made possible the epidemiologic studies needed for COPC. Finally, the IOM report notes that the monitoring/evaluation function of COPC is seldom developed to any significant degree, partially accounting for the dearth of evidence regarding COPC's efficacy.

Missing from all attempts to evaluate the efficacy of COPC (and from the Institute of Medicine staging scheme) is the specification of what aspects of COPC should be tested. How can we decide whether COPC is a good way to deliver health care? Most of the

studies discussed above are in reality testing the efficacy of specific projects that were designed under the framework of COPC, and not testing COPC itself. Even when a COPC practice population has been compared with a similar control population, the effect on health is due to an intervention that could have been designed and implemented in some other manner. The issue of the costs of implementing and supporting COPC has been largely ignored (Madison, 1983b; Reed, 1987).

I have begun to think that COPC should not be seen as an alternative to other ways of delivering health care. Instead, COPC might be defined as the combination of primary care, community medicine, and evaluation within one organization. The establishment of a focus on the health of a community, rather than on the patients in a community who happen to seek care, is *a priori* a better way of planning and delivering health care. This is true if we decide that it is the health of the larger community that we want to promote. But COPC may represent an inappropriate attempt on the part of primary care physicians to usurp the roles of public health officials. And it is not immediately clear that primary care providers should be entrusted with evaluating their own work; in clinical research, this lack of blinding would be considered a potential source of bias. A short feedback loop as described above should provide for more timely and well-adapted planning in the individual practice. The issue then becomes economic: balancing the costs of integrating surveillance and program evaluation into primary care against the costs of delayed or poorly matched responses to changes in the health status of a community. It seems likely that COPC will prove to be a more efficient way to deliver health care services than the fragmented system currently in place.

Barriers to Implementing COPC

For many reasons, COPC has not become a major force in the American health care system. A number of barriers to the establishment of COPC as a practice model in the United States have been identified. Underlying all of these barriers is a lack of emphasis on the public's health, with a consequent lack of prestige and support for primary care and public health. The lack of glamour inherent in preventive care renders such activities a poor cousin at most institutions. And the medical profession itself has traditionally restricted its attention to the individual doctor-patient encounter (Madison, 1983a).

America's Pluralistic and Complex Health Care System. It is hard to imagine any single medical practice defining and assuming responsibility for a population in this country. Even in rural areas there are multiple providers on the market. In urban settings the choices presented to a health care consumer are mind boggling. Most people receive care from a variety of sources, including urgent care clinics, hospital emergency rooms, general practitioners in private practice, specialists, and county clinics. It is not at all unusual for the members of a family to each be the patients of a different, unrelated medical practice. For medically indigent people, that very large fraction of the populace who have neither public nor private health insurance, the situation is even worse. These people often bounce from free clinic to emergency room to county clinic, occasionally seeing a private physician when finances or circumstances permit. Without a rational, universal health care system, it will probably never be possible to deliver truly community-oriented primary care to most Americans.

Reimbursement for Health Services. There are definite marginal costs for COPC. The maintenance of a clinical database, data analysis, and program planning all demand specialized skills and equipment. Special epidemiologic studies are even more expensive to conduct. In the present political economy of the U.S., health cost containment is the universal concern. Thus, it is very difficult for most practices to pay for any activities that are not directly reimbursed (Madison, 1983b; Rogers, 1982). Madison (1983a) calls preventive care "Cinderella service" because, although it lacks glitter and glamour, preventive medicine is of great benefit in the long run. These Cinderella services are valued very little, according to our reimbursement schedules. Beyond the lack of financial resources for COPC, the incentive for the individual practitioner is to provide invasive and technically sophisticated curative services.

COPC and Medical Education. Traditional medical education, with its emphasis on sophisticated hospital-based care, may be an impediment to the development of community-oriented approaches to health care. When the role models and clinical experiences of undergraduate and graduate medical training are centered around technologically intensive interventions, it is no surprise that students gravitate toward those fields (Boufford, 1983; Geiger, 1983). The obvious personal rewards of a primary care physician, both money and prestige, cannot compare with those of a prenatal neurosurgeon or sports cardiologist, compounding the problem of recruitment for primary care specialties. But the family practice literature is full of reports demonstrating that the quality of early medical experiences has a great impact on specialty choice of medical students (Brave-

man and Mora, 1987). Without positive early experiences and successful mentors, entry into the primary care specialties will probably continue to lag.

Another aspect of education is also important to the future of COPC: the skills needed by the COPC practitioner are not part of the usual medical curriculum (Abramson, 1983; Geiger, 1983). The specialized training in epidemiology, demographics, planning, and program evaluation that are needed would ordinarily require several extra degree programs. To some degree the use of multidisciplinary teams can provide such skills to the practice. But a basic knowledge of epidemiology and public health -- beyond that usually available in medical school -- is essential for physicians to work effectively in COPC practices, even when experts are a part of the team. Another subtle weakness in traditional medical education is cooperation; most doctors have been taught to function as the lonely captain of the ship, not as part of a team (Rogers, 1982). A number of Latin American and Israeli programs have gone far in providing such training, just as they have provided positive primary care experiences as a part of their curricula (Abramson, 1983; Braveman and Mora, 1987).

COPC at the Haight-Ashbury Free Medical Clinic

It seems clear that COPC can be an effective approach to the provision of health services in developing countries. Whether it can serve as an effective and efficient model in the pluralistic health care system of the United States is not so clear. One area where COPC seems to have clear applicability and utility is the provision of health care services to vulnerable populations. Most of the COPC practices established in the United States

53

have been targeted at underserved groups, whether urban or rural. Community-oriented primary care may have special advantages in the setting of providing health services to a population with resources that are clearly inadequate. The COPC process can then facilitate the setting of priorities and the careful evaluation of programs, leading to efficient and efficacious health care spending. Groups that have commonly been targeted for special programs include pregnant women, teen or other high risk mothers, young children, and poor inner city residents. Two groups of special concern to the Haight-Ashbury Free Medical Clinic are *medically indigent adults* (MIAs) and *homeless people*. The latter group, a subset of MIAs, will be the focus of initial steps toward COPC at the Free Clinic.

The first phase of bringing COPC to the Haight-Ashbury Free Clinic involves both the definition of a practice community and the assessment of that community's health needs. Because the resources available at the Free Clinic are extremely limited, we are focusing on making the most of information that is readily available. This will include the gathering, collation, and interpretation of data from the practice, as is described in the remainder of this report. While some purists would say that this is not *real* COPC, since there is no population-based data collection, it is a step that is within reach of this practice. The project will also include the use of a variety of secondary data sources: census data, county and state health department reports, American Medical Association practice area profiles, and so on. Finally, it will draw on the perceptions of those close to the target population. The nurses, physicians, medical students, office workers, and other volunteers and staff members of the Free Clinic will be called upon to help in the

identification of health needs and the setting of priorities for action and standards for the

evaluation of all clinic services.

Chapter 3

Design Issues

The Haight-Ashbury Free Medical Clinic's Uniform Database Pilot Project is intended to be the first step in the development of community-oriented primary care at the Free Clinic. This means that the database system will be expected to provide information on the demographic and social makeup of the clinic's population of current users, as well as the health problems of that population. The system will also be expected to generate surveillance data for the evaluation and monitoring of clinic programs. The design of a data management system for these and related purposes is the subject of this chapter.

The overall tasks of COPC, as detailed in the previous chapter, will require the use of many other data sources. Such sources can initially include U.S. census publications and data tapes, county and state health department statistics, regional and local economic forecasts, and a wide variety of national, state, and local studies. As the San Francisco Community Clinic Consortium is able to develop cooperative data collection procedures and the pooling of patient data, a richer base of clinic-based information will be available (Cubbon, 1987; Trachtenberg et al., 1987). The Consortium is already undertaking focused studies of certain vulnerable populations, including adolescents and homeless people, that will be useful for the planning of community-oriented health care services (Carroll Johnson, personal communication, 4/25/89). This report will be limited to the

56

planning and implementation of a new patient data management system at the Haight-Ashbury Free Medical Clinic. While this process has included detailed consideration of many other potential data sources, and of ways to integrate such information with routinely collected patient data for planning purposes, they will be discussed here only briefly.

A tremendous quantity of demographic and clinical information resides in the medical records of almost any health care facility. Almost all facilities record such basic facts as age, sex, race, place of residence, reason for seeking health care, and disposition for all patient contacts. The data are only infrequently used in the planning and evaluation of health care services, in part because they are not routinely tabulated into useful or accessible forms. The increasing availability of computers for use in medical practice has recently made it much easier for individual practices to manage routinely collected data in a way that facilitates epidemiologic and quality control analyses (Cubbon, 1987; Kamerow, 1987). The Uniform Database Project seeks to tap the flow of data in community clinics (in a manner that is smoothly integrated with all aspects of clinic operations) for use in demographic and epidemiologic studies.

The ultimate application of computers in medical practice is the completely computerized medical record. So-called paperless medical records systems were originally developed at a handful of academic medical centers (Barnett, 1989; Blum, 1986). Fully computerized medical records systems in which all patient data are electronically stored are still rare, with accounting and billing still the predominant uses of computers in health care (Bleich et al., 1985). Many clinical functions are becoming routinely auto-

57

mated, however, including patient registration, scheduling, clinical laboratory reporting, and medication prescription (Bleich et al., 1985; DeTore, 1988). In fact, for-profit providers have generally embraced computer-based automation as an important tool in the race for profits (Prussin, 1987). Some hospitals, including Boston's Beth Israel Hospital and the entire Veteran's Administration system, have already achieved a high degree of automation, providing a rich source of clinical data for research purposes (Bleich et al., 1985; Munnecke and Kuhn, 1989; Safran and Porter, 1989).

Computer automation and computerized medical records have not been limited to hospital settings. Computerized medical records and automation systems have been developed in and for a variety of ambulatory care settings (Bridges-Webb, 1986a; Chan, et al, 1987; Gabrielli, 1987; Kannus et al., 1987; McDonald and Tierney, 1986; McDonald et al., 1989). Computers have also been widely used in chronic disease registers (Fries and McShane, 1986; Romaniuk and Blanks, 1987), emergency room logging (Januzik, 1986; Stewart et al., 1985), clinical medical education (Anastasio et al., 1986), and other areas. Very powerful desktop microcomputer systems have become readily available (and affordable) in the past 5 years. The performance of such a system is astounding by the standards of only a few years before; it can easily handle data management and analysis tasks which were until recently relegated to minicomputers and mainframes costing orders of magnitude more. This new availability of computer power is fostering a revolution in health care administration, as with other fields.

Computers are virtually essential for the sophisticated data analysis that the Uniform Database Project call for. To perform manually the collation and analysis of even a mod-

est data set of, say, 1,000 patient encounters would take far too much time to be routinely applied in most settings, as witnessed by the complexity and limited adoption of early integrated medical information systems for family practice. Despite their importance, however, the planning of a data management system should largely ignore the specifics of the computer system until the very last moment (Kruse, 1987). A high-quality system depends on careful definition of the desired *results*; that is, what the system must produce. The desired reports and searching capabilities will naturally define the required data *input*. Only when the output has been specified and the input defined should the data handling *process* be designed. If, instead, the first design step involves firing up the computer and cracking the software manuals, the system is likely to be ill-suited to the needs of the organization. This need-driven approach was taken in designing the Free Clinic's new data handling routines.

Desired System Output

Community-Oriented Primary Care. The main goal of this project is the development of an information base from which to evaluate and plan primary health care services at the Haight-Ashbury Free Clinic. The previous chapter extensively reviewed the COPC literature, in which the definition of a practice community and the assessment of its health status are central tasks. Our approach to these tasks is incremental, beginning with the Free Clinic's active patients as suggested by Hawk and Calvert (1987).

The Free Clinic serves a broad mix of patients including homeless people, the working poor, visitors to the city, and recent immigrants. It is doubtful whether a precise defi-

nition of the Free Clinic's target population could ever be reached, no matter what resources were available for the effort. There are no lists of potential clients (as in Britain's National Health Service or in health maintenance organizations), no geographic boundaries that determine eligibility for clinic services. Many of these clients are transients, and many more are transiently without health insurance. The nature of the Clinic's active clients seems to change from month to month and from year to year.

Despite these difficulties, the Clinic can do much more than it has to define the population for which it provides health care and to measure their health status. Even transient populations can be characterized, if not enumerated (Ellerbrook et al., 1987). Recent research has provided new methods and insights for understanding the complex problems faced by homeless people (Bassuk and Rosenberg, 1988; Ismach, 1989; Koegel and Burnam, 1988; Koegel et al., 1988; Rossi and Wright, 1987; Rossi et al., 1987). At present, planning decisions at the Clinic are made primarily on the basis of clinical impressions. While such impressions may be quite accurate in the initial identification of health problems, they do not provide a reliable method for setting priorities or for evaluating the impact of Clinic activities.

By tabulating basic information on each patient and clinical encounter, an empirical basis for planning can be established. It should be straightforward to define the demographic composition of the Clinic's active patient population, and the distribution of health problems in that group. In addition, the position of these clients in the U.S. health care system will be of great interest. Age- and sex-specific rates for the incidence or prevalence of various diseases or complaints in the Clinic's patient population should be

produced by this system on a monthly basis. The specific design of the system is presented in the next chapter.

A myriad of questions can be answered, at least in part, with such information. From what parts of the city, state, or country do Free Clinic patients come? Are there segments of San Francisco's population who don't make use of the Free Clinic? What are the unmet (or poorly met) health needs of Clinic patients, and of specific subgroups, such as the homeless? To what degree does the Free Clinic provide services to people who have other means of obtaining health care? How many of the Clinic's patients would otherwise end up at the San Francisco General Hospital emergency room, where the cost of providing care is at perhaps an order of magnitude higher? Answering such questions will help the clinic to define its mission and tailor its services to those most in need.

Extrapolating from the active patient population to a larger target community is more difficult. Under both the Israeli and Institute of Medicine models of COPC, a community beyond the practice's active patients is the focus of concern. Various secondary data sources can be used to help define that community, but community surveys have been the gold standard for defining COPC practice communities whenever a complete enumeration is not available (Abramson and Kark, 1983; Mullan and Nutting, 1986). Unfortunately, such studies are very expensive, especially in large urban settings. We feel that accurate information on those who seek care at the Free Clinic will provide substantial insight into the diverse elements of San Francisco's populace to which the Clinic hopes to provide health care. It is a certainty that there will be selection bias in this clinic-based sample: some members of the 'real' community will not seek health care as readily (or at

all), and others will seek it from other sources, such as the emergency department of the county hospital or the county's venereal disease clinic. This bias may be extremely important; for example, homeless people may face important barriers to their use of health
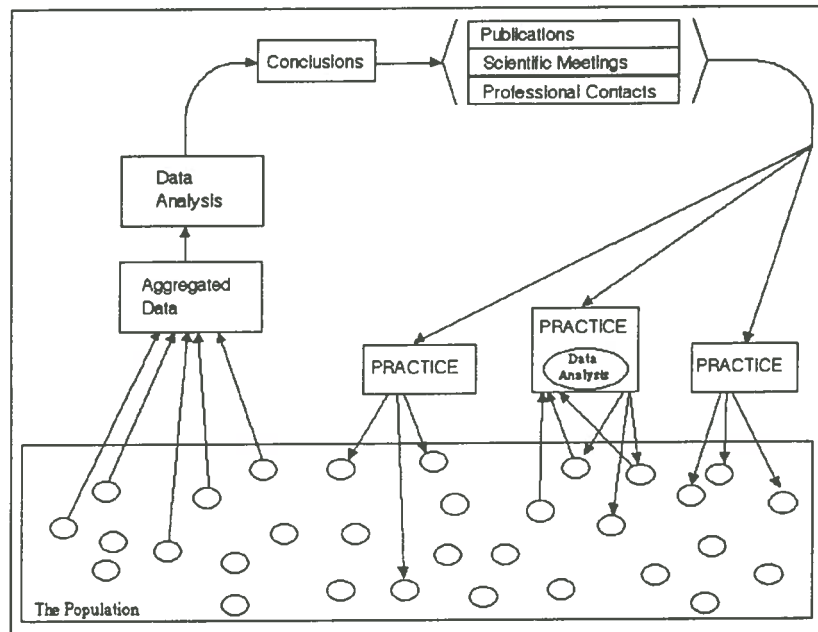

Figure 1. The Short Feedback Loop of Primary Care Epidemiology. The practice that studies its target population or active clients can realize more timely adjustment of itss services. After Mullan, 1984.

care services (Robertson and Cousineau, 1986), and such limits to access may have an important effect on their health (Lurie et al., 1984). Still, precise measurements of the clinic's active population can provide a much better basis for planning than no measurements at all. This will be especially true if continuous surveillance can be established -- the *short feedback loop* of primary care epidemiology (fig. 1; Mullan, 1984). A practice that studies its own patients in this way will not be able to make the broader generalizations that more carefully controlled research can (the long feedback loop), but will be more aware of its own patient population and the trends that affect it.

Patient Care. Any clinical data management system should support patient care directly whenever possible, and should be smoothly integrated into the clinic's operations so that patient care is not interfered with. We do not envision anything approaching a computerized medical record, but even very simple record keeping can be useful in routine operations.

One way in which a computer system can directly improve patient care is by automatically generating preventive care reminders for specific patients (Block and Brennan, 1988). Another is the targeting of individuals at high risk for some health problem based on computer matching of a risk factor profile, as anticipated by Nutting and colleagues (1975). Computers have been used to enhance the continuity of care for homeless people and other transients in urban locations where there are multiple providers (Barry et al., 1986; CDC, 1987; Filardo, 1985; Nichols et al., 1986; Schwingl et al., 1987). The important point for the design of the Uniform Database Pilot Project is to allow for the later development of such uses as integral parts of the system. For example, epidemiologic data need not have any personal identifiers (unless record linking is required), but automated preventive care reminders and patient tracking obviously require access to individual patient records. The Free Clinic's new system has been designed with such applications in mind.

Clinic Administration. A computerized clinical information system can aid in the administrative functions of a medical practice in a wide variety of ways. One immediate need of the Haight-Ashbury Free Clinic is the generation of complex reports to various grant agencies (Marsha Taylor, personal communication, 5/9/89). The limited data

collection performed by the Clinic in the past was begun only to meet reporting requirements (see chapter 4). The Clinic is required to tally the number of homeless clients and the number of clinical encounters for these clients according to complex rules; a task much more efficiently handled by computer than manually. Other tasks which should be coordinated with the Uniform Database Project include the scheduling of both patients and staff (Hancock et al., 1988; Roach, 1984), the determination of Medi-Cal eligibility (Sear, 1988), and quality review. The Haight-Ashbury Free Medical Clinic is quite unusual: at most sites, the expansion of an existing administrative computer system to include COPC tasks should be attempted (Jacobs, 1987).

Facilitation of Public Health Surveillance Activities. Traditional disease surveillance methods, whether passive or active, usually suffer from severe underreporting biases (Sacks, 1985; Thacker et al., 1983). Most disease surveillance programs are passive: physicians are urged or 'required' to report incident cases of diseases such as AIDS, cholera, or tuberculosis, as are clinical laboratories and hospitals, depending on the jurisdiction and the specific surveillance system. Even when such reporting is mandated by law, reporting to public health authorities can include less than 10% of incident cases. Such low ascertainment may be more than satisfactory, however, if the goal of surveillance is the timely detection of outbreaks or trends (Klaucke et al., 1988). Unfortunately, the timeliness of surveillance reports is often compromised.

Practice-based computerized surveillance, if linked to public health department systems, can potentially improve both the completeness and timeliness of surveillance data. Such systems have been tried in France (Valleron et al., 1986), Belgium (Lobet et al.,

64

1987), North America (Iverson et al., 1988), and elsewhere. Data from these systems suffer from several biases, such as the exclusion of those individuals not seeking care, the exclusion of those who seek care at sites which aren't part of the network, and incomplete
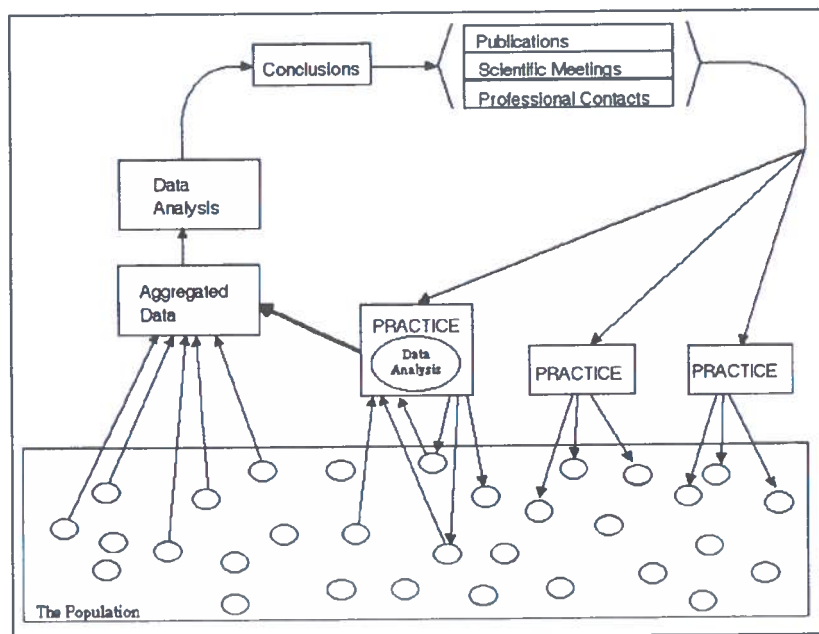

Figure 2. The Long and Short Feedback Loops of Epidemiology Can Exist Together.

reporting by network members (Green et al., 1988a). They are nonetheless a valuable source of information, and the development of such a network in San Francisco, especially if integrated with the county health department, should facilitate better planning of services. I see this as the integration of data collection to feed both the short and the long feedback loops of epidemiologic research simultaneously (fig. 2).

Facilitation of Academic Research Projects. Although the main purpose of the Uniform Database Pilot Project is to enhance program planning, a system of this type can go far in supporting research projects. Microcomputers such as the IBM PC-AT or the

65

Apple MacIntosh have been widely used in clinical and epidemiologic research (Hawkins and Singer, 1986; Johnson, 1985; Voynick and Makuch, 1988). Integrated data management systems intended to facilitate both patient care and research have also been described (Rock et al., 1986). Distributed data processing for clinical research, with each individual site performing data entry and initial tabulation locally and then sending data electronically to a main research center for analysis, will probably become the norm within a short time (Davis et al., 1985). In the present case, we have paid attention to the possibility of collaborating in clinical or epidemiologic research projects. Thus, the system has been designed for easy modification and flexible data manipulation that does not require extensive programming. All data sets can be stripped of personal identifying information for research purposes. And a wide variety of file formats are supported for communication.

Another, more fundamental way in which the Uniform Database Project will ease the burden on researchers is the establishment of a minimum basic data set. Information such as *age* and *housing status* were not abstracted from records in the past, but now will be part of the main patient register. Baseline information on *occupation, income, insurance coverage*, and *education* was seldom (if ever) recorded at the Free Clinic until this project was begun. Thus, it will now be possible to perform retrospective case-control studies using clinic charts: basic demographic information will be recorded.

Documenting Medical Education Experiences. The Haight-Ashbury Free Medical Clinic is, in addition to a primary care provider for medically indigent people, an educational facility. A number of residency programs have used computers to document the

66

specific experiences of their trainees (Bordley et al., 1987; Ellsbury et al., 1987; Johnson and Murata, 1988; Schneeweiss et al., 1987). With growing attention to the quality of care delivered by clinicians in training, it may become necessary to document training experiences in a much wider variety of settings, including sites like the Free Clinic.

Diagnostic and Encounter Classification Schemes

Any attempt to tabulate clinical data -- whether computer based or manual -- necessitates the explicit definition of diagnostic categories. Formal case classification is necessary to avoid ambiguity in compiling statistics; diseases (or other entities) that are truly similar should be included under the same rubric, but diseases which are dissimilar must be distinguished from one another. Classification allows the uniform labelling of diseases, symptoms, or other medical facts, and facilitates the consistent recording of medical information. When broad categories are used (e.g., "dermatology"), inclusion and exclusion criteria are mandatory if the results are to be interpretable.

Of the many case classification schemes in use, the *International Classification of Disease, Ninth edition, Clinical Modification* (ICD-9-CM) is by far the dominant one (Iezzoni, 1987; Rosko, 1988). This system represents more than 80 years of international cooperation, and forms the basis for Medicare's *diagnosis related groups* (DRGs) in the United States. Unfortunately, ICD-9-CM has several major drawbacks, especially in the context of ambulatory care research. It is heavily slanted toward the blend of medical problems treated at hospitals, making little provision for classifying and recording encounters that do not end in an exact diagnosis, for multiple or chronic problems that re-

sult in more than one encounter, for recording of diagnostic or therapeutic measures, or for the health care process that takes a symptom and produces both a diagnosis and a treatment (White, 1988). Moreover, the logical structures of the 17 chapters are neither consistent nor orthogonal. The tenth revision of ICD was originally scheduled to be implemented in 1989; at present little has been done to address the deficiencies noted above (Brämer, 1988).

Many alternatives to ICD-9-CM have been devised, but few have gained widespread use. Attempts to classify the content of primary care in the United States have remained idiosyncratic even when compatibility with ICD-9-CM was retained, although some of these schemes have proven quite useful to the authors who devised them (Martin and Werblun, 1977; Schneeweiss et al., 1986; Schneeweiss et al., 1983). Among the better known classification schemes for primary care are those of the Royal College of General Practitioners and the *International Classification of Health Problems in Primary Care* (ICHPPC), the latter of which benefited from international cooperation in its design (Bridges-Webb, 1986b). The recently introduced *International Classification of Primary Care* (ICPC), based on ICHPPC and developed by the World Organization of National Colleges, Academies, and National Associations of General Practitioners/Family Physicians (mercifully abbreviated "WONCA"), is likely to become a dominant alternative to ICD (Lamberts and Wood, 1987). This scheme provides a consistent and rational structure from chapter to chapter, with most chapters corresponding to organ systems. Provision is made for classifying all aspects of health care: the reason for an encounter with a health care provider, the diagnostic steps and other elements in the process of providing

care, the eventual diagnosis if one is arrived at, and any therapeutic interventions (Wood, 1987, 1989). The ICPC also retains compatibility with ICD-9-CM, a crucial factor for research applications since so many existing data sets are ICD-9-CM coded.

For our purposes we have adopted two strategies. Because the cost of extracting data from patient charts and coding by a scheme such as the ICPC is substantial, routine coding will be according to an idiosyncratic scheme of our own. As detailed in the next chapter, this coding scheme will include very broad categories (e.g., "dermatology"), as well as more specific categories for the problems most frequently seen at the Free Clinic. This scheme will allow summary reports to be generated with minimal effort and expense, and will allow researchers to rapidly assemble a more limited group of patients among whom a condition of interest was found. For some special studies, however, and perhaps for all data in the future, ICPC will be adopted.

Data Processing Procedures

Once the output of a data management system has been specified, the required input is fairly easy to define. Having specified the output of a data handling system, then decided which items of information must be collected to generate the desired output, it is necessary to design procedures for collecting the data and collating them into a form that allows easy retrieval and analysis. Data entry could take place when data are first collected (in our case when charts are reviewed) or later, after first being transcribed onto log sheets. Because this is a new system and represents significant change for the Free Clinic, we have chosen to retain elements of the previous manual system. Thus, data are

69

extracted from charts onto log sheets, which are later transcribed into the computer database. The overall design of the Free Clinic's new system is depicted in figure 3; details will be found in the next chapter.
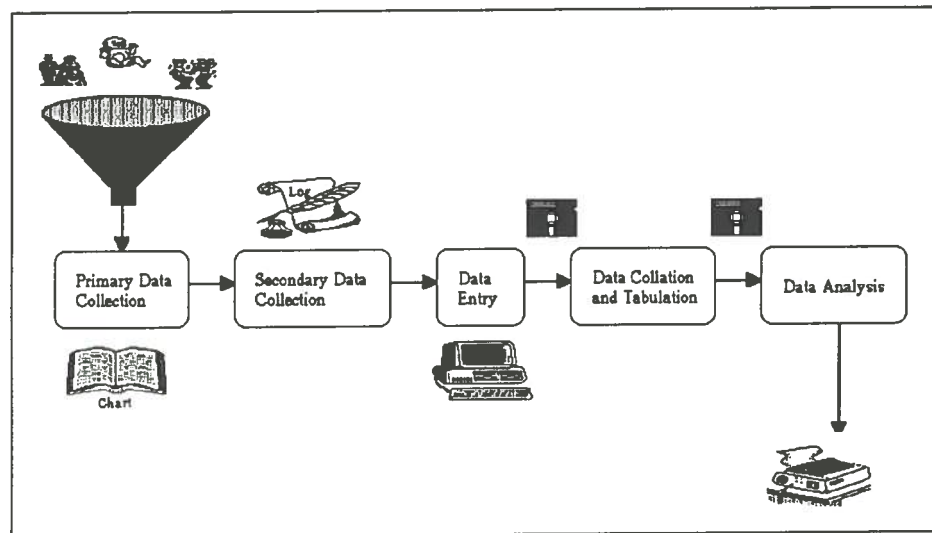

Figure 3. Data Flow in the Uniform Database Pilot Project. Information is abstracted from patient charts onto log sheets, which are later entered into a computer database. Tabulation and analysis can take place on a remote computer if necessary.

In most epidemiologic studies, data analysis is performed in an interactive and progressive manner. A researcher will typically begin by calculating crude rates and risk ratios, next test for confounding (perhaps by stratifying the data), then consider the possibility of interaction among variables. After a period of exploratory data analysis, more complex or sophisticated models will be created, with appropriate adjustment procedures, hypothesis testing, regression analysis, and other statistical techniques applied. Even in extremely well designed studies some adjustments in the analysis are usually required. It is this process of steadily refining the analysis that makes epidemiology an art as well as a science.

In contrast, community-oriented primary care requires the routine production of epidemiologic data analyses. This is analogous to surveillance; COPC really requires a highly flexible surveillance system. The need in this case is for routine reports, without much investment in programming or data analysis. For this project, both approaches have been applied. A variety of routine reports have been devised, providing regular updates on the demographic and medical characteristics of the patient population. At the same time, provision for more sophisticated and customized analyses has been made; data can easily be transformed, graphed, or exported to any of a variety of standard statistical packages.

Integration

In many ways the most difficult task of designing this system has been the integration of diverse needs and goals. The main purpose of this system remains the collation of data for use in planning primary care services based on the COPC model. At the same time, clinic administrative functions and patient care functions can use the same system. This means that these and other needs must be weighed equally in the design of the system. Different practices will have very different needs as well. The Uniform Database Pilot Project has been designed with complete office automation and standardization across diverse systems in mind. Integration has been attempted in all planning stages, but we recognized early that a system could never satisfy all of its diverse users. Thus, easy modification of the system has also been of prime concern. Hopefully, this system can grow into a county-wide tool for the rational planning of health care services.

Chapter 4

Methods

The Uniform Database Pilot Project has been conducted in three stages (fig. 1). The first stage was a comprehensive evaluation of the Clinic's data collection and processing procedures as they existed in the summer of 1988, when the project began. The Clinic's
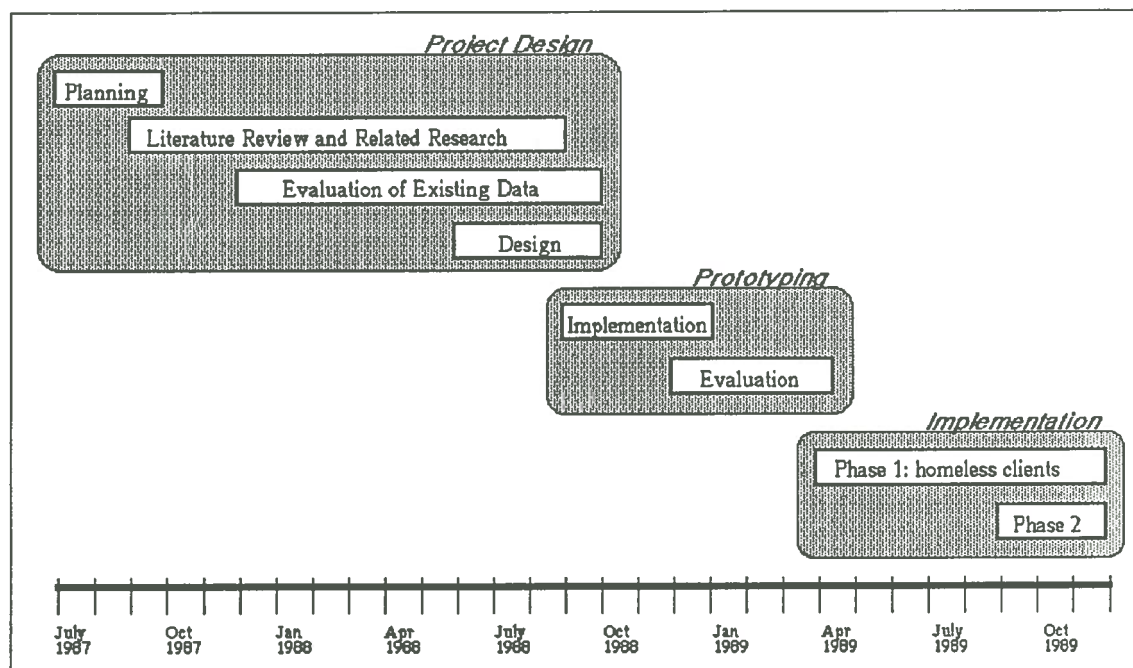

Figure 1. Timeline for the Uniform Database Pilot Project at the Haight-Ashbury Free Medical Clinic.

procedures as we found them are described below, and examples of the data obtainable from the old system are given in the next chapter. In parallel with this assessment, a literature review was conducted with the goal of defining the characteristics of an ideal uni-

form database for a group of urban community clinics. This review included personal contact with a number of other clinics, San Francisco Bay area COPC workers, and the Alameda County Health Consortium (where a uniform database system has been in place for a number of years; Trachtenberg et al., 1987). The second phase was a prototype implementation of the Uniform Database at the Haight-Ashbury Free Medical Clinic. This prototype allowed us to gain experience with our approaches to organizational reform, software development, forms design, and related tasks. Based on our experience with that prototype, final implementation was begun in April of 1989 and will continue through the fall of that year.

Evaluation of Existing Clinic Procedures

This project began with an assessment of the Haight-Ashbury Free Medical Clinics existing data handling procedures. The goals of this assessment were to describe the data handling procedures then in use, to identify the data that could be extracted from Free Clinic records, and to evaluate the usefulness of that information.

The Haight-Ashbury Free Medical Clinic has provided medical care to all who sought it for more than 20 years (Seymour and Smith, 1986). Care is provided mostly by third and fourth year medical students; an occasional physician's assistant or nurse practitioner intern will also serve a rotation there. Students from the UCSF School of Medicine usually spend one afternoon per week at the Clinic as part of a Family Medicine clerkship. The Free Clinic, both the oldest and most famous in the United States, draws students from all over the country. Many foreign medical students spend four to six

weeks at the clinic, improving both their clinical skills and their English. An attending physician, either the half-time medical director or one of many one-night-a-month volunteers, supervises the students and is ultimately responsible for the care of every patient. Volunteers also staff the clinical laboratory and perform many ancillary tasks. Most of the office workers are college work-study students. This complex blend of students, volunteers, and part time workers is supervised by two full-time clinic coordinators, a half-time medical director, a quarter-time laboratory director, and a full-time clinic director. Monthly reports on clinic activities, derived according to procedures approved by the clinic director and medical director, are the responsibility of the clinic coordinators. In practice, most data collection and processing is performed by work-study students.

The Free Clinic's data handling procedures have been driven entirely by the reporting requirements of various granting agencies, especially those of the San Francisco Department of Public Health. The Haight-Ashbury Free *Medical* Clinic is a division of the Haight-Ashbury Free Clinics, Inc. (formerly Youth Projects Inc.), and reports regularly to the board of directors of that organization. Most of the Free Medical Clinic's operating budget comes from contributions made by patients and members of the community, but in addition the Free Clinic receives funding from the city and county of San Francisco and from the state of California. The San Francisco Department of Public Health has the most stringent reporting requirements; under a long-standing contract for the provision of primary health care services, the Free Clinic reports total patient visits and encounters for a number of disease categories on a monthly basis (fig. 2). Age- and sex-specific figures are not reported. Other reports include the total numbers of clients

haight ashbury   558 clayton street   telephone   "medical care is a right
free medical clinic   san francisco 94117   415 431 1714   not a privilege"

MONTHLY PATIENT STATISTICS

MAY MISC.	133
ACUPUNCTURE SCREEN	
AIDS SCREEN	54
ASTHMA	4
CARDIOVASCULAR (EKG)	2
DENTAL	0
DERMATOLOGY	71
Herpes	8
Infestations (crabs, lice, scabies)	30
Warts, Common	6
EARS, NOSE, AND THROAT	24
EMERGENCY BIRTH CONTROL PILLS	17
EMERGENCY FIRST AID	
Abcesses I & D	1
Allergy Shots	0
Sutures Removed	6
Tetanus Shots	5
Wounds Dressed	3
Wounds Sutured	1
EYES	4
GASTROINTESTINAL	11
GENITO-URINARY	37
Urinary Tract Infections	19
GYNECOLOGY	75
HEPATITIS AND FOLLOW-UP	8
POSSIBLE HEPATITIS AND PROPHYLAXIS	6
HYPERTENSION SCREEN AND TREATMENT	18
LAB WORK ONLY	10
MUSCULO-SKELETAL	54
OTHER	71
PHYSICALS	0
PODIATRY	4
RECTAL-ANAL	4
SEXUALLY TRANSMITTED DISEASES	
Gonorrhea Cultures	46
(Positive 0)	
Intestinal Parasites	5
(Positive 2)	
VDRL Testing	50
(Positive 2)	
Venereal Wart Treatment	15
STREP CULTURES	15
(Positive 1)	
TB SCREEN (PPD)	19
(Positive 1)	
UPPER RESPIRATORY INFECTIONS	26
TOTAL NUMBER OF PATIENT VISITS	540
TOTAL NUMBER OF DIAGNOSES AND SERVICES	774
TOTAL NUMBER OF SOCIAL SERVICES	15
TOTAL NUMBER OF TELEPHONE SERVICES	4325
TOTAL SERVICES	5119

*   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *

Figure 2. Haight-Ashbury Free Medical Clinic Monthly Report. Sample report is shown at 70% of actual size.

per month by sex and by race (but not sex *and* race together). Until this project began, none of these reports or statistics were used for planning purposes.

The ultimate source of data at the Free Clinic is the patient chart. When a person visits the clinic for the first time, she or he fills out a two page intake form. On the front of this form (fig. 3) are questions regarding basic personal information: *name, date of birth, sex, race, living situation* (single or couple), and *address* and *phone number*. With the exception of the questions on *living situation* and *sex*, all are fill-in-the blank rather than check-off-the-box. The rest of the front page and most of the back page (fig. 4) are devoted to a standard medical history questionnaire. At the bottom of the second page a consent statement is followed by a question regarding Medi-Cal eligibility. Assistance with the form is available for illiterate clients and for those with learning disabilities.

At least two people are in principle responsible for ensuring the accuracy and completeness of these intake forms. When a patient first registers, the *office coordinator* (a college work-study student) is supposed to quickly review the form before entering it in the new chart. These front office workers are also responsible for answering patients' questions, retrieving and filing patient charts, answering the phones, logging laboratory results, making appointments, and almost any other nonclinical task that comes up. After registering, and on all subsequent visits, the patient's vital signs and chief complaint are taken by a *medical assistant*. This person, often a pre-medical college student, is supposed to review the information on the intake form for completeness. In addition, the medical assistant is required to ask the patient if all information (especially address and phone number) is up to date. All clients are free to withhold any information they

HAIGHT ASHBURY FREE MEDICAL CLINIC

Answer questions only if you want to— This is confidential between you and the Clinic.

Name_____   Age_____ Birthdate_____
    (Please Print)
Local Address_____   Male_____ Female_____
City/State_____   Single___ Couple_____
PHONE # At Home_____ At Work_____   Race/Ethnic Group_____

Who can we notify for important test results?

Name_____   Phone_____
Address_____   City/State_____

Please list any drugs or foods you can not take:

Do you have a special diet?   Describe:

Do you.......(circle)   drink coffee, black tea or sodas? How much daily?_____

                        smoke cigarettes? How much daily?_____

                        drink alcohol? How much daily?_____

                        smoke grass? How much daily/weekly?_____

                        use other drugs? What kinds? How often?_____
                        _____

                        exercise regularly? How?_____

Have you ever been hospitalized or had an operation? Been in an accident or had stitches?
How old were you?   What happened?

Please circle IMPORTANT problems you have had in the past (not your current symptoms).

SKIN AND HAIR   NOSE
  Unusual hair growth or loss   Nosebleeds
  Chronic rash or boils   Chronic stuffed nose
  Recurrent hives   Polyps
  Acne   Sinus problems
  Wart problems   Other_____
  Athlete's foot
  Other_____   MOUTH AND THROAT
                                         Wear dentures
EYES   Repeated toothaches
  Chronic itching or discharge   Problems swallowing or chewing
  Wear glasses or contacts   Voice changes
  Vision problems   Abnormal taste
  Color blindness   Sores or herpes
  Other_____   Bleeding or sore gums
                                         Other_____
EARS
  Hard of hearing   NECK
  Previous ear infections   Injury
  Ear pain, ringing or discharge   Thyroid problems
  Other_____   Chronic pain or stiffness
                                         Other_____

Figure 3. Haight-Ashbury Free Medical Clinic Intake Form (part 1). This is the old intake form, in use until the fall of 1988. Reduced to 70% of actual size.

77

HEART AND LUNGS
    Chronic cough
    Shortness of breath or wheezing
    Chest pains
    Rheumatic fever
    TB or TB medication
    Pneumonia
    Told you had a murmur
    High blood pressure
    Chest wounds or injury
    Other_____

BLOOD
    Anemia
    Sickle cell disease
    Easy bruising
    Other_____

GASTROINTESTINAL
    Abdominal pains
    Ulcers
    Call Bladder problems
    Hernia
    Wounds or injuries Where?
    Chronic constipation (Too hard)
    Chronic diarrhea (Too Loose)
    Previous Hepatitis What kind?
    Intestinal parasites
    Bleeding hemorrhoids
    Serious vomiting
    Foreign travel in the last 2 years
    Other_____

SKELETAL
    Chronic back problems
    Joint pain Where?
    Swelling or deformity
    Amputation Where?
    Fracture or dislocation Where?
    Other?_____

NEUROLOGICAL
    Ever had a seizure or convulsion
    Concussion or head injury
    Head X-rays Why?
    Paralysis
    Severe headaches or dizziness
    Other_____

GENITO/URINARY PROBLEMS
    Previous bladder or kidney infections
    Blood in urine
    Kidney stones
    Dribbling or leaking
    Operations or procedures on genitals
    Other_____

SEXUALLY TRANSMITTED DISEASES
    Gonorrhea
    Syphilis
    NSU (nonspecific urethritis)
    Venereal warts
    Herpes
    Other_____

Please tell your clinician if you think your
sexual orientation could be important to the
completeness of your health care. We will
respect your privacy.

GYNECOLOGY (FOR WOMEN ONLY)
    How often do you have a period? _____ days
    How many days do you flow? _____
    Regular or irregular?
    Cramps? Slight, moderate or severe
    Bleed between periods Rarely or frequently

    Current birth control method_____
    Number of times you've been pregnant?_____
    How many living children? _____

    Repeated vaginal discharges? Yes No Rarely
    What kind?_____
    Ever had P.I.D. (pelvic inflammatory disease)?
        Yes No Hospitalized
    Ovarian cysts or enlargement Yes No Which side?
    Breast lump? Biopsy?
    Did your mother take DES while pregnant with you?
        Yes No Am not sure
    Other_____

I GIVE MY CONSENT TO BE EXAMINED AND TREATED BY THE HAIGHT ASHBURY FREE MEDICAL CLINIC

SIGN HERE _____

DATE_____   MEDICAL ASSISTANT SIGNATURE_____

Thanks for filling out this history form. If you have any suggestions or comments about
the way you were treated, please tell your medical assistant who will act as your
patient advocate or drop us a note in the donation box. We would appreciate your thoughts.
The donation box is at the top of the stairs. Help us out if you can.
I HAVE MEDI-CAL   YES   NO   FORGOT STICKERS   MEDI-CAL ELIGIBLE
Your file is confidential, however if you have Medi-Cal we may be obligated to release
your diagnosis (orlu) before we receive reimbursement. Tell us if you object.

Figure 4. Haight-Ashbury Free Medical Clinic Intake Form (part 2). This is the old intake form, in use until the fall of 1988. The poor legibility is the result of many generations of photocopying, the original having been lost long ago. Reduced to 70% of actual size.

78

choose; a name is required, but it can be an obvious alias like "Moon Pie" or "Ronald Raygun." In actual practice there is little effort to ensure that the form is filled out completely.

Medical information from each visit is recorded on a daily encounter form (fig. 5). After the vital signs are recorded by the medical assistant, the clinician records the history, physical findings, assessment, and plan. The use of this problem oriented medical record format is Clinic policy. The results of diagnostic tests are stapled into the chart over the encounter form. At the end of the visit, the clinician who treated the patient is supposed to mark the category or categories in which the visit falls at the top of the encounter form. Most clinicians find these labels hard to decipher, and most attending physicians place little weight on their completion. The reason for encounter coding is thus ignored more often than not.

The Clinic's monthly reports are derived from routine chart review. At the end of each week, a work-study student logs every encounter sheet that has been signed by an attending physician during that week. This student is traditionally one who has been with the clinic for some time (a year or more), but the position requires no special medical or administrative training. The name, sex, and ethnicity of the patient are copied from the chart onto one line of a log sheet. Because charts are logged in the order in which they are signed by the attending physician each week, repeat visits by the same patient often are logged onto separate sheets. Based on both the clinician's selection of encounter categories (top of fig. 5) and a careful but brief reading of the chart, one or more boxes representing the reason for the encounter are checked off on the log sheet entry.

79

Figure 5. Haight-Ashbury Free Medical Clinic Encounter Form. This is the old encounter form, in use until the spring of 1989. Shown reduced to 70% of actual size.

The log sheets have 25 lines per page, with each line containing the record for a single clinical encounter.

Table 1. Data Items at the Haight-Ashbury Free Medical Clinic.

Before June 1988	After June 1988	Before June 1988	After June 1988
Acupuncture Screen	Acupuncture	Sprain	-
Allergy	Allergy Shots	Musculoskeletal (other)	Musculoskeletal
AIDS (comprehensive)	AIDS (comprehensive)	Podiatry	Podiatry
AIDS (intermediate)	AIDS (intermediate)	PPD	PPD
AIDS (brief)	AIDS (brief)	Psychiatric	Counseling
ECG	Cardiology/ECG	Asthma	Asthma
Hypertension	-	Bronchitis	-
Allergic Dermatitis	-	Strep (or culture)	Strep (or culture)
Bacterial Skin Infection	-	Upper Resp. Infection	Upper Resp Infection
Cellulitis	-	Respiratory (other)	-
Fungal Skin Infection	-	Gonorrhea (or culture)	Gonorrhea (or culture)
Dermatology (other)	Dermatology	Hepatitis testing	Hepatitis testing
Ears, Nose, and Throat	Ears, Nose, and Throat	Hepatitis	Hepatitis
Conjunctivitis	-	Herpes	Herpes
Eyes (other)	Eyes	Infestation	Infestation
Fissures/Hemorrhoids	Rectal/Anal	NSU/NGU/Chlamydia	NSU/NGU/Chlamydia
Gastroenteritis	-	Stool Culture/O&P	Stool Culture/O&P
GI (other)	Gastrointestinal	VDRL	VDRL
Prostatitis	-	Warts (venereal)	Warts (venereal)
Urinary Tract Infection	Urinary Tract Infection	Warts (common)	Warts (common)
Genitourinary (other)	Genitourinary	Tetanus immunization	Tetanus immunization
Birth Control Pills	Birth Control Pills	Suturing	Suturing
Pap Smear	Pap Smear	Wound Dressing	Wound Dressing
Vaginitis	-	Suture Removal	Suture Removal
Gynecology (other)	Gynecology	Well Physical	Well Physical
Lab Work Only	Lab Work Only	Miscellaneous	Other

Although the log sheets retain the connection between *person* and *problem*, this connection is not used at all. Collation and analysis consist primarily of summing each column on the log sheets over the entire month. Some aggregate totals are calculated. For example, the *dermatology* field on the monthly report includes allergic/contact dermatitis, bacterial skin infections, cellulitis, fungal skin infections, and other. Until July of

1988, each of these categories was recorded on a separate column of the log sheets. At that time several categories were collapsed to conform more closely with the categories being reported (table 1). I have used the monthly reports for my initial assessment of data handling procedures at the Haight-Ashbury Free Medical Clinic.

Time series data was graphed both directly and with smoothing. Smoothing was accomplished by calculating the mean of each raw data point and the five points on each side. Each data point in the smoothed data set, then, is the average of 11 data points from the raw data set. Correlation analysis used Pearson's product-moment correlation coefficient (Zar, pp. 306-311). Tests of significance for correlations were two-tailed. Linear regression analysis is reported with standard errors for the parameters.

Evaluation of Clinic Surveillance Data

Reportable diseases are logged in a special notebook at the Free Clinic when positive lab reports are entered into patient charts. This logging is performed by a variety of college work-study students, most of them with no medical training and most of them with less than six months experience at the Clinic. Diseases reported include all legally reportable conditions, of which the clinic regularly treats gonorrhea, syphilis, tuberculosis, and type B hepatitis. Chlamydial urethritis was only recently added to this list.

The representativeness of clinic data regarding trends in the incidence of infectious diseases was tested by comparing clinic records with data from the San Francisco county health department (as reported in the monthly San Francisco Epidemiologic Bulletin). I chose to compare the trends in incidence rates for *gonorrhea, syphilis*, and *hepatitis B* at

the Free Clinic with those for San Francisco. Because they occur with some frequency in the Free Clinic's population, these diseases allowed sufficient sample size for statistical validity in this comparison. This analysis was performed both with the Clinic's recorded incident cases and with the rates of testing for these conditions at the Free Clinic. The rates of testing were tried as surrogate measures of incidence in the Free Clinic's client population because the completeness of recording incident cases was in doubt. Comparison of the trends in the two populations was made by linear correlation analysis, with two-tailed tests of significance, and with the Kolmogorov-Smirnov test for goodness of fit between two distributions.

Redesign of the Free Clinic Data System

Two major changes have been made in the Clinic's data handling procedures: the data items collected were revamped, with the addition of many new items, and the abstracted data were entered into a computer database. The most important additions were demographic and social questions: *housing status* (homelessness), *occupation, income, source* of income, *insurance,* and *education.* The questions on race/ethnicity, living situation (marital status), personal habits, and medical history were revamped as well (figs. 6 and 7). These changes and additions to the information collected on each patient allow the clinic to produce a minimum basic data set that is compatible with most other data sets (Treviño, 1988).

Forms Design and Primary Data Collection. The quality of the information recorded in patients' charts was felt to be poor at the outset of this project. Questions are

often unanswered, information is not reliably kept up to date, and some questions are answered incorrectly. These problems have been attributed by staff members to the poor quality of the forms used (poorly phrased questions and illegibility) and to laxity on the part of Clinic personnel in reviewing patients' answers on the intake forms. Because of these deficiencies and because of the need for additional questions, new intake forms were designed as part of the prototype implementation. The new intake form was introduced in the fall of 1988. It has undergone several revisions since then, mostly for cosmetic reasons, with the final version introduced in May of 1989 (figs. 6 and 7).

The daily encounter form was also redone, although mostly for cosmetic purposes (fig. 8). The word "cosmetic" is not meant to be pejorative; the look of these forms is an important determinant of the way people view the Free Clinic. In addition, the layout of a form is important for efficient and accurate data collection, both for clinical and research purposes. Although more substantial changes in the reason for encounter categories were planned, the medical director felt strongly that compatibility with the older categories must be maintained. Several categories have been added for completeness, including *endocrine* and *neurological* problems, *AIDS related illness* (as opposed to AIDS screening), and *chiropractic* and *podiatry* services. There is now clear distinction between a diagnosis and a diagnostic test, with the latter being recorded on a separate laboratory test form.

Computer Database Development. Data collection and processing procedures have been changed as little as possible in order to avoid straining the Clinic's resources. Thus, although it might be more efficient and accurate to enter data directly into the computer,

84

Haight-Ashbury Free Medical Clinic

558 Clayton St., San Francisco, CA   94117   (415) 431-1714

Answering these questions helps us to serve you better, helps us qualify for federal aid for homeless people and other funding.
Your answers may be used *anonymously* for research, but will not affect your care - this is a FREE clinic!
This is completely confidential.

Name: _____ _____	Today's date: _____

Last   First   MI

Birth date: _____

Sex: ☐ Male   ☐ Female

Race:
☐ White   ☐ Native American
☐ Black   ☐ Other
☐ Asian/Pacific Islander

Hispanic:
☐ Yes
☐ No

Are you presently homeless?   ☐ Yes   ☐ No

If so, where do you spend the night?
☐ Shelter   ☐ Car   ☐ Park
☐ Rent-free with friends/family (less than 90 days)
☐ Other

Local Address: _____

_____

Home phone: _____   **Work phone:** _____

Emergency contact: _____   **Phone:** _____

Living situation: ☐ Single (never married)   ☐ Divorced/Widowed   ☐ Married/Couple   **Family size:** _____

Occupation: _____

Monthly Income (if any): _____

Source:
☐ No Income   ☐ Public Assistance (GA, AFDC, SSI, SSDI, etc.)
☐ Employment
☐ Other   ☐ Worker's Compensation

Insurance:
☐ No insurance
☐ Medi-Cal   #:_____
☐ Medicare
☐ Private/HMO

Are you a U.S. Veteran?   ☐ Yes   ☐ No

Education:
☐ 8th Grade or less   ☐ High School graduate
☐ Some High School   ☐ College/other post-HS

Current Medications: _____

Drugs or food you cannot take: _____

Any special diet? _____

How much do you use each day:

Coffee/Black tea/soda: _____   Alcohol: _____
Cigarettes: _____   Grass: _____

What else do you use?

Has anyone in your family had:
☐ Cancer   ☐ High blood pressure
☐ Diabetes   ☐ Heart Disease

I give my consent to be examined and treated by the Haight-Ashbury Free Medical Clinic.

Signature: _____   **Date:** _____

If you wish to make a contribution, our donation box is near the entrance. Donations are appreciated but not required.
Please fill out both sides

Figure 6. Haight-Ashbury Free Medical Clinic Intake Form (part one). This is the current version, in use at the Free Clinic since fall of 1988. Shown at 70% of actual size.

85

Please check all __important__ problems you have had in the past (not your current problem)

Skin and Hair
- ☐ Unusual hair growth or loss
- ☐ Chronic rash or boils
- ☐ Recurrent hives
- ☐ Acne
- ☐ Wart Problems
- ☐ Athlete's foot
- ☐ Shingles (herpes zoster)
- ☐ Kaposi's sarcoma (KS)

Eyes and Ears
- ☐ Wear glasses or contacts
- ☐ Chronic itching or discharge
- ☐ Vision problems
- ☐ Color blindness
- ☐ Hard of hearing
- ☐ Ear infections
- ☐ Ear pain, ringing, or discharge

Nose
- ☐ Nosebleeds
- ☐ Chronic stuffy nose
- ☐ Polyps
- ☐ Sinus problems

Mouth and Throat
- ☐ Wear dentures
- ☐ Repeated toothaches
- ☐ Thrush (oral Candida)
- ☐ Problems swallowing or chewing
- ☐ Voice changes
- ☐ Abnormal tastes
- ☐ Sores or herpes in mouth
- ☐ Bleeding or sore gums

Neck
- ☐ Injury
- ☐ Thyroid problems
- ☐ Chronic pain or stiffness
- ☐ Swollen glands (lymph nodes)

Heart and Lungs
- ☐ Chronic cough
- ☐ Shortness of breath or wheezing
- ☐ Chest pain
- ☐ Rheumatic fever
- ☐ TB (tuberculosis) or TB medicine
- ☐ Pneumonia
- ☐ Heart murmur
- ☐ High blood pressure
- ☐ Chest wound or injury
- ☐ Heart attack or angina

Digestive System
- ☐ Abdominal pain
- ☐ Ulcers (stomach or intestines)
- ☐ Gall bladder problems
- ☐ Hernia
- ☐ Constipation (stool too hard)
- ☐ Chronic diarrhea (stool too loose)
- ☐ Hepatitis (type:_____)
- ☐ Intestinal parasites
- ☐ Bleeding hemorrhoids
- ☐ Serious vomiting
- ☐ Foreign travel in last two years
- ☐ Bloody, dark, or light stools

Skeletal
- ☐ Chronic back problems
- ☐ Joint pain
- ☐ Swelling or deformity
- ☐ Amputation
- ☐ Fracture or dislocation

Blood
- ☐ Transfusions
- ☐ Anemia
- ☐ Sickle cell disease (or trait)
- ☐ Bruising (platelet problems)

Neurological
- ☐ Seizure or convulsion
- ☐ Concussion or head injury
- ☐ Head X-rays
- ☐ Paralysis
- ☐ Severe headaches/dizziness

Genital and Urinary
- ☐ Bladder or kidney infection
- ☐ Blood in urine
- ☐ Abnormal urinalysis
- ☐ Kidney stones
- ☐ Dribbling or leaking
- ☐ Genital operation or procedure

Sexually transmitted
- ☐ Gonorrhea
- ☐ Syphilis
- ☐ Non specific urethritis (NSU or NGU)
- ☐ Chlamydia
- ☐ Venereal warts
- ☐ Herpes
- ☐ AIDS or ARC

Please tell your clinician if you have any other health concerns

Gynecology (for women only)

How often is your period?_____
Is it :
- ☐ Regular
- ☐ Irregular

How many days do you flow? _____
Cramps:
- ☐ slight
- ☐ moderate
- ☐ severe

Bleeding between periods:
- ☐ rarely
- ☐ often

Current birth control method:_____

How many pregnancies?_____

How many living children? _____

Repeated vaginal discharge
- ☐ yes
- ☐ no
- ☐ rarely

Pelvic inflammatory disease
- ☐ yes
- ☐ no

Ovarian cysts or enlargement
- ☐ yes
- ☐ no

Breast lumps
- ☐ yes
- ☐ no

Did your mother take DES
- ☐ yes
- ☐ no
- ☐ not sure

Please fill out both sides.

Figure 7. New Haight-Ashbury Free Medical Clinic Intake Form (part two). Shown at 70% of actual size.

Haight-Ashbury Free Medical Clinic

558 Clayton St., San Francisco, CA 94117 (415) 431-1714

Name:		☐ Afternoon ☐ Evening	**Clinician:**
			Check all that apply
Last	First	MI Date:	**Diagnosis:**

Medical Assistant:
Check When Verified:
- ☐ Homeless status
- ☐ Address/Phone
- ☐ Income/Work
- ☐ Insurance

If any have changed, correct the intake sheet. The patient does not have to answer, although it will help the clinic to raise money.

Initials:

B/P: _____ Pulse: _____ Resp: _____ Temp: _____ Wt: _____

LMP: _____ VA: _____ Allergies: _____

Diagnosis:

☐ AIDS (except screen)

Derm
- ☐ Allergic
- ☐ Bacterial
- ☐ Cellulitis
- ☐ Fungal
- ☐ Infestation
- ☐ Warts
- ☐ Other

- ☐ Eyes
- ☐ ENT

Resp
- ☐ Asthma
- ☐ Bronchitis
- ☐ Strep
- ☐ URI
- ☐ Other

CV
- ☐ Hypertension
- ☐ Cardiac

GI
- ☐ Hepatitis
- ☐ Rectal/Anal
- ☐ Other

GU
- ☐ Prostatitis
- ☐ UTI
- ☐ Other

☐ Gynecology

STD
- ☐ Chlamydia
- ☐ Gonorrhea
- ☐ Herpes
- ☐ Syphilis
- ☐ Ven. Warts
- ☐ Other

- ☐ Musculoskeletal
- ☐ Neurological
- ☐ Endocrine
- ☐ Counselling
- ☐ Other

Other Services:
- ☐ Acupuncture Clr
- ☐ AIDS Screening
- ☐ Allergy Shots
- ☐ Birth Control
- ☐ Chiropractic
- ☐ Lab Work Only
- ☐ Physical Exam
- ☐ Podiatry
- ☐ PPD
- ☐ Wound Care
- ☐ Tetanus Shot

Clinician's Name (print)   Attending Physician's Signature

Figure 8. New Haight-Ashbury Free Medical Clinic Encounter Form. This is the current encounter form, introduced in the spring of 1989. Shown reduced to 70% of actual size.

the intermediate step of logging onto a paper log sheet has been retained. This has allowed the Clinic to retain its manual system in parallel with the new computerized database, a much safer way of introducing change into the institution (Kruse, 1987).

The prototype implementation involved, in addition to the new intake forms, the copying of these log sheets into a computer database. The source of all data during this trial was these log sheets (with the exception of the reportable disease logs, as described above). Other than housing status (homelessness), no new data items were collected in this phase, even though they were now recorded in the patients' charts.

The first part of full-scale implementation has been the adoption of the complete database system for homeless clients beginning in May of 1989. Charts are logged as under the manual system, with the addition of date of birth to the items abstracted. These log sheets are entered into the computer database at a later date. The software then generates a list of the patients entered in that batch. In order to enter more complete demographic information, a second reading of the chart is required.

Because many inexperienced computer users will be expected to use the Clinic's system, we decided to base all development on the easily learned and approachable Microsoft *Windows* operating environment. This elaborate MSDOS shell provides a uniform, graphics-based user interface, with pull-down menus, a point-and-shoot mouse-based command structure, and limited multitasking capabilities. While any MSDOS program can run under *Windows*, only programs developed specifically for Windows maintain the MacIntosh style user interface. Windows requires an IBM compatible computer with at least an 80286 microprocessor (the old PC, with an 8088 microprocessor, is too slow for

acceptable performance), a hard disk, and a graphics monitor. The Clinic has a donated IBM AT compatible computer with a 10 MHz 80286 microprocessor, one megabyte of memory, a 10 megabyte hard disk, and a monochrome graphics monitor. Development took place on a similar computer which had a total of three megabytes of memory, a 40 megabyte hard disk, and a high resolution VGA color graphics monitor. Each machine is equipped with a mouse.

Software development was based on the idea of rapid prototyping, allowing the quick implementation of a system for field trials. Such rapid development requires the use of a fourth generation language. Traditional microcomputer databases provide such higher level facilities, but are not as user friendly as the Windows environment and its compatible programs. The Microsoft *Excel* spreadsheet program (fig. 9) has simple database capabilities, an embedded fourth generation programming language, and complete integration with the *Windows* environment. We have developed data entry and editing programs with *Excel*, which can then export data to almost any other database management or statistical analysis program.

The data management program (fig. 9) presents the user with a scrollable window showing clients already in the database, an expanded display of the currently highlighted client, a window showing a list of encounter records, and a menu bar across the top of the screen. To register a new client, the appropriate pull-down menu item is selected, and a new client window is superimposed on the screen (fig. 10). After the name and date of birth are entered, the software verifies that the client has not already been registered.[1] If

---

1   At present, spelling errors and aliases must be found by examining an alphabetized listing of clients. Intelligent database technology promises to automate the detection of such errors.

an existing record with the same name and date of birth is found, an error message is generated; otherwise, a client information form is brought up on the screen (fig. 11). The same screen is used for editing the record of a previously registered client. To select a client's record for editing, one need only point at the client's name using the mouse and click once on the mouse button. The on-screen data form makes use of scrollable windows and radio buttons for the entry of multiple choice items (fig. 11). Data validity
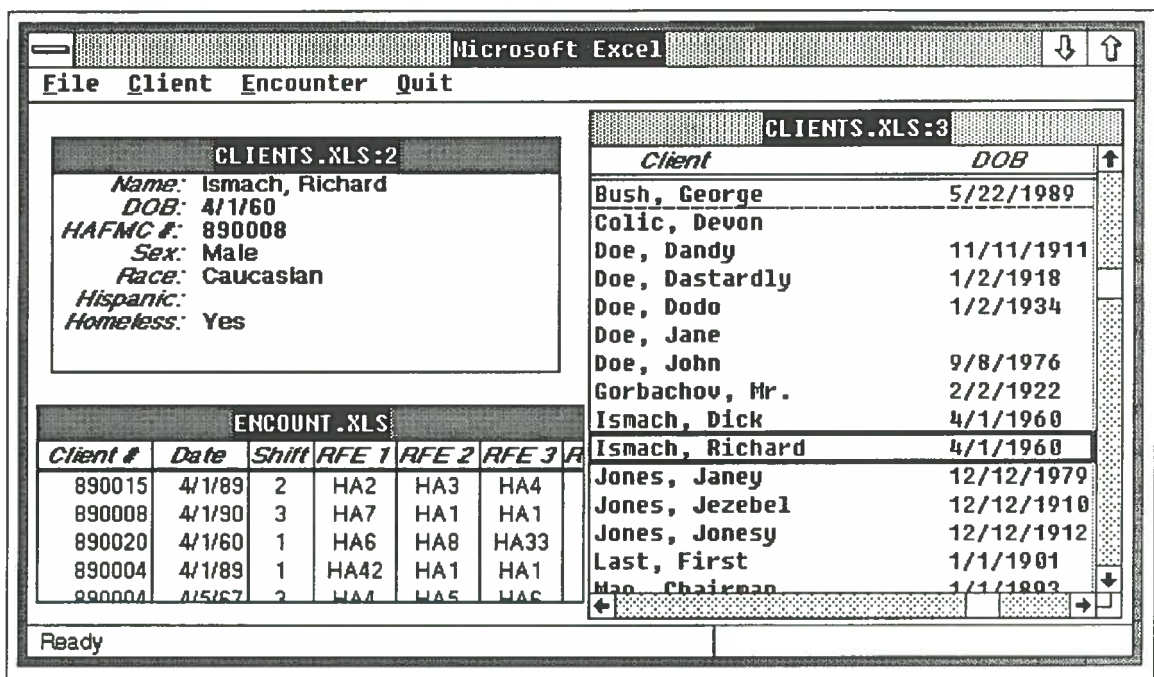

Figure 9. Main Screen of the HAFMC Data Management Program. The system is a custom Microsoft *Excel* application, with customized menus and data entry screens.

checks are easily programmed into the system.

Encounters are recorded in a separate database file (lower left of fig. 9). The encounter entry process requires first selecting a client by pointing and clicking with the mouse, then selecting the appropriate pull-down menu item. The on-screen form for encounter data uses scrollable lists for the selection of encounter categories (fig. 12). At present,
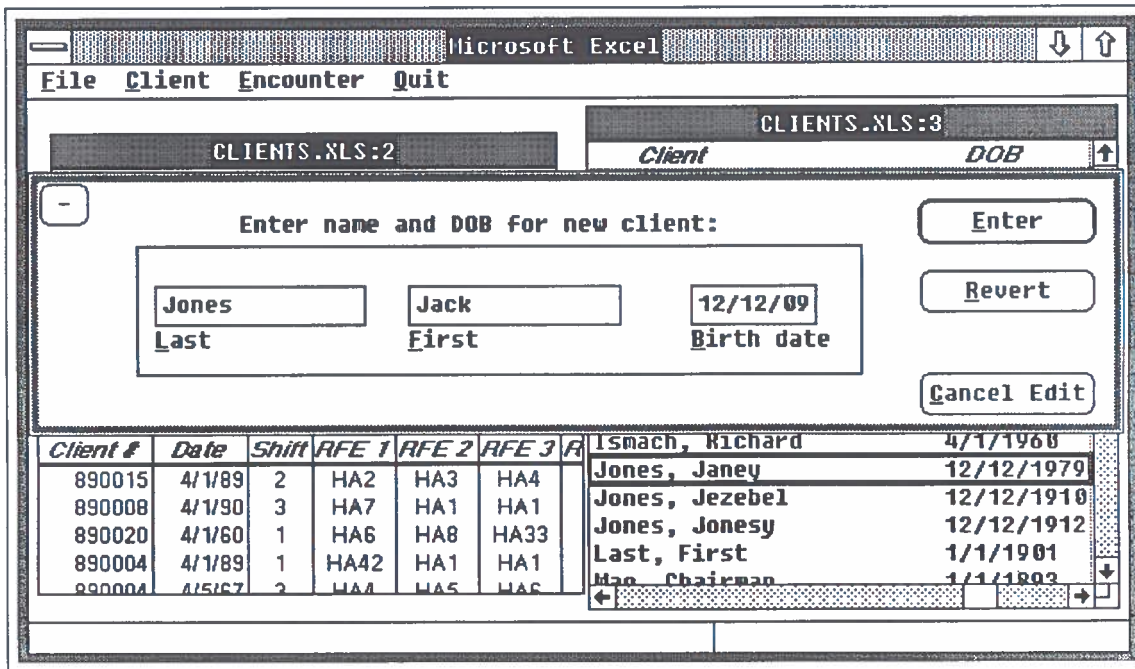
Figure 10. New Client Screen of the HAFMC Data Management Program. A unique client is defined by the combination of last name, first name, and date of birth.

there is space for three reason for encounter (RFE) choices, but this is an arbitrary limit. The list presented currently uses the Free Clinic's own idiosyncratic categories. The highlighted selection for each list is automatically converted to an alphanumeric code. The substitution of International Classification of Disease (ICD-9-CM) or International Classification of Primary Care (ICPC) categories and codes would be straightforward.

Once client and encounter information is entered into the database, it can be analyzed in a variety of ways. Transformation to matrices using dummy variables for use with statistical analysis programs can be performed automatically. Most basic graphs and summary statistics, including confidence intervals, can be generated by *Excel*. The graphs presented here were made by Excel. Statistical analysis was performed with the *Crunch* (Crunch Software Corporation, Oakland, CA) and *StatGraphics* (STSC Inc., Rockville,

91

Figure 11. Client Data Screen. The same on-screen form is used for both new client registration and editing existing records.

Figure 12. Encounter Record Screen. The lists of encounter categories can be easily customized.

MD) packages for IBM microcomputers. These provide for correlation analysis, linear regression, testing of two-by-two tables with chi-square or Fisher's exact tests, the calculation of Cochran-Mantel-Heinzel summary odds ratios for stratified analyses, and more sophisticated procedures such as ANOVA, multiple regression modelling, and non-parametric techniques. The proper use of such statistical software for any but the most routine analysis depends on a good understanding of statistical methods in epidemiology, of course, ensuring the need for an epidemiologist in the Uniform Database Project.

Chapter 5

Results

At the time of this writing, results are available from two of the three phases of the Uniform Database Pilot Project. The first phase was the evaluation of the Haight-Ashbury Free Medical Clinic's existing data collection and analysis procedures. Selected findings from an analysis of Clinic monthly reports are presented below. The evaluation also included a test of the representativeness of Free Clinic Data with respect to trends in San Francisco as a whole. The second phase was the implementation of a prototype data management system. While this prototype was intended mainly to serve as a step in the software development cycle, it also produced new types of information about the Clinic's patients. The third phase -- complete implementation of the pilot database project -- has been started recently, and will continue through the fall of 1989.

Information Available Under the Clinic's Old Data System

Monthly reports are prepared by the clinic in order to meet the requirements of various funding agencies (a sample is found in chapter 4). These reports give the total number of patient visits, the number of "diagnoses and services," and the number of encounters in which each of a variety of clinical problems or services were recorded in the chart. Table 1 contains the raw data used for the first part of this evaluation. The

Table 1. Raw Data From Free Clinic Reports, January 1985-February 1989

Month	AIDS	Derm	ENT	GI	GU	GYN	Resp	STDs	Visits
Jan-85	98	191	32	32	53	128	196	203	902
Feb-85	39	196	26	46	61	115	148	229	833
Mar-85	28	197	54	52	89	110	179	293	940
Apr-85	23	150	31	29	74	111	86	263	754
May-85	30	167	49	30	88	128	76	277	851
Jun-85	19	140	24	28	70	79	30	147	599
Jul-85	17	171	28	28	75	65	40	161	620
Aug-85	27	107	15	20	69	80	50	206	536
Sep-85	47	166	42	31	69	92	79	210	668
Oct-85	50	172	37	28	57	76	99	187	721
Nov-85	37	128	35	18	35	56	62	137	537
Dec-85	36	154	23	21	58	53	73	146	632
Jan-86	49	182	57	15	47	86	126	193	767
Feb-86	66	165	38	24	44	89	83	213	762
Mar-86	26	175	42	23	89	113	69	248	848
Apr-86	29	168	27	37	97	54	94	306	903
May-86	26	99	33	14	62	68	64	148	504
Jun-86	54	115	24	15	56	92	45	130	540
Jul-86	26	140	36	18	117	60	57	137	724
Aug-86	38	203	34	16	117	121	54	144	969
Sep-86	47	221	169	55	58	154	66	153	948
Oct-86	63	182	104	30	50	135	50	133	833
Nov-86	81	159	151	68	36	135	74	143	1007
Dec-86	72	122	23	11	31	119	47	101	635
Jan-87	66	156	71	15	45	163	121	254	982
Feb-87	72	217	151	70	38	122	62	196	1082
Mar-87	32	292	62	123	47	141	83	206	1159
Apr-87	62	167	0	11	32	203	28	133	966
May-87	34	233	34	10	24	194	41	191	1076
Jun-87	49	105	57	18	29	50	65	141	633
Jul-87	50	231	180	20	35	166	38	109	1201
Aug-87	59	38	151	38	27	178	37	107	1003
Sep-87	59	38	151	38	27	178	37	107	1003
Oct-87	40	167	74	126	30	66	45	132	1054
Nov-87	46	252	147	55	31	16	34	102	976
Dec-87	46	51	71	28	32	11	55	109	633
Jan-88	41	156	86	31	28	49	98	66	716
Feb-88	50	157	63	24	29	28	93	100	712
Mar-88	41	110	62	10	35	52	71	106	728
Apr-88	45	95	64	17	20	35	47	69	569
May-88	37	94	40	11	26	61	49	72	615
Jun-88	61	206	84	33	39	70	87	151	806
Jul-88	44	164	52	23	38	39	36	126	662
Aug-88	69	177	106	29	53	69	78	148	1049
Sep-88	39	117	89	28	51	69	92	179	798
Oct-88	34	159	81	33	36	44	75	143	735
Nov-88	55	187	87	30	33	61	107	134	845
Dec-88	48	126	70	23	36	36	83	156	821
Jan-89	54	139	117	22	33	38	127	136	897
Feb-89	60	155	124	29	52	49	111	164	948
Mar-89	55	48	90	42	45	31	87	160	-

AIDS -AIDS screening; Derm - dermatology; ENT - ears, nose, & throat; GI - gastrointestinal;
GU - Genitourinary; GYN - gynecology; Resp - Respiratory; STDs - sexually transmitted diseases.

95

categories used in the Clinic's monthly reports were collapsed into broader groups both to facilitate the analysis of case mix at the Free Clinic and to help smooth the effects of varying definitions and traditions existing at the Clinic over the course of time.
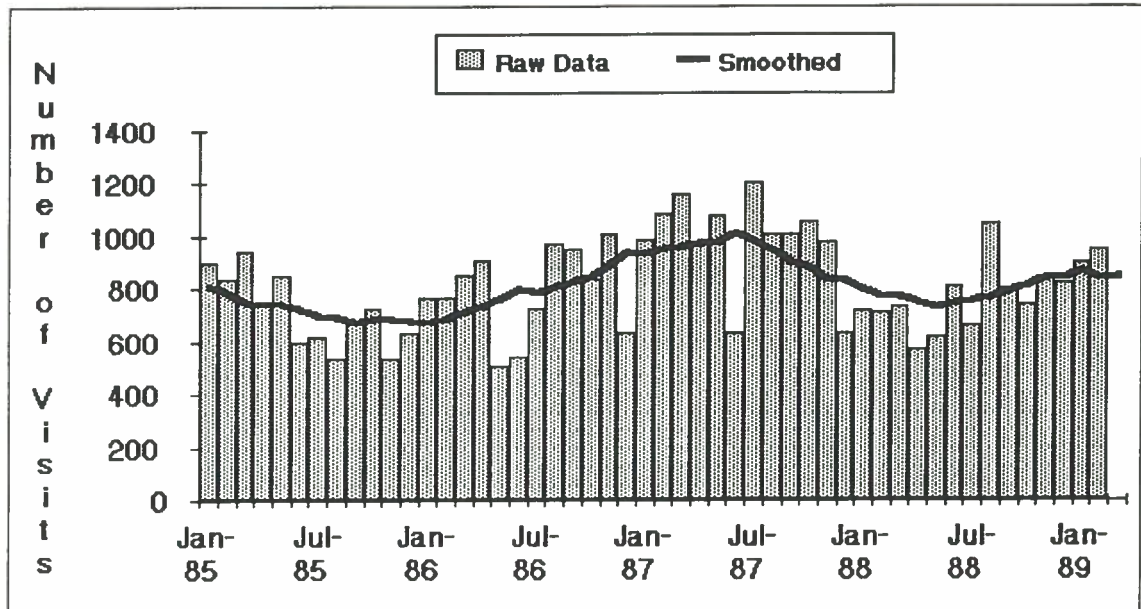

Figure 1. Monthly Patient Visits at the Haight-Ashbury Free Medical Clinic, January 1985 Through February 1989. The total visits for each month are shown with bars, and data smoothed by averaging is plotted as a line.

The number of patient visits per month has remained fairly stable from January 1985 through February 1989, despite sometimes large fluctuations from month to month (fig. 1). There were a mean of 814 visits per month during this period (95% confidence interval, 764.6 - 863.4). The smoothed data reveal a peak in visits early in 1987 and a general increase in monthly visits (Pearson's product moment correlation coefficient 0.3884, $p < 0.005$). The real importance of this trend is probably negligible, and in the raw data this trend is not statistically significant. The mean number of diagnoses and services per month was 983 (95% c.i. 928.7-1038.2; more than one problem can be recorded during a

single visit). The monthly number of diagnoses and services also peaked during 1987, but the trend was not significant in either the raw or smoothed data.

The distribution of reasons for the visit is shown in figure 2 as the mean number of visits per month in eight major categories. These estimates are based on 40,702 visits
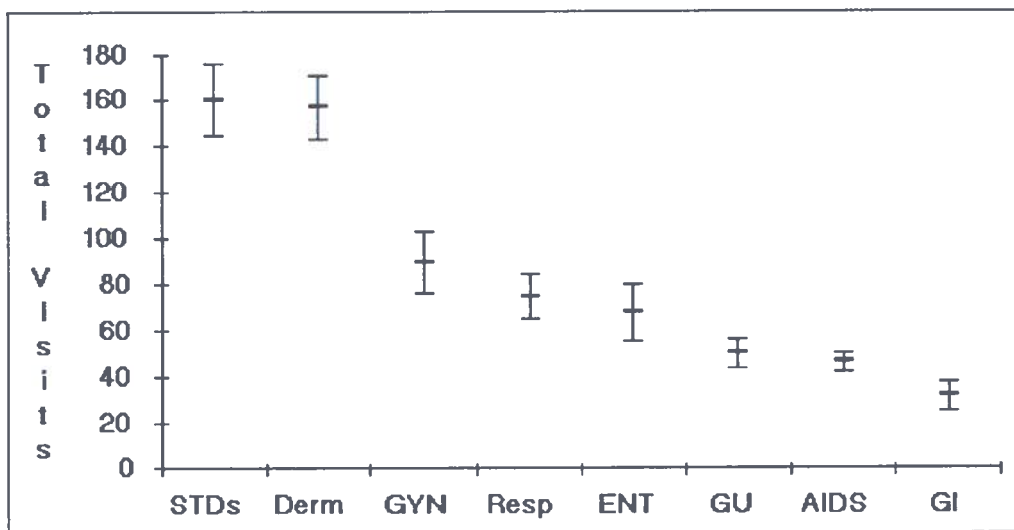

Figure 2. Mean Distribution of Reasons for the Clinical Encounter at the Haight-Ashbury Free Medical Clinic. The mean number of visits in each of eight major categories is shown along with the respective 95% confidence interval. Data is from January 1985 through February 1989. See the text for abbreviations.

over more than four years. The categories shown account for 84.9% of all visits, although other clinical problems or services may have been coexistent for some of those visits. The uncertainty in the estimated number of visits per month for each category can be attributed to variation in the total number of visits per month; the 95% confidence intervals for the estimates of the *proportions* (calculated by the exact method; Zar, 1984, pp. 378-379) are all narrower than 0.01%
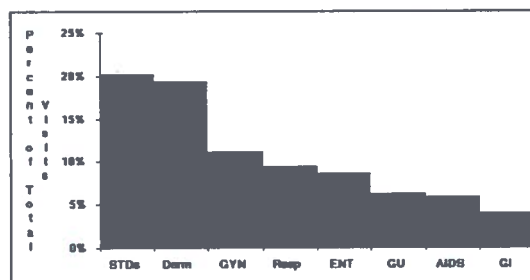

Figure 3. Mean Percentage of Total Visits for each of the Indicated Categories.

around the mean (fig. 3). Sexually Transmitted Diseases (STDs) and Dermatology (Derm) each account for roughly one fifth of Clinic visits. Gynecology (GYN) and genitourinary (GU) may both include some sexually transmitted diseases -- for example, chlamydial vaginitis or urethritis -- that were misclassified as other problems. Respiratory illnesses (Resp) include mainly upper respiratory tract infections (colds and flu) and bronchitis (data not shown). The AIDS category comprises almost entirely screening for the acquired immunodeficiency syndrome, but also includes some care for people with AIDS or other illness due to human immunodeficiency virus. Gastrointestinal (GI) illnesses commonly seen at the clinic include intestinal parasitic infections and gastroenteritis, the latter being a wastebasket diagnostic category with very little specificity. The 15% of visits in which no problem falling into one of these categories is recorded include neurologic, cardiovascular, endocrine, pediatric, and other clinical problems.

The estimates for the number and proportion of visits in each category are very precise statistically, but in fact there have been important changes in the parameters over the four years studied. For example, the proportion of visits in which an ears, nose, and throat (ENT) problem was recorded increased sharply in 1986 (fig. 4). This increase is statistically significant in a simple linear regression model ($p<0.004$). The regression equation is:

$$ENT = (1.49 \times PERIOD) + 30.07$$

where *Period* ranges from one (January 1985) to 50 (February 1989). The
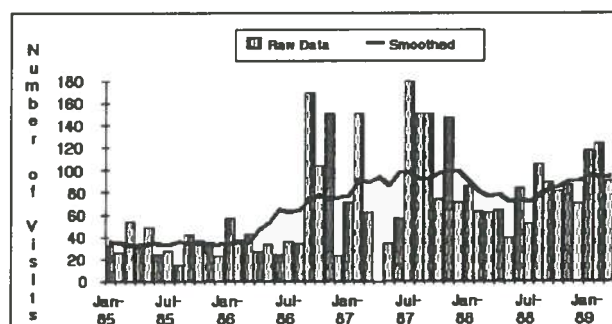

Figure 4. Monthly ENT (Otolaryngology) Visits at the Free Clinic Increased in 1986. Raw data are shown in the vertical bars, smoothed data in the line.

98

shape of the distribution is, of course, nonlinear, with a remarkably steady baseline of approximately 34 visits per month until August 1986, when a jump to 169 visits occurred. The same trend is observed when examining the proportion of visits (not shown).

An interesting trend was observed in the rate of visits for sexually transmitted diseases (STDs). The number of STD visits declined in a nearly linear fashion until the end of 1987, when this trend was reversed (fig. 5). The net decrease in such visits at the Free
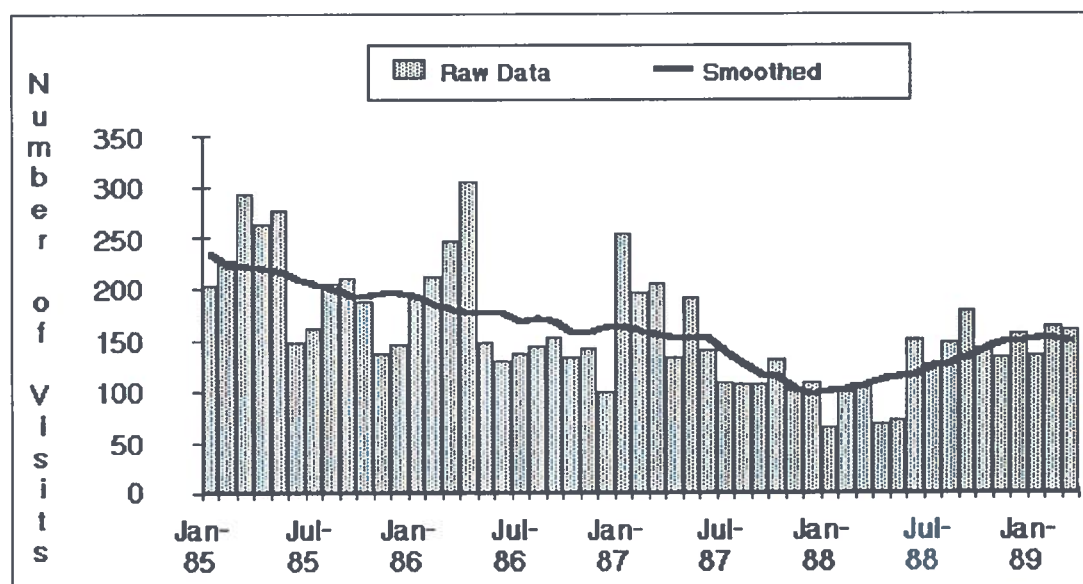
Figure 5. Monthly Visits in Which a Sexually Transmitted Disease Was Recorded. Testing or screening is included in this data.

Clinic is highly significant by correlation analysis of the number of STD visits and the period, a dummy variable for time defined as above (p<0.0001). When the regression analysis is restricted to the period January 1985 through April 1988, the slope is -3.59 (standard error = 0.62). The increase beginning in May of 1988 is not statistically significant in this analysis (p=0.134), although the smoothed data from April 1988 through February 1989 are nearly linear (correlation coefficient = 0.979).

Changes in the rate or proportion of visits for a certain problem at the Haight-Ashbury Free Clinic might reflect changes in disease incidence within the Clinic's target
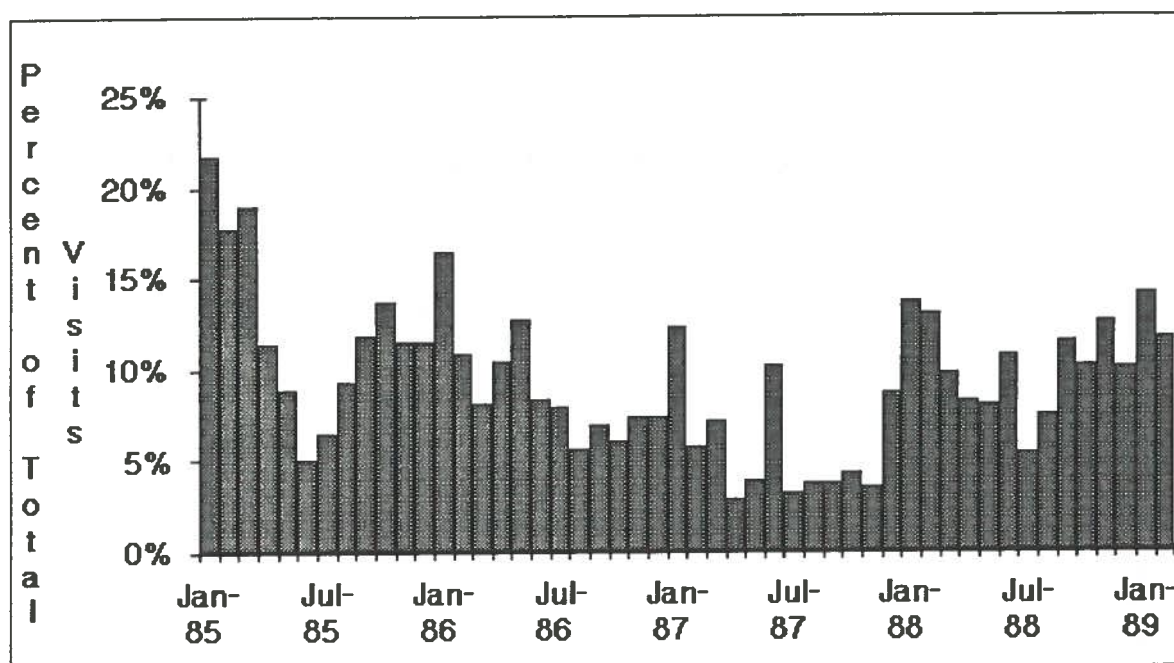

Figure 6. Proportion of Visits in Which a Respiratory Illness Was Reported. The two most common respiratory illnesses at the Free Clinic are upper respiratory infections and acute bronchitis. The expected seasonality, with peak incidence in winter months, is apparent.

population, changes in the factors which determine who receives care at the Clinic, or both. If the incidence of bronchitis, upper respiratory infections, and other pulmonary infectious diseases can be assumed to be seasonal, then temporal trends at the Free Clinic can be compared to the expected trends in the population. As shown in figure 6, the rate of respiratory problems at the Free Clinic has annual periodicity, with peak rates in the winter months and minimum rates in the summertime. This trend was not tested statistically because of uncertainty regarding the validity of the available methods for correlation and regression analysis for circular data (Zar, 1984, p. 463).

The Usefulness of Clinic Surveillance Data

The long-term goal of the Uniform Database Project is the efficient use of routinely collected data in planning health care services. To be of much use, this data must accurately reflect trends in the practice's target community (Abramson, 1984). To assess the representativeness of routinely collected Free Clinic data, I compared the Free Clinic's

Table 2. Raw Data (Cases) From San Francisco and the Free Clinic.

Period	Days	HAFMC GC	HAFMC Syph	HAFMC Hepatitis	Days	SF GC	SF Syph	SF HBV
Dec-87	31	1	0	8	35	629	48	11
Jan-88	31	0	2	4	28	475	27	10
Feb-88	29	3	0	2	28	453	36	7
Mar-88	31	2	2	4	35	825	87	8
Apr-88	30	2	0	2	28	540	45	5
May-88	31	2	0	1	28	495	41	8
Jun-88	30	6	0	2	35	577	80	10
Jul-88	31	1	0	3	28	367	24	7
Aug-88	31	3	1	5	35	687	46	5
Sep-88	30	1	0	2	28	464	43	4
Oct-88	31	2	0	5	28	531	53	8
Nov-88	30	3	1	4	35	631	72	13
Dec-88	31	7	0	6	35	546	73	19
Jan-89	31	0	2	0	28	523	38	5

HAFMC - Haight-Ashbury Free Medical Clinic. *SF* - San Francisco County Health Department Data. *GC* - gonorrhea cases. *Syph* - syphilis cases. *HBV* - hepatitis B cases. *Hepatitis* includes other causes of hepatitis. For all analyses, data were adjusted to a 31 day monthly period by multiplying these raw numbers by 31 and dividing by the number of days in the period. .

number of cases of selected diseases with data for San Francisco as a whole. Hepatitis B, gonorrhea, and syphilis were selected for this comparison. The raw data (table 2) were directly adjusted because the reporting periods of the San Francisco Department of Health differed from those of the Free Clinic.

101

The distributions of hepatitis B cases reported to the San Francisco County Health

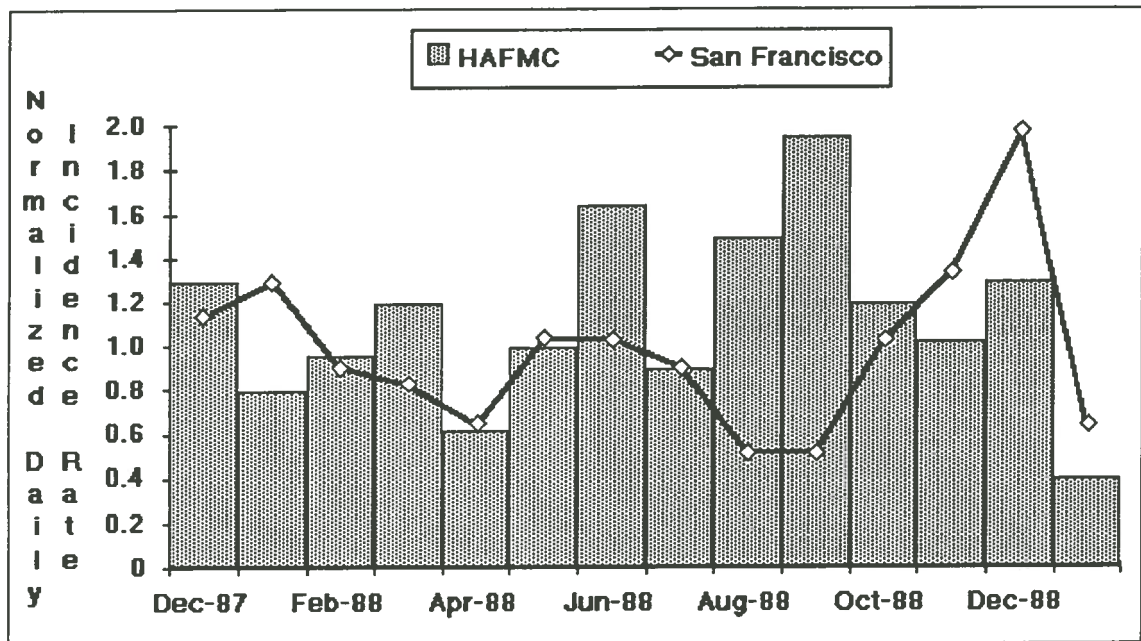Department and all cases of hepatitis* at the Haight-Ashbury Free Medical Clinic from

Figure 7. Hepatitis in San Francisco and at the Haight Ashbury Free Medical Clinic. The data for San Francisco is for hepatitis B infections reported to the health department. Data for the Free Clinic includes hepatitis A and non-A, non-B hepatitis as well.

December 1987 through January 1988 are shown in figure 7. Correlation analysis for

hepatitis did not reveal a significant correlation ($r=0.48$, $p<0.081$) between the two data

sets (fig. 8). However, the Kolmogorov-Smirnov goodness of fit test statistic for com-

paring the two distributions was 0.214 (based on normalized data); with 14 observations

per data set, this corresponds to a probability greater than 0.999 that the two data sets

came from the same distribution.

---

* The Haight-Ashbury Free Clinic data from this period do not distinguish between hepatitis A, hepatitis B, and non-A, non-B hepatitis. Although laboratory data are incomplete, and the records of positive hepatitis B serology does not allow record linking with the data presented here, comparison of the *number* of positive hepatitis B surface antigen tests at the free clinic with the number of cases logged as "hepatitis" for selected months supports the assumption that most recorded cases of hepatitis at the Free Clinic are due to hepatitis B virus infection.
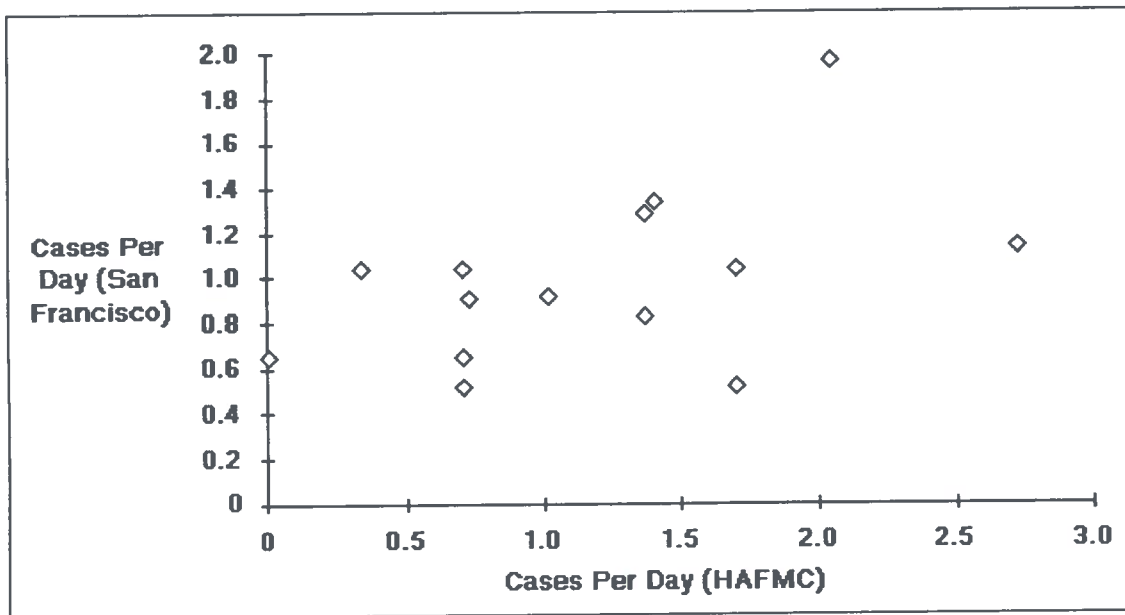
Figure 8. Correlation Between San Francisco and Haight-Ashbury Free Clinic Hepatitis Cases per month, December 1987 through January 1989.

The results of comparing the reported cases of Gonorrhea in San Francisco to the number of cases reported by the Free Clinic were similar (not shown). In this case, the linear correlation coefficient was -0.1651 (p=0.57), indicating very poor correlation.
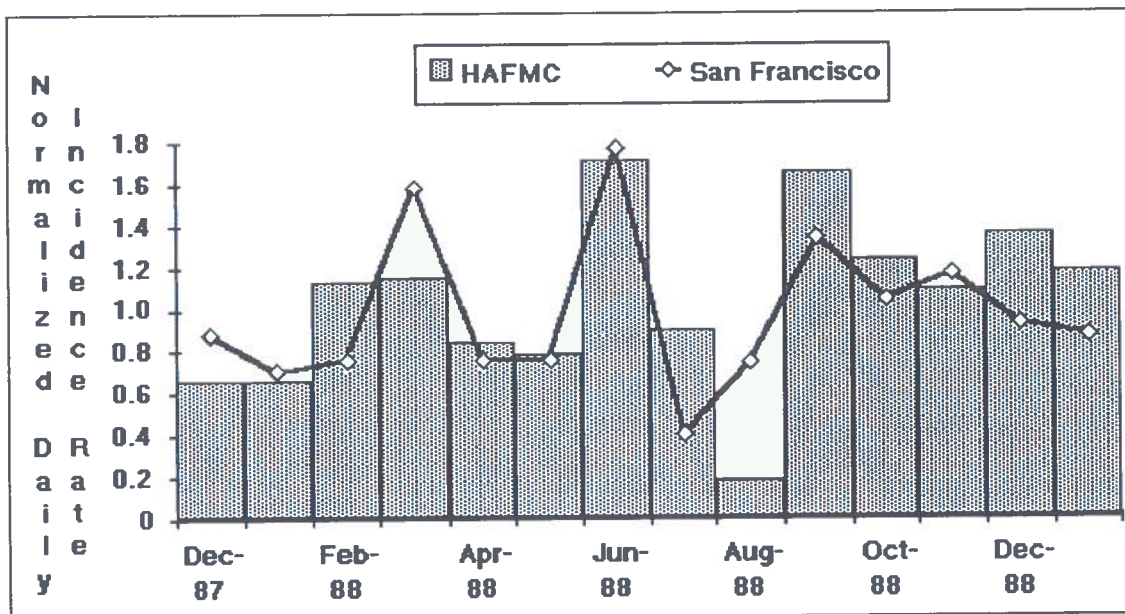

Figure 9. Incidence of Syphilis in San Francisco and the Rate of Testing for Syphilis at the Haight-Ashbury Free Medical Clinic. Bars show cases reported to the San Francisco Health Department and diamonds show patients tested at the Free Clinic.

Again, however, the nonparametric Kolmogorov-Smirnov test predicted a probability of greater than 0.999 that the two samples (San Francisco and Haight-Ashbury Free Clinic) were drawn from the same distribution.

Figure 10. Correlation Between Incident Cases of Syphilis in San Francisco and Testing for Syphilis at the Free Clinic.

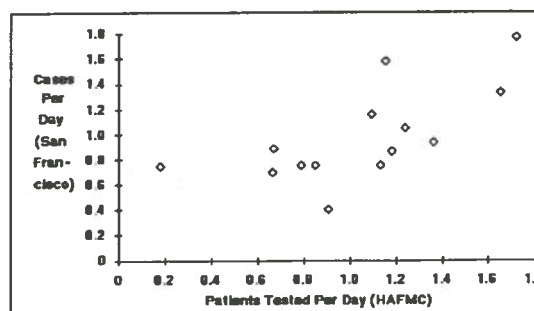The Free Clinic reported only eight cases of syphilis during the period under study, making correlation analysis impossible. On the premise that the rate of testing for syphilis at the Free Clinic is linearly related to the incidence rate of syphilis in the community, I compared the rate of testing at the Clinic to the rate of syphilis cases in San Francisco (fig. 9). In this instance the product-moment correlation statistic was highly significant ($r=0.595$, $p<0.025$), but the two-way Kolmogorov-Smirnov test for goodness of fit was less clear (fig. 10). The test statistic value of 0.357 means that there is a 0.333 probability that the two samples were drawn from the same distribution -- in other words, there are not statistically significant grounds for rejecting the "null" hypothesis that the two samples are from the same distribution. Similar results were obtained by comparing the rate of new syphilis cases (primary and secondary syphilis exclusive of tertiary or congenital syphilis) in San Francisco with the rate of testing at the Clinic ($r=0.668$, $p<0.009$).

The Prototype Data System

As part of the prototype of the new data management system, all clinic visits for one month (June, 1988) were analyzed. More than 75% of the 609 patients treated at the clinic during that month had only a single visit during the month. The distribution is log-
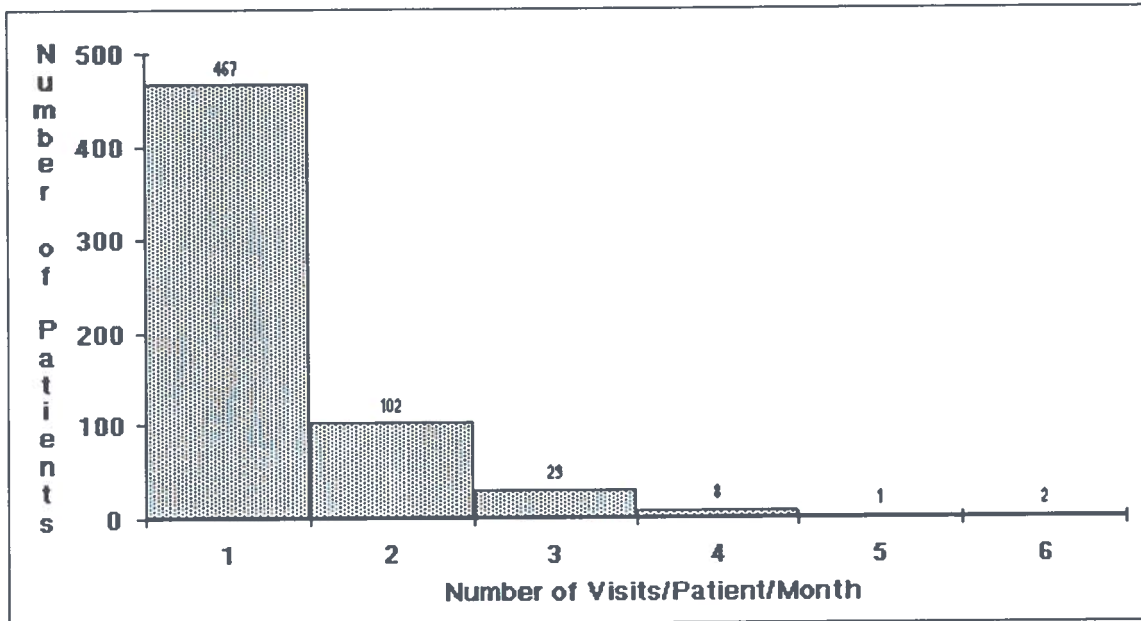
Figure 12. Number of Visits Per Patient During July 1988 at the Haight-Ashbury Free Medical Clinic. There were 609 patients seen that month at the Clinic.

linear, corresponding to the geometric probability distribution. For the logarithmically transformed data, linear regression analysis yielded the equation:

$$\ln(\text{patients}) = -1.259 \times (\text{number of visits/month}) + 7.263$$

The standard errors were 0.120 for the slope and 0.434 for the intercept. Pearson's product-moment correlation coefficient was -0.978 ($p<0.0002$). As suggested by Bass (1976), we have extrapolated back to the theoretical number of patients with zero visits during the month to calculate an estimated denominator for the calculation of incidence

rates. Based on this limited data set, we would expect to find 1,799 people who depend on the Clinic for care but had no Clinic visit during the month of June, 1988. Together with the 609 people who received medical care at the Free Clinic, there would be 2,408 people for whose health the Clinic assumed responsibility during that month.
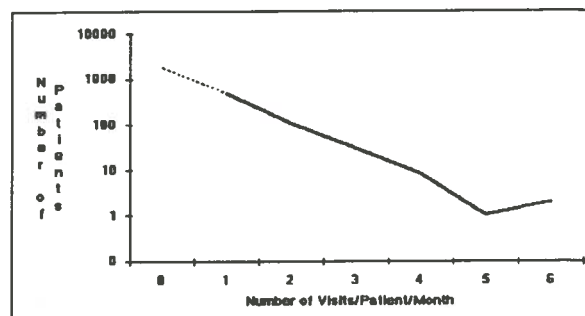

Figure 13. Visits Per Patient in July of 1988 at the Free Clinic. The data are displayed on a logarithmic scale. The dotted line shows the extrapolation to people who depend on the clinic for care, but had zero visits during the month.

The distribution of the number of medical problems recorded for each visit is also geometric (fig. 14). When these data are logarithmically transformed, the correlation coefficient is -0.992 (p<0.0001). Almost 75% of the 805 patient visits in June of 1988 were for a single medical problem, and only 10% of visits had more than two problems recorded.
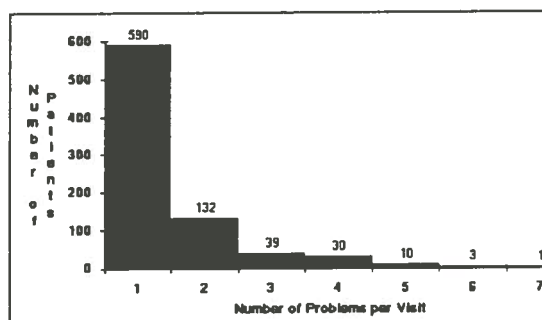
Figure 14. Number of Medical Problems Per Visit at the Haight-Ashbury Free Medical Clinic, July 1989.

The distribution of clinical problems for homeless people and housed people is shown in table 3 and in figure 15. In addition, the number of PPD skin tests (for tuberculosis screening) is given. For both groups, sexually transmitted diseases and dermatologic problems were the two leading clinical problems. The general features of this distribution are similar to those found from the longitudinal data presented earlier, but

106

several differences were found between the frequency of problems in homeless people and the frequency in housed people. Homeless people were significantly less likely to be

Table 3. Diagnoses and Services in Housed and
Homeless Patients, June 1988

Diagnosis or Service	Homeless	Housed
AIDS Screening	0	61
Dermatology	16	104
Ears, Nose, & Throat	4	79
Gastrointestinal	3	31
Genitourinary	4	34
Gynecology	7	51
PPD Skin Testing	1	20
Respiratory	4	49
Sexually Transmitted Disease	20	152

screened for the acquired immunodeficiency syndrome (odds ratio = 0.07, $p < 0.017$ by chi-square test with continuity correction). Other differences were not statistically different, although the power to detect significant differences in this study was quite low. Homeless people were more likely to be treated for sexually transmitted diseases (odds ratio = 1.46, $p < 0.218$). They were also more likely to have a dermatologic problem (odds ratio = 1.73, $p < 0.120$).

Although the difference in the rate at which homeless people and housed people are tested for tuberculin skin test (PPD) reactivity was not statistically significant (odds ratio = 0.98, $p < 0.707$), this difference may be highly significant clinically. The trends in

PPD testing stratified by sex and housing status (fig. 16) are the opposite of what would

be dictated by the high prevalence of tuberculosis in homeless people. Homeless patients

at the Haight-Ashbury Free Medical Clinic were less likely to have been to the clinic
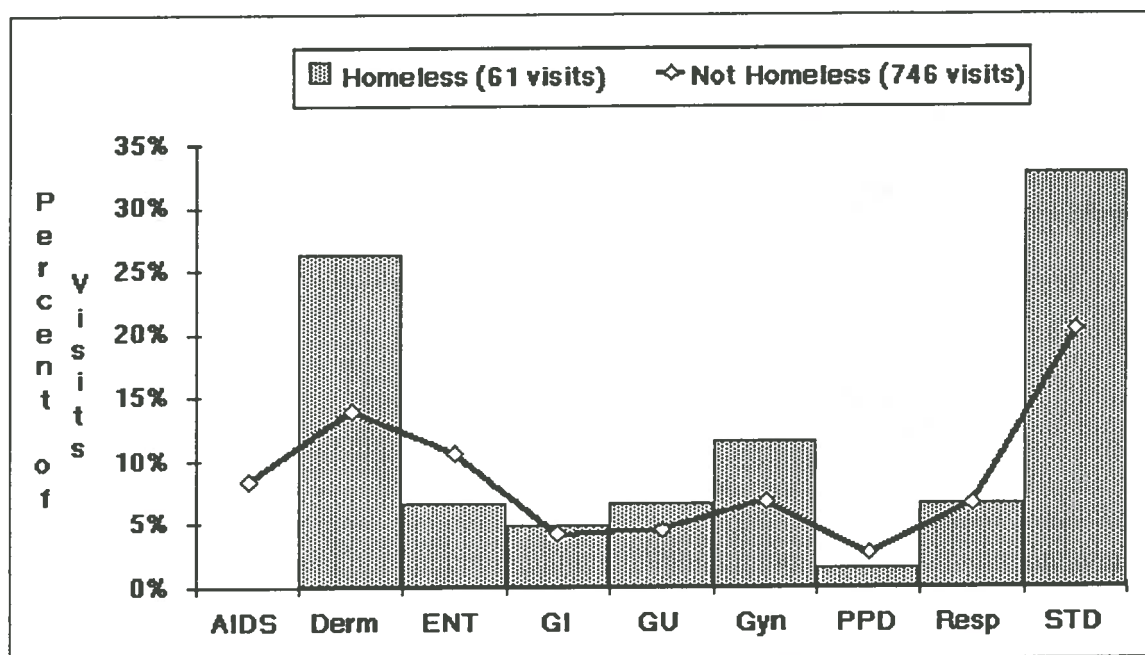
Figure 15. The Distribution of Clinical Problems for Homeless and Housed Patients at the Haight-Ashbury Free Medical Clinic, July 1988. *AIDS* - AIDS screening; *Derm* - dermatology; *ENT* - ears, nose, and throat; *GI* - gastrointestinal; *GU* - genitourinary; *Gyn* - gynecology; *PPD* - tuberculosis skin testing; *Resp* - respiratory; *STD* - sexually transmitted diseases.

more than once during the month, compared to housed patients (fig. 17). There were 609

patients treated at the Free Clinic during June of 1988, 51 of them identified as homeless.

Nine of the homeless people (17.6%) and 133 of the housed people (23.8%) visited the

clinic more than once during the month. Once again, this difference was not statistically

significant (odds ratio 1.40, p<0.210 by Fisher's exact test, one tailed). When the analy-

sis was stratified according to sex, though, a significant difference was found for home-

less men (odds ratio = 3.88, p<0.013 by Fisher's exact test). A Cochran-Mantel-Haenszel

summary odds ratio was not calculated.

Figure 16. PPD Skin Testing at the Haight-Ashbury Free Medical Clinic. The proportion of patients from each of the four groups listed who were screened for tuberculosis by skin testing is given.

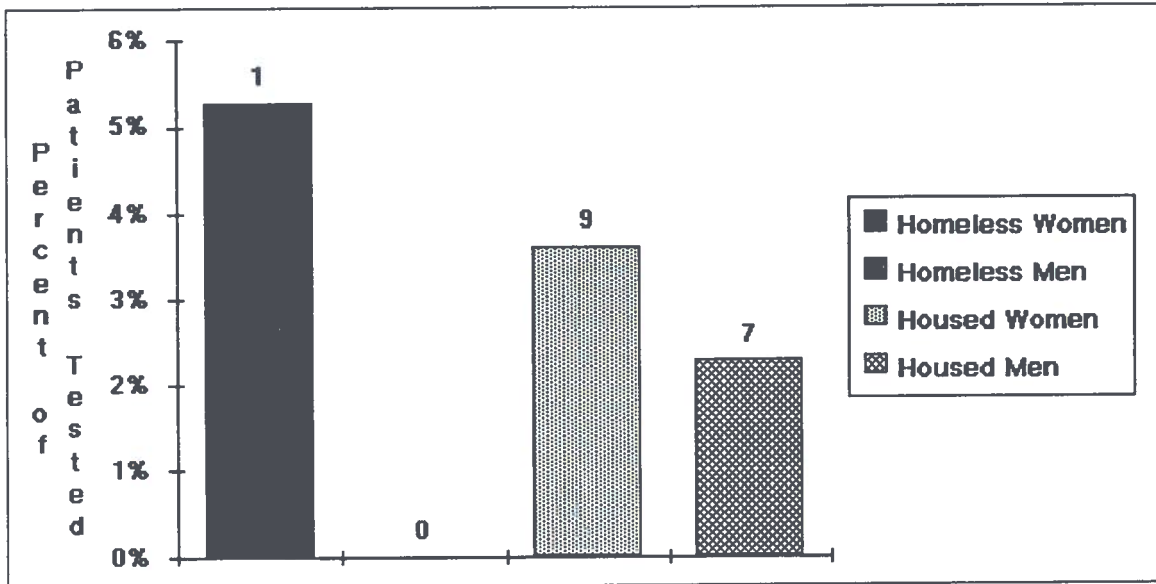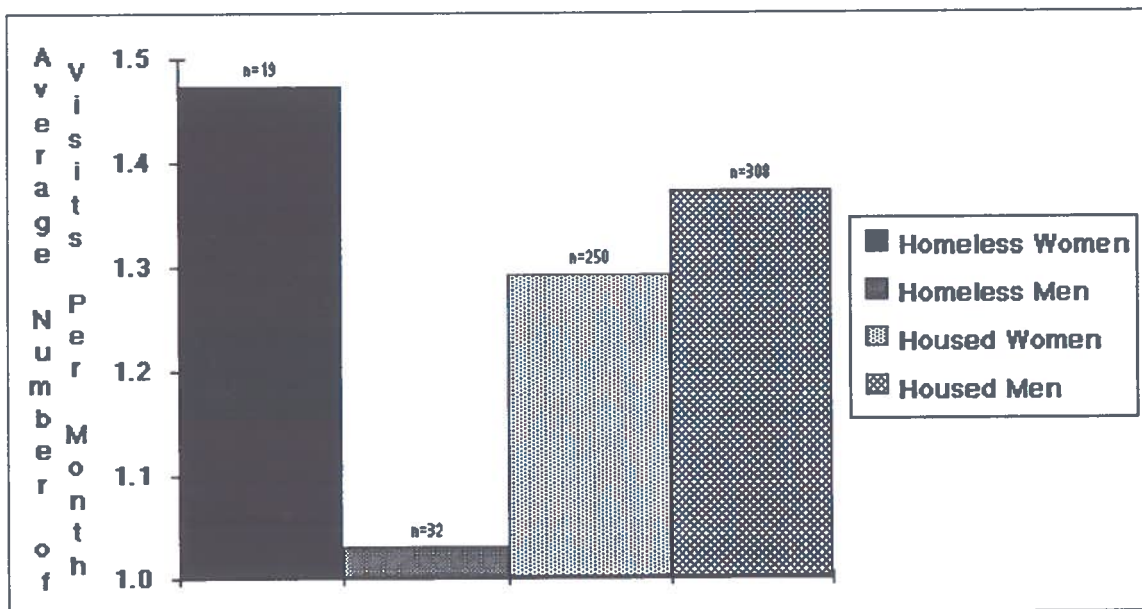*Figure 17.* Average Visits Per Month at the Free Clinic According to Sex and Housing Status. Homeless men were significantly more likely to have visited the Clinic only once during the study period.

109

Chapter 6

Discussion

It is premature to draw conclusions regarding the Uniform Database Pilot Project itself at the Haight-Ashbury Free Medical Clinic; the system is only now being partially implemented. Most of the epidemiologic techniques used in the project will require the accumulation of many months' worth of data in order for adequate samples to be achieved. Even when the entire Pilot Project is in operation at the Haight-Ashbury Free Medical Clinic, the information gathered must still be put to use. As was the case before the Project began, it would be easy for the Clinic's busy practitioners and administrators to ignore the monthly reports produced by this system. Establishing a short feedback loop between epidemiologic intelligence and health care planning, as described in chapter 2, is really the Project's main goal. Only after planned changes are made in the Clinic's health care services can the Uniform Database Pilot Project be evaluated from the perspective of community-oriented primary care.

Evaluating the Uniform Database Project will be difficult in any case. Under the COPC model, the success or failure of this system must be measured in terms of impact on the health of the Clinic's target population. At a minimum, this would require the accurate estimation of population-specific rates (as opposed to Clinic-specific rates) for the health indicators of interest, an expensive undertaking. Even when relevant information

is available, as is the case for reportable diseases in San Francisco, it is rarely specific enough for evaluation of COPC projects. At the Free Clinic, for example, the defined population is all residents of and visitors to San Francisco who cannot afford health care and don't have insurance. Information is available regarding homeless people, and Medi-Cal data may be applicable in some cases. For the most part, however, population-specific rates for disease incidence and other parameters are not available by insurance status, and will be beyond the ability of the Free Clinic to collect.

A network of community clinics could, by sharing information, go far in overcoming these problems. With the records of clinical encounters from nine primary care facilities pooled, problems of small sample size and selection bias at individual sites would be substantially ameliorated (White, 1972). Networks like this have been developed in many places, at least in rudimentary form (Trachtenberg et al., 1987). The integration of such a network with public health information systems could allow an unprecedented degree of sophistication in planning, with detailed information relevant to a specific practice easily available from a central or regional data processing center (Johnson et al., 1988). Unfortunately, the health care system in the United States, and specifically in San Francisco, may be too fragmented and competitive for such cooperation to take place at present.

Although a complete and searching evaluation of the Uniform Database Pilot Project is not feasible at this time, many aspects of the work to date deserve comment. In a sense, this evaluation is a metaphor for the COPC process. Community oriented primary care seeks to make do with what is at hand, making maximal use of information that is at

111

times of poor quality by traditional standards. In this spirit of willingness to explore the facts that are at hand, I will discuss the Project's results to date.

The Use and Abuse of Information at the Free Clinic

The Free Clinic has made little use (for planning or evaluation purposes) of the data it collects. The details of data collection and collation have been dictated by reporting requirements, and these reports are not well suited to characterizing the Clinic's target population. The categories used for recording the reason for each encounter are not precise, sometimes failing to distinguish between a diagnosis and a test. Although the rate of positive tests is reported for several important diseases (including gonorrhea, syphilis, chlamydia, and hepatitis B), these diseases may be diagnosed and treated on a clinical basis, so that laboratory-based surveillance at the Free Clinic suffers to an unknown degree from underreporting. Recording of race in patients' charts is incomplete, and age, income, or other demographic information is not abstracted from charts. Even the information which is abstracted (sex, race, and reason for encounter) is degraded in that reports sever the connection between person and problem. Thus, it was not possible under the old system to analyze the relationships between personal factors and clinical problems. The poor quality of the forms in use when the project began is evidence of the Clinic administration's lack of concern regarding the case mix and utilization information.

Despite these limitations in the data, several potentially important conclusions can be drawn from an examination of the last four years' worth of monthly reports. The volume

of patients treated at the Clinic is perhaps the most basic fact regarding utilization of services there. The Clinic had an average of 814 patient visits per month from 1985 to 1989, with relatively little fluctuation over time. It is likely that the peak in mid 1987 reflects increased availability of medical students and volunteer physicians, rather than any trend in disease incidence or access to care in San Francisco. The Clinic, even when operating at full capacity with 5 students and one attending physician, usually cannot provide care to all who seek it on any given day (Ann Howell-Isom, personal communication, 5-5-89). One worthwhile project would be to document the rate of turning patients who seek care away from the Free Clinic.

It is not possible to examine the utilization of services in terms of number of visits per person over time, since the Clinic has not collated data in a way in which records can be matched. Based on the mean number of diagnoses and services per month (983), the calculated mean number of problems per visit is 1.21. This figure is very difficult to interpret because of the variable meaning of "diagnoses and services" in Free Clinic practice. For certain problems, protocols dictate that two or more tests be ordered which, if performed, are each counted as a diagnosis or service under the Clinic's old system. For practical purposes, then, we can conclude that most patients at the Free Clinic are being treated for a single medical problem, as expected for this relatively young and healthy population.

This also means that the estimated frequencies of clinical problems calculated here are not severely biased by the presence of multiple problems for a single visits. Because these proportions were derived by dividing the number of times a given problem was re-

corded by the total number of visits to the Clinic, they would be biased upward if there were many secondary diagnoses recorded. The degree of this bias is difficult to assess from old Clinic data.

The two most frequently noted medical problems at the Free Clinic are sexually transmitted diseases (STDs) and dermatologic conditions, each of which account for approximately 20% of visits. This is in marked contrast to the experience of other ambulatory care providers in the United States and abroad (table 1). In the study by Bordley and

Table 1. **Diagnostic Frequency in Ambulatory Care**

Study	STDs	Derm	Resp
Bordley et al., 1987	<1%	<1%	12.6%
Marsland et al., 1976	<1%	5.5%	12.8%
Yekutiel, 1981	<1.5%	6.3%	23%
Haight-Ashbury Free Medical Clinic	20.2%	19.4%	9.4%

STDs - sexually transmitted diseases; Derm - dermatology; Resp - respiratory, including upper and lower respiratory tract infections. See the text for a description of the studies.

colleagues (1987), patient visits to the Rochester General Hospital general internal medicine ambulatory clinic were recorded and analyzed. Data from 1,618 visits were collected, with reason-for-encounter classification adapted from Schneeweiss and colleagues (1983). Marsland and his colleagues (1976a, 1976b) at the Medical College of Virginia used the Royal College of General Practitioners system to record 526,196 health problems from 88,000 patients under the care of 118 family practice residents and physicians over a two year period. The study by Yekutiel (1981) was similar in purpose to the present study, seeking to harness the data from primary care clinics for planning purposes.

114

Carried out during 1973 at 13 primary care practices in Israel, they used a hybrid of the Royal College of General Practitioners system and the International Classification of Disease. The findings from these studies are similar to those from other surveys of ambulatory care, including the National Ambulatory Care Survey.

The prevalence of sexually transmitted diseases in the Clinic's population is apparently much higher than in the population in general. Age- and sex-specific data are not available from the Free Clinic, but the overall patient population is predominantly Caucasian young adults. Sexually transmitted diseases are most prevalent in urban Black teenagers in the U.S., but are also common among young Caucasians (CDC 1988; Hahn et al., 1989). The majority of Free Clinic patients are probably uninsured, although this cannot be documented at present. Johnson and Murata (1988) found significant differences in the distribution of medical problems between uninsured patients, those with private insurance, and those covered by Medicaid. The Clinic also treats a high proportion of homeless, transient, and marginally housed people. The high prevalence of sexually transmitted diseases at the Free Clinic probably reflects their prevalence in the Clinic's target population. Targeted interventions (e.g. health education aimed at decreasing transmission or aggressive screening programs) should be considered for this high risk population.

Only anecdotal information regarding the exact mix of dermatologic cases is available. Free Clinic clinicians mention *contact dermatitis* as with poison oak exposure, *infestations* with lice or scabies, and minor *fungal infections* such as tinea pedis when asked to name the most commonly seen dermatologic problems. These are all conditions

that are prevalent among homeless and marginally housed people (Brickner et al., 1986). At least 7.6% of patient visits were from homeless people in June of 1988 (61 of 807 visits). The true proportion is probably at least slightly higher, since homeless people may be reluctant to admit that they lack shelter (Bachrach, 1984; Milburn and Watts, 1986). This proportion has almost certainly increased substantially during the last year because of aggressive outreach activities carried out by the San Francisco Community Clinic Consortium. It is possible, then, that the high prevalence of dermatologic problems (and perhaps STDs) among Free Clinic patients reflects the prevalence of these conditions in the homeless and marginally housed population.

The sharp increase in ear, nose, and throat problems treated at the Free Clinic illustrates the Clinic's dependance on a shifting pool of volunteers. Beginning in 1986, an otolaryngologist began volunteering regularly. This allowed the Clinic to treat simple ENT problems in-house, rather than referring patients to San Francisco General Hospital, and roughly doubled the number (and proportion) of ENT visits per month.

The trend in sexually transmitted diseases over the four years studied at the Free Clinic is similar in shape but not timing to the national trend (CDC 1987b, 1988). For syphilis, the incidence rate in California decreased through mid-1985, but then began to increase again. The proportion of Free Clinic visits in which syphilis was diagnosed continued to decrease until 1988, and has been increasing since then. It is possible that this disparity reflects a later increase in the Clinic's predominantly white population than in the California population as a whole, although changes in access to and utilization of Clinic services cannot be excluded. Because proportions, rather than absolute rates, were

116

used for this analysis, fluctuation in the number of visits per month cannot account for this trend.

The incidence of respiratory illnesses among Free Clinic patients is cyclical, lending support to the hypothesis that Clinic data reflect real trends in disease incidence. Because of the imprecision of Clinic data -- chronic and acute respiratory illnesses are not even distinguished reliably under the old system -- it is not possible to make meaningful comparisons with data for San Francisco. Since upper respiratory infections and acute bronchitis are prevalent diseases, they may prove useful in the future for assessing the degree to which variation in Clinic-derived estimates of incidence rates are affected by selection biases.

The Free Clinic as a Source of Surveillance Data

The temporal trends in the incidence rates of hepatitis and gonorrhea in Free Clinic patients from December of 1987 through January of 1988 were poorly correlated with the corresponding incidence rates for all of San Francisco according to a linear model tested with Pearson's product-moment statistic. The Kolmogorov-Smirnov two-way goodness of fit test is more appropriate for comparing two time series, however, because of its use of the ordering of observations in estimating whether two samples were drawn from different distributions or populations (Zar, 1984, pp. 53-58). The results of this test support the impression gained by examining graphs of the incidence rates at the Free Clinic and for San Francisco: changes at the Free Clinic mirror those in San Francisco to an important degree. Surveillance systems which depend on mandatory reporting by clinicians are

117

notoriously subject to under-reporting. Integrating the Uniform Database Project into county health department surveillance activities might improve this considerably, especially if applied widely in community clinics.

The rate of *testing* for syphilis at the Free Clinic is significantly correlated with the incidence of syphilis in San Francisco. Too few cases of syphilis (only eight during the 14 months studied here) are treated by the Free Clinic for a meaningful comparison based on actual incidence rates to be drawn. Since syphilis testing is performed for most patients at the Free Clinic suspected of having any sexually transmitted disease, the rate of testing might be a reasonable surrogate for the crude incidence of all sexually transmitted diseases. This is probably enough for many planning functions (e.g., how many give-away condoms to order, or evaluating an educational intervention). With several providers (clinics) pooling information, stable estimates of incidence rates for specific diseases may be obtainable. In this context, the importance of the Uniform Database Project really lies in improving the consistency of reporting, ideally making data on ambulatory health problems as accessible and complete as that for hospitalizations (for which discharge summary data is relatively complete).

Case Mix and Utilization Measurements from the Prototype System

The analysis of data in which personal characteristics are linked with health problems will be a major step for the Free Clinic. Using a computerized database, it will is easy to calculate age- and sex-specific rates. Analyses can be stratified according to housing status (homelessness), income, insurance coverage, or other variables of interest. While

most of these variables were not extracted during the prototype phase of the Uniform Database Pilot Project, selected applications of this more sophisticated approach to data analysis are discussed here.

The number of times in which patients visit a physician during a given time period can be quite revealing of the nature of the patient population. At the Free Clinic during June of 1988, the number of visits per month was distributed geometrically among the patients, with most patients having only a single visit. This reflects the relative youthfulness of the Free Clinic's patients, who therefore have few chronic health problems and fewer illnesses in general. The transience of many clinic patients may cause some underestimation of the incidence of health problems in the target community (if people are in a different city, they can't easily seek care from the Free Clinic). The data do not allow us to distinguish follow-up visits from visits for new or different medical problems.

The appropriate denominator for calculating rates and proportions at an urban community clinic is not obvious. The lucky COPC practice has a geographically defined target population (as is the case for the Indian Health Service) or an enumerated population (as with Kaiser Permanente and other health maintenance organizations, and in the case of Israel or Great Britain). For an urban practice in the pluralistic system of the United States, the definition of the community can draw on census data, family information for the practice's patients, surveys, and other sources. None of these adequately define the group of people who might consider the practice to be their primary care provider, however. Bass (1976) has suggested extrapolating from the distribution of visits per patient per year to calculate the number of people with no visits during the time period studied

who, nonetheless, would seek care from that practice if they needed medical care. Adapting this technique to the single month's data at hand, we would predict a total of 2,408 people depended on the Free Clinic for care during June 1988, 609 of them actually being treated during that period. This approach has never been validated, however.

This estimate is likely to be severely biased, since the sample is so small; the effects of seasonal variation, the fluctuating number of clinicians at the Free Clinic, transience in the Clinic's target population, and random variation cannot be controlled for. Indeed, given that the Free Clinic is always turning people away, it is questionable whether an accurate estimate of the total denominator population can ever be made. Other methods of extrapolating from clinic experience in order to define a population have been suggested, including models based on the negative binomial and the quadratic odds estimator (Hearst, 1987). These methods would be subject to similar uncertainties in the present case. Thus, it is difficult for the Free Clinic to estimate incidence or prevalence rates; there is no easily measured denominator.

Just as most patients visited the Free Clinic only once during June, 1988, most patients had only one medical problem during each visit. Since the Clinic's old coding practices called for the recording of several diagnoses and services for a single problem in many cases, this is an indication of incomplete reporting. At least 20% of visits (those for STDs) would have had to have at least two "problems" recorded if Clinic protocols were followed. In many or most of an additional 20% of visits (dermatologic problems), serologic testing for syphilis would have been indicated. This underreporting could occur at the stage of primary data collection (incomplete charting by the student or physi-

cian), during data abstraction from charts onto log sheets, or during data entry into the computer.

Studies of the validity of medical records in ambulatory settings have revealed rates of failing to record visits on patients charts of as high as 45% (Weitzman et al., 1981). DeSimone and colleagues (1976), in a study of data abstraction from 100 patients' records in a medical school affiliated Syracuse, NY hospital, found that only 58% of codeable problems found in charts were actually present on the computer data tapes drawn from these charts. Other studies of the validity and completeness of computerized data abstracted from patients' charts have found similarly high error rates (Cohen et al., 1985; Coulter et al., 1989; Dambro and Weiss, 1988). And, as illustrated by an alarming report by Stellman (1989), the computerized collation of data after entry can also introduce errors into a data set. The importance of these sources of error at the Free Clinic is unknown, but given the largely nonprofessional staff may be quite high.

Homeless people are an especially vulnerable group, and the Free Clinic has targeted special services in an attempt to meet their needs. Because of this interest in homelessness, we have examined case mix and the utilization of Clinic services by the homeless. A statistically significant difference in the rate of screening for AIDS in homeless people was found (odds ratio=0.07). Because the Clinic's AIDS screening is entirely elective, this may reflect decreased awareness of AIDS and human immunodeficiency virus (HIV) infection on the part of homeless people. If that is the case, an educational intervention might be useful. The possibilities that homeless people seen at the Clinic are at less risk for HIV infection, that they seek HIV antibody testing elsewhere but receive general

121

medical care from the Free Clinic, or that Clinic personnel discriminate against the homeless with regard to AIDS screening cannot be excluded by these data.

Other differences between homeless and housed patients were not statistically significant. Because of the relatively small sample size, the power to detect a significant difference between homeless and housed people of this study is very low. The prevalence of sexually transmitted diseases in homeless people treated at the Free Clinic was higher than that in housed people (odds ratio = 1.46). If this is a real difference, it lends weight to the need for education regarding safe sexual practices and HIV prevention for homeless people. Dermatologic problems are also more prevalent among the homeless than among the Free Clinics housed population. The same relationship is found in other studies; homeless people suffer from greater exposure to skin parasites and harsh environmental conditions, may suffer from venous stasis in the legs because of prolonged standing, and are less able because of their circumstances to provide basic hygienic measures for themselves (Bowdler and Barrell, 1987; Brickner et al., 1986).

The homeless are known to be at high risk for tuberculosis, a disease whose incidence has recently begun to increase in the United States (CDC, 1987a). Because of this increased risk, homeless people should probably be the focus of active screening programs. During June of 1988, however, the rate of PPD screening at the Free Clinic was slightly *lower* for homeless people than for housed people -- in fact, only one homeless person received a documented PPD skin test! This distribution of services may be explained by the perception of clinicians that many homeless people are unlikely to return after two days to have their skin test read. This finding has led to increased efforts by the clinic to

consciously screen homeless people for tuberculin skin test reactivity, although nothing approaching uniform coverage has yet been achieved.

Homeless people were also found to have been more likely to have visited the clinic only once during the month studied (odds ratio = 1.4, p<0.210). For homeless men, the difference was greater (odds ratio = 3.88) and statistically significant (p<0.013). The reasons for this difference are unknown; homeless people, especially men, may be more likely to be transient, or they may have a higher tolerance for health problems, deferring care for longer. In either of these cases, managing chronic diseases such as diabetes and hypertension becomes extremely difficult. Homeless people may be more likely to use a variety of providers because they seek care from the nearest facility that will treat them for a given episode of illness. Homeless people may also be fearful of the authority manifested at health care facilities, even at a place like the Haight-Ashbury Free Medical Clinic. If a cooperative data collection system with patient tracking capabilities were instituted, it would be possible to better assess the utilization of health care services by homeless people.

Conclusion

The Uniform Database Pilot Project is an attempt on the part of the San Francisco Community Clinic Consortium to foster the sharing of data among member clinics for planning purposes. In order for such a system to be useful, the data sets of each clinic must be comparable. The Pilot Project will provide, among other things, a minimum basic data set for use by the Consortium's Clinics. For the Haight-Ashbury Free Medical

Clinic, the Project has also been an opportunity to revamp data management procedures, allowing management requirements to be more elegantly met. This restructuring has been based on the community-oriented primary care model. Based on the preliminary results available at present, this new data management and analysis system can have an important impact on the planning and delivery of Clinic services if used in the planning process.

Community oriented primary care, as defined by the Institute of Medicine's studies, requires that a practice define a target population for which it will be responsible, then assess the health needs of that population, modify the health care delivery system to better meet those needs, and finally assess the efficacy of the changes made. One way to formulate the COPC model is as the establishment of a short feedback loop between epidemiologic research and clinical practice. This short feedback loop is an integral concept in primary care epidemiology, and forms the underpinning of the Uniform Database Pilot Project.

The main reasons that primary care epidemiology is attractive as a source of information for planning health care services are economic and temporal. Traditional epidemiologic studies are expensive to conduct, requiring resources and expertise that are beyond the reach of most providers, let alone a community-based free clinic. By making the most of routinely collected data, it is may be possible to substantially improve planning with minimal expenditure. At the same time, it should be possible for a practice to react much more promptly to trends in the target community than is the case with traditional epidemiology, in which data collection is often broader based (but takes longer), analysis

may be sophisticated (and lengthy), and the dissemination of results mainly via peer-reviewed journals (introducing further delays).

The findings from this project support these hopes. Even data collected before the Uniform Database Pilot Project began provided useful information regarding case mix and utilization at the Free Clinic. The Clinic treats more sexually transmitted diseases and dermatologic problems than other ambulatory care providers that have been studied, reflecting its different target population. The actual number of patients seen per month is quite dependent on the availability of medical students and volunteer physicians; ensuring the adequacy of these personnel should be a management priority. In subspecialties, such as otolaryngology, this may especially critical.

For some of the trends observed (for example, the increase in sexually transmitted diseases beginning in 1988), there is insufficient evidence to distinguish whether real differences between the Free Clinic's population and the public as a whole exist or selection biases have confounded the situation. One function of this system, however, can be hypothesis generation. If, for instance, the trend of increasing incidence of STDs began later in the Free Clinic's target community than in the rest of San Francisco and California (1988 rather than 1985), valuable clues regarding the risk factors for STDs might be uncovered by further study. The preliminary, unreliable findings of this study, then, could serve as a starting point for a more focused epidemiologic study.

There is some evidence that the Free Clinic's surveillance data accurately reflect trends in disease incidence in San Francisco for selected sexually transmissible diseases. The small sample size involved could be dealt with by pooling data from other communi-

ty clinics. And, again, the possibility that the differences between the data for San Francisco and that for the Free Clinic reflect real differences in the incidence of disease between the two populations should be investigated.

The new system allows the connection between person and medical problem to be retained. Even without the full system's minimum basic demographic data items, important findings have emerged. The approach to caring for homeless people may need to be modified in a variety of ways, including innovative means of screening for tuberculosis and targeted educational efforts. The cooperation of all of San Francisco's providers would have the potential for tremendously enhancing the continuity of care received by homeless people, although privacy may be a difficult issue for such a system.

This system has been carefully designed to integrate smoothly with other Clinic functions. Thus, all required reports can be generated automatically from this system. Integration with scheduling of patients would be a simple step. A variety of coding systems can be supported, allowing for flexibility with interfacing with other systems. For a provider that charges for its services (unlike the Free Clinic), integration of the data system with billing is also straightforward. The system can serve as a source of cases for more focused epidemiologic studies as well.

It is hoped that this system will enhance the ability of the Free Clinic to meet the needs of its clients in an efficient manner. In this era of cost containment and growing need, such efficiency on the part of all providers, and especially community clinics, is essential. Our success at improving the health of people will remain to be tested during the further evaluation and development of this Project.

Epilogue

The Uniform Database Pilot Project at the Haight-Ashbury Free Clinic has an uncertain future. As has often been the case for COPC projects, the problem is one of economic support: the Free Clinic is unable to provide the financial and staff resources necessary for expanded implementation of the project. While potential sources of grant support have been identified, no funding has yet been obtained. As principal investigator, and longtime volunteer at the Free Clinic, I have provided most of the impetus for pursuing the development of the Clinic's data handling and analysis capabilities. Unfortunately, other commitments will limit my ability to work on the Project for some time. If startup funding is in fact obtained, the system will require relatively little maintenance, but the prospects for completing the grant proposal development process and continuing the implementation beyond handling homeless grant reporting requirements are guarded.

The lessons learned from this Pilot Project are being applied by the San Francisco Community Clinic Consortium. A shared (but anonymous) database on homeless clients is now being developed. The first slow and wobbly steps toward the sharing of data are now being taken by Consortium clinics, and I have high hopes that the future will bring a slightly more rational system to San Francisco.

References

Abramson JH. Training for Community-Oriented Primary Care. *Isr J Med Sci* 1983; 19: 764-767.

Abramson JH. Application of Epidemiology in Community Oriented Primary Care. *Public Health Rep* 1984; 99: 437-442.

Abramson JH, Gofin R, Hopp C, Gofin J, Donchin M, Habib J. Evaluation of a Community Program for the Control of Cardiovascular Risk Factors: The CHAD Program in Jerusalem. *Isr J Med Sci* 1981; 17: 201-212.

Abramson JH, Kark SL. Community Oriented Primary Care: Meaning and Scope. In Connor E, Mullan F (eds), Community Oriented Primary Care, New Directions for Health Services Delivery. Washington D.C.: National Academy Press, 1983; pp 21-59.

Anastasio GD, White TR, Fries JC. Computerized Prescription Inventory Program for the Education of Residents (PIPER). *J Fam Pract* 1986; 23: 598-600.

Babitz ME. COPC: Doing Something is Better than Doing Nothing. In Nutting PA (ed). Community-Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 23-27.

Bachrach LL. Interpreting Research on the Homeless Mentally Ill: Some Caveats. *Hosp Community Psychiatry* 1984; 35: 914-917.

Baker G. An Essay, Concerning the Cause of the Endemial Colic of Devonshire. New York: The Delta Omega Society, 1958 (Original work published 1767).

Bannister J, Preston SH. Mortality in China. *Pop Develop Rev* 1981; 7: 98-110.

Barell V, Wax Y, Ruder A. Analysis of Geographic Differentials in Infant Mortality Rates: The Or Yehuda Community. *Am J Epidemiol* 1988; 128: 218-230.

Barnett GO. The Application of Computer-Based Medical-Record Systems in Ambulatory Practice. In Orthner HF, Blum BI (eds), Implementing Health Care Information Systems. New York: Springer-Verlag, 1989; pp 85-99.

Barry MA, Wall C, Shirley L, Bernardo J, Schwingl P, Brigardi E, Lamb GA. Tuberculosis Screening in Boston's Homeless Shelters. *Public Health Rep* 1986; 101: 487-494.

Bass M. Approaches to the Denominator Problem in Primary Care Research. *J Fam Pract* 1976; 3: 193-195.

Bassuk EL, Rosenberg L. Why Does Family Homelessness Occur? A Case-Control Study. *Am J Public Health* 1988; 78: 783-788.

Block B, Brennan JA. Automated Health Survellance. *Fam Med* 1988; 20: 377-380.

Blum BI. Clinical Information Systems - A Review. *J Clin Computing* 1988; 16: 167-174.

Bordley DR, Dolan JG, Hall WJ. Monitoring and Improving the Content of Medical Residents' Ambulatory Care Experience: A Microcomputer-based Method Using Diagnostic Clusters. *J Gen Intern Med* 1987; 2: 174-177.

Boufford JI. Medical Education and Training for Community-Oriented Primary Care. In Connor E, Mullan F (eds), Community Oriented Primary Care: New Directions for Health Services Delivery. Washington, D.C.: National Academy Press, 1983; pp 167-189.

Bowdler JE, Barrell LM. Health Needs of Homeless Persons. *Public Health Nurs* 1987; 4: 135-140.

Brämer GR. International Statistical Classification of Diseases and Related Health Problems, Tenth Revision. *Wld Hlth Statist Quart* 1988; 41: 32-34.

Braveman PA, Mora F. Training Physicians for Community-Oriented Primary Care in Latin America: Model Programs in Mexico, Nicaragua, and Costa Rica. *Am J Public Health* 1987; 77: 485-490.

Breckenridge MB, Like RC. Practical Applications of Demography in Community-Oriented Primary Care. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 90-108.

Brickner PW, Scanlon BC, Conanan B, Elvy A, McAdam J, Scharer LK, Vicic WJ. Homeless Persons and Health Care. *Ann Intern Med* 1986; 104: 405-409.

Bridges-Webb C. A Computer Summary for General Practice Medical Records: MEDSUM. *J Fam Pract* 1986; 23: 389-392.

Bridges-Webb C. Classifying and Coding Morbidity in General Practice: Validity and Reliability in an International Trial. *J Fam Pract* 1986; 23: 147-150.

Carstairs V. Small Area Analysis and Health Services Research. *Community Med* 1981; 3: 131-139.

Cassel JC. A Comprehensive Health Program Among South African Zulus. In Paul B (ed), Health, Culture, and Community. New York: Russell Sage Foundation, 1955; pp 15-42.

Centers for Disease Control. Increases in Primary and Secondary Syphilis. *MMWR* 1987; 36: 393-397.

Centers for Disease Control. Tuberculosis Control Among Homeless Populations. *MMWR* 1987; 36: 257-260.

Centers for Disease Control. Continuing Increase in Infectious Syphilis. *MMWR* 1988;
37: 35-39.

Chabot A. Improved Infant Mortality Rates in a Population Served by a Comprehensive
Neighborhood Health Program. *Pediatrics* 1971; 47: 989-994.

Chadwick E. Report on the Sanitary Condition of the Labouring Population of Great
Britain. Edinburgh: Edinburgh University Press, 1965.

Chan DH, Donnan SP,Chan N, Chow G. A Microcomputer-Based Computerized Medi-
cal Record System for a General Practice Teaching Clinic. *J Fam Pract* 1987; 24:
537-541.

Cohen E, Bernier D, Tam S, Schimel D, Postel AH, Scheidt S, Stamm JB. Data Quality
and DRGs: An Assessment of the Reliability of Federal Beneficiary Discharge Data
in Selected Manhattan Hospitals. *J Community Health* 1985; 10: 238-246.

Colombo TJ, Freeborn DK, Mullooly JP, Burnham VR. The Effect of Outreach Work-
ers' Educational Efforts on Disadvantaged Preschool Children's Use of Preventive
Services. *Am J Public Health* 1979; 69: 465-468.

Committee on the Costs of Medical Care. Medical Care for the American People - the
Final Report of the Committee on the Costs of Medical Care. Chicago: University of
Chicago Press, 1932.

Connor E. Overview and Summary. In Connor E, Mullan F (eds), Community Oriented
Primary Care: New Directions for Health Services Delivery. Washington, D.C.: Na-
tional Academy Press,1983; pp 1-5.

Connor E, Mullan F. *Community Oriented Primary Care: New Directions for Health
Services Delivery.* Washington, D.C.: National Academy Press, 1983.

Coulter A, Brown S, Daniels A. Computer Held Chronic Disease Registers in General
Practice: A Validation Study. *J Epidemiol Community Health* 1989; 43: 25-28.

Coulter A, Daniels A. Computers, Epidemiology, and General Practice. *Lancet* 1988; 2: 1493.

Cubbon JE. Methods of Evaluating Community Health Services at Local Level: Possible Applications of Routinely Collected Data. *Community Med* 1987; 9: 323-330.

Dambro MR, Weiss BD. Assessing the Quality of Data Entry in a Computerized Medical Records System. *J Med Syst* 1988; 12: 181-187.

Davis BR, Slyman DJ, Cooper CJ, Mutchler L. A Distributed Data Processing System in a Multicenter Clinical Trial. *Proc 1985 Conf on Records & Stats* 1985; pp 149-153.

DeSimone JP, Hudson N, Konen JC. Does Encounter data Really Reflect Wht is Seen in the Office?. *J Fam Pract* 1976; 3: 666.

DeTore AW. Medical Informatics: An Introduction to Computer Technology in Medicine. *Am J Med* 1988; 85: 399-403.

Deuschle KW. Community-Oriented Primary Care: Lessons Learned in Three Decades. *J Community Health* 1982; 8: 13-22.

Deuschle KW. Community Oriented Primary Care: Lessons Learned in Three Decades. In Connor E, Mullan F (eds), Community Oriented Primary Care: New Directions for Health Services Delivery. Washington, D.C.: National Academy Press, 1983; pp 6-17.

Doron H. Planning Community-Oriented Primary Care in Israel. *Pub Health Rep* 1984; 99: 450-455.

Doyle DB. Patient Tracking Systems in COPC. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 250-263.

Ellerbrook M, Kraus L, Osborn EH, Bujold R. Defining a Transient Population in an Urban Setting. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 152-157.

Ellsbury KE, Schneeweiss R, Montano DE, Cleveland PO, Coombs JB, Eggertsen SC, Gore EJ. Content of the Model Teaching Unit Ambulatory Care Training and Continuity of Care in Six Family Practice Residency Programs. *J Fam Pract* 1987; 25: 273-278.

Farley ES. Data Organization: The Practice as a Laboratory for COPC. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 420-427.

Filardo T. Chronic Disease Management in the Homeless. In Brickner PW, Scharer LK, Conanan B, Elvy A, Savarese M (eds), Health Care of Homeless People. New York: Springer Publishing Company, 1985; pp 19-31.

Frame PS. Is Community-Oriented Primary Care a Viable Concept in Actual Practice? An Affirmative View. *J Fam Pract* 1989; 28: 203-206.

Freeman WL. Implementing COPC: Achieving Change in a Small Organization. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 410-416.

Fries JF, McShane DJ. ARAMIS (The American Rheumatism Association Medical Information System): A Prototypical National Chronic-Disease Data Bank. *West J Med* 1986; 145: 798-804.

Furcolow ML, Shaffer SA, Deuschle KW. Tuberculosis Eradication in Theory and Practice. *Arch Environ Health* 1966; 12: 287-294.

Gabrieli ER. Automated Medical Office Records. *J Medical Systems* 1987; 11: 59-68.

Galazka SS, Zyzanski S. How Representative is Your Practice Population of the Community?. In Nutting PA (ed), <u>Community Oriented Primary Care: From Principle to Practice</u>. Rockville, MD: Health Resources and Services Administration, 1987; pp 83-89.

Geiger HJ. The Meaning of Community Oriented Primary Care in the American Context. In Connor E, Mullan F (eds), <u>Community Oriented Primary Care: New Directions for Health Services Delivery</u>. Washington, D.C.: National Academy Press, 1983; pp 60-90.

Gordis L. Effectiveness of Comprehensive Care Programs in Preventing Rheumatic Fever. *N Engl J Med* 1973; 289: 331-335.

Green LA, Calonge N, Fryer GE, Reed FM. Age/Sex Registries in Primary Care Research. *Fam Med* 1988; 20: 185-188.

Guerrero R. Community Oriented Primary Care: An International Perspective. In Connor E, Mullan F (eds), <u>Community Oriented Primary Care: New Directions for Health Services Delivery</u>. Washington, D.C.: National Academy Press,1983; pp 104-112.

Haber S, Lunenfeld B. Epidemiology, Health Policy, and Resource allocation: The Israeli Perspective. *Pub Health Rep* 1984; 99: 455-460.

Hahn RA, Magder LS, Aral SO, Johnson RE, Larsen SA. Race and the Prevalence of Syphilis Seroreactivity in the United States Population: A National Sero-Epidemiologic Study. *Am J Public Health* 1989; 79: 467-470.

Hancock WM, Walter PF,More RA, Glick ND. Operating Room Scheduling Data Base Analysis for Scheduling. *J Med Syst* 1988; 12: 397-409.

Harris KW, Royston PN, Givens JD. Use and Interpretation of Diagnostic Statistics from Selected Data Systems. *Vital and Health Statistics*, Series 2, No. 107. Washington, D.C.: U. S. Government Printing Office, 1988.

Hart JT. A New Kind of Doctor. *J R Soc Med* 1981; 74: 871-883.

Hatch J, Eng E. Health Worker Roles in Community Oriented Primary Care. In Connor E, Mullan F (eds), Community Oriented Primary Care: New Directions for Health Services Delivery. Washington, D.C.: National Academy Press, 1983; pp 138-158.

Hauser J. Discussion of "Population-Based and Community-Oriented Approaches to Preventive Health Care. *Am J Preventive Med* 1988; 4: 155-157.

Hawk DL, Calvert JF. The Active Patients in a Clinical Practice: The First Step Toward a Definable Community. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 40-44.

Hawkins BS, Singer SW. Design, Development, and Implementation of a Data Processing System for Multiple Controlled Trials and Epidemiologic Studies. *Controlled Clin Trials* 1986; 7: 89-117.

Hearst N. The Denominator Problem in Community-Oriented Primary Care. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 71-75.

Hsiao WC. Transformation of Health Care in China [Special Report]. *N Engl J Med* 1984; 310: 932-936.

Iezzoni LI. Case Classification and Quality of Care: Issues to Consider Before Making the Investment. *QRB* 1987; : 135-139.

Institute of Medicine. Community-Oriented Primary Care: A Practical Assessment. Volume I, The Committee Report. Washington, DC: National Academy Press, 1984.

Institute of Medicine. Community-Oriented Primary Care: A Practical Assessment. Volume II, The Case Studies. Washington, DC: National Academy Press, 1984.

Ismach RB. The Epidemiology of Homelessness: A Review of the Literature and Meta-Analysis. Unpublished manuscript, 1989.

Iverson DC, Calonge BN, Miller RS, Niebauer LJ, Reed FM. The Development and Management of a Primary Care Research Network, 1978-87. *Family Medicine* 1988; 20: 177-180.

Jacobs J. Creative Uses of a Practice Billing System to Support COPC. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 432-436.

Januzik SJ. Application of Microcomputers in the Emergency Department: Experience With a Computerized Logbook. *Ann Emerg Med* 1986; 15: 1200-1202.

Johnson RA. A Microcomputer-based Data Management System for Case-Comparison Studies. *Proc 1985 PH Conf on Recs & Stats 1985*; pp 71-74.

Johnson RA, Murata PJ. Variations in Content of Care in a Family Medicine Residency Relating to Types of Insurance Coverage. *J Fam Pract* 1988; 27: 87-91.

Johnson Z, Johnson H, McNee N, Dack P. The Epidemiological Information System. *J Clin Computing* 1988; 17: 73-88.

Kamerow DB. Alcohol, Drug Abuse, and Mental Disorders: Opportunities for COPC. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 196-200.

Kannus P, Aho H, Järvinen M, Niittymäki S. Computerized Recording of Visits to an Outpatient Sports Clinic. *Am J Sports Med* 1987; 15: 79-85.

Kark SL. From Medicine in the Community to Community Medicine. *JAMA* 1974; 228: 1585-1586.

Kark SL. Community-Oriented Primary Health Care. New York: Appleton-Century-Crofts, 1981.

Kark SL, Abramson JH. Community-Focused Health Care: Introduction. *Isr J Med Sci* 1981; 17: 65-70.

Kark SL, Kark E. An Alternative Strategy in Community Health Care: Community-Oriented Primary Health Care. *Isr J Med Sci* 1983; 19: 707-713.

Klaucke DN, Buehler JW, Thacker SB, Parrish RG, Trowbridge FL, Berkelman RL. Guidelines for evaluating Surveillance Systems. *MMWR* 1988; 37: 1-18.

Koegel P, Burnam MA. Alcoholism Among Homeless Adults in the Inner City of Los Angeles. *Arch Gen Psychiatry* 1988; 45: 1011-1018.

Koegel P, Burnam MA, Farr RK. The Prevalence of Specific Psychiatric Disorders Among Homeless Individuals in the Inner City of Los Angeles. *Arch Gen Psychiatry* 1988; 45: 1085-1092.

Kruse RL. Data Structures and Program Design. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1987.

Kuller LH. Epidemiology and Health Policy. *Am J Epidemiol* 1988; 127: 2-16.

Lamberts H, Wood M. International Classification of Primary Care. Oxford: Oxford University Press, 1987.

Last JM. A Dictionary of Epidemiology. New York: Oxford University Press, 1983

Lilienfeld AM, Lilienfeld DE. Foundations of Epidemiology (2nd ed.). New York: Oxford University Press, 1980.

Lobet MP, Stroobant A, Mertens R, Van Casteren V, Walckiers D, Masuy-Stroobant G, Cornelis R. Tool for Validation of the Network of Sentinel General Practitioners in the Belgian Health Care System. *International Journal of Epidemiology* 1987; 16: 612-618.

Lurie N, Ward NB, Shapiro MF, Brook RH. Termination from Medi-Cal -- Does it Affect Health. *N Engl J Med* 1984; 311: 480-484.

Mackenbach JP. Health Care Policiy and Regional Epidemiology: International Comparisons and a Case-Study from the Netherlands. *Soc Sci Med* 1987; 24: 247-253.

Madison DL. Opportunities and Constraints for Community Oriented Primary Care. In Connor E, Mullan F (eds), Community Oriented Primary Care: New Directions for Health Services Delivery. Washington, D.C.: National Academy Press, 1983; pp 119-130.

Madison DL. The Case for Community-Oriented Primary Care. *JAMA* 1983; 249: 1279-1282.

Marcus A. A Plan for Information in the National Health Service [Point of View]. *Lancet* 1988; : 1242-1243.

Marsland DW, Wood M, Mayo F. A Data Bank forPatient Care, Curriculum, and Research in Family Practice: 526,196 Patient Problems. *J Fam Pract* 1976; 3: 25-28.

Marsland DW, Wood M,Mayo F. Content of Family Practice. *J Fam Pract* 1976; 3: 37-68.

Martin CR, Werblun MN. The CR Alpha Diagnostic coding System for Ambulatory Care. *J Fam Pract* 1977; 4: 563-566.

McDermott W, Deuschle K, Adair J, Fulmer H, Loughlin B. Introducing Modern Medicine in a Navajo Community [part 1]. *Science* 1960; 131: 197-205.

McDermott W, Deuschle K, Adair J, Loughlin B. Introducing Modern Medicine in a Navajo Community [part 2]. *Science* 1960; 131: 280-287.

McDermott W, Deuschle KW, Barnett CR. Health Care Experiment at Many Farms. *Science* 1972; 175: 23-31.

McDonald CJ, Tierney WM. The Medical Gopher - A Microcomputer System to help find, Organize and Decide About PAtient Data. *West J Med* 1986; 145: 823-829.

McDonald CJ, Tierney WM, Blevins L. The Benefits of Automated Medical Records Systems for Ambulatory Care. In Orthner HF, Blum BI (eds). Implementing Health Care Information Systems. New York: Springer-Verlag, 1989; pp 67-84.

McKay DA. The Epidemiologic Basis for Family Medicine Research. *Family Medicine* 1988; 20: 202-206.

Mettee TM. Community Diagnosis: A Tool for COPC. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 52-59.

Mettee TM. William N. Pickles, M. D.: A Country Doctor with a Naturalist's Interest in Illness. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 2-5.

Milburn NG, Watts RJ. Methodological Issues in Research on the Homeless and the Homeless Mentally Ill. *Int J Ment Health* 1986; 14: 42-60.

Modan B, Barell V. Epidemiology in Health Policy. *Isr J Med Sci* 1981; 17: 80-85.

Morrell DC, Holland WW. Epidemiology and Primary Health Care. *Isr J Med Sci* 1981; 17: 92-99.

Mullan F. Community-Oriented Primary Care: An Agenda for the `80s [Sounding Board]. *N Engl J Med* 1982; 307: 1076-1078.

Mullan F. Community-Oriented Primary Care: Epidemiology's Role in the Future of Primary Care. *Pub Health Rep* 1984; 99: 442-445.

Mullan F. COPC and the Challenge of Public Health. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 28-30.

Mullan F. Rethinking Public Ambulatory Care in America [Sounding Board]. *N Engl J Med* 1987; 316: 544-547.

Mullan F, Kalter HD. Population-Based and Community-Oriented Approaches to Preventive Health Care. *Am J Preventive Med* 1988; 4: 141-154.

Mullan F, Nutting PA. Primary Care Epidemiology: New Uses of Old Tools. *Family Medicine* 1986; 18: 221-225.

Munnecke TH, Kuhn IM. Large-Scale Portability of Hospital Information System Software Within the Veterans Administration. In Orthner HF, Blum BI (eds). Implementing Health Care Information Systems. New York: Springer-Verlag, 1989; pp 133-148.

Nichols J, Wright LK, Murphy JF. A Proposal for Tracking Health Care for the Homeless. *J Community Health* 1986; 11: 204-209.

Nichter M. Project Community Diagnosis: Participatory Research as a First Step Toward Community Involvement in Primary Health Care. *Soc Sci Med* 1984; 19: 237-252.

Nutting PA. Community-Oriented Primary Care: a Promising Innovation in Primary Care. *Pub Health Rep* 1985; 100: 3-4.

Nutting PA. Community-Oriented Primary Care: From Principle to Practice. Introduction. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987.

Nutting PA. Defining a Practice Community: An Approach to COPC for Family Medicine. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 45-47.

Nutting PA. Examining the Distribution of Care in the Community. In Nutting PA´(ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; : 212-226.

Nutting PA. Population-Based Family Practice: The Next Challenge of Primary Care. *J Fam Pract* 1987; 24: 83-88.

Nutting PA. The Evaluation Function in COPC: Quality Assurance for the Community. In Nutting PA (ed), Community Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 344-351.

Nutting PA, Connor EM. Community-Oriented Primary Care: An Examination of the US Experience. *Am J Public Health* 1986; 76: 279-281.

Nutting PA, Strotz CR, Shorr GI, Berg LE. Reduction of Gastroenteritis Morbidity in High-Risk Infants. *Pediatrics* 1975; 55: 354-358.

Nutting PA, Wood M, Conner EM. Community-Oriented Primary Care in the United States: A Status Report. *JAMA* 1985; 253: 1763-1766.

O'Connor PJ. Is Community-Oriented Primary Care a Viable Concept in Actual Practice? An Opposing View. *J Fam Pract* 1989; 28: 206-208.

Osborn EH, Hearst N, Lashof JC, Smith WM. Teaching Community-Oriented Primary Care (COPC): A Practical Approach. *J Community Health* 1986; 11: 165-171.

Palti H, Zilber N, Kark SL. A Community-Oriented Early Intervention Programme Integrated in a Primary Preventive Child Health Service - Evaluation of Activities and Effectiveness. *Community Med* 1982; 4: 302-314.

Pickles WN. Epidemiology in Country Practice. Baltimore: Williams and Wilkins, 1939.

Reed FM. Estimating the Economic Impact of COPC Activities on Primary Care Practice. In Nutting PA (ed), <u>Community Oriented Primary Care: From Principle to Practice</u>. Rockville, MD: Health Resources and Services Administration, 1987; pp 417-419.

Regier DA, Shapiro S, Kessler LG, Taube CA. Epidemiology and Health Service Resource Allocation Policy for Alcohol, Drug Abuse, and Mental Disorders. *Pub Health Rep* 1984; 99: 483-492.

Rhoades ER, D'Angelo AJ, Hurlburt WB. The Indian Health Service Record of Achievement. *Pub Health Rep* 1987; 102: 356-360.

Rhyne RL, Kozoll R, Stewart B. Defining the Practice Population With Census Data. In Nutting PA (ed), <u>Community Oriented Primary Care: From Principle to Practice</u>. Rockville, MD: Health Resources and Services Administration, 1987; pp 60-70.

Roach VK. Appointment Scheduling By Computer. *M.D. Computing* 1984; 1: 17-26.

Robertson LS. Community Injury Control Programs of the Indian Health Service: An Early Assessment. *Pub Health Rep* 1986; 101: 632-637.

Robertson MJ, Cousineau MR. Health Status and Access to Health Services Among the Urban Homeless. *Am J Public Health* 1986; 76: 561-563.

Rock JA, Early SA, Zacur HA, Wallach EE. A Computer-based System for Patient Care and Research Management in Reproductive Endocrinology. *Fertility and Sterility* 1986; 45: 216-220.

Rogers DE. Community-Oriented Primary Care. *JAMA* 1982; 248: 1622-1625.

Rogers DE. Thoughts on Community Oriented Primary Care. In Connor E, Mullan F (eds), <u>Community Oriented Primary Care: New Directions for Health Services Delivery</u>. Washington, D.C.: National Academy Press, 1983; pp 198-205.

Romaniuk JG, Blanks EE. Issues in the Development of a Clinical Database on Alzheimer's Disease. *J Medical systems* 1987; 11: 1-9.

Roper WL, Winkenwerder W, Hackbarth GM, Krakauer H. Effectiveness in Health Care: An Initiative to Evaluate and Improve Medical Practice. *N Engl J Med* 1988; 319: 1197-1202.

Rose DN. Setting Priorities Among Competing Health Problems. In Nutting PA (ed), Community-Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 237-241.

Rosko MD. DRGs and Severity of Illness Measures: An Analysis of Patient Classification Systems. *J Med Syst* 1988; 12: 257-274.

Rosser WW. Strategies for Clinical Prevention in COPC. In Nutting PA (ed), Community-Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; : 264-271.

Rossi PH, Wright JD. The Determinants of Homelessness. *Health Affairs* 1987; : 19-32.

Rossi PH, Wright JD, Fisher GA, Willis G. The Urban Homeless: Estimating Composition and Size. *Science* 1987; 235: 1336-1341.

Sacks JJ. Utilization of Case Definitions and Laboratory Reporting in the Surveillance of Notifiable Communicable Diseases in the United States. *Am J Public Health* 1985; 75: 1420-1422.

Safran C, Porter D. New Uses of a Large Clinical Data Base. In Orthner HF, Blum BI (eds). Implementing Health Care Information Systems. New York: Springer-Verlag, 1989; pp 123-132.

Sanders D, Carver R. The Struggle for Health: Medicine and the Politics of Underdevelopment. London: MacMillan Publishing Ltd., 1985.

Schneeweiss R, Cherkin DC, Hart LG, Revicki DA, Wollstadt LJ, Stephenson MJ, Rosenblatt RA. Diagnosis Clusters Adapted for ICD-9-CM and ICHPPC-2. *J Fam Pract* 1986; 22: 69-72.

Schneeweiss R, Jacobsen SC, Montano DE, Gore E. An Evaluation of Computerized Documentation of Resident Experiences in Training. *Family Medicine* 1987; 19: 356-360.

Schneeweiss R, Rosenblatt RA, Cherkin DC, Kirkwood CR, Hart G. Diagnosis Clusters: A New Tool for Analyzing the Content of Ambulatory Medical Care. *Medical Care* 1983; 21: 105-122.

Schramm CJ (ed). Health Care and its Costs: Can the U.S. Afford Adequate Health Care? New York: W. W. Norton & Company, 1987.

Schwingl PJ, Margelis L, Shirley L, Barry MA, Lamb GA. Development of a Tuberculosis Surveillance System for the Homeless: Process and Integration of Computer Technology for Case Finding. In Stead WW (ed), Proceedings - Symposium on Computer Applications in Medical Care. New York: Institute of Electrical and Electronic Engineers, 1987; pp 334-339.

Sear AM. An Expert System for Determining Medicaid Eligibility. *J Med Syst* 1988; 12: 275-283.

Seymour RB, Smith DE. The Haight Ashbury Free Medical Clinics: Still Free After All These Years, 1967-1987. San Francisco: Partisan Press, 1986.

Shattuck L. Massachusetts Sanitary Commission, Report of Sanitary Conditions of Massachusetts. Cambridge: Harvard University Press, 1948 (Original work published 1850).

Snow J. On the Mode of Communication of Cholera. New York: The Commonwealth Fund, 1936.

Steinbach AB. Epidemiologic Concerns of Urban Family Practice. In Birrer RB (ed), Urban Family Medicine. New York: Springer-Verlag, 1987.

Stellman SD. The Case of the Missing Eights: An Object Lesson in Data Quality assurance. *Am J Epidemiol* 1989; 129: 857-860.

Stewart B, Kozoll R, Rhyne RL. Use of Secondary Data: Extrapolating to the Community. In Nutting PA (ed), Community-Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 168-173.

Stewart RD, Burgman J, Cannon GM, Paris PM. A Computer-Assisted Quality Assurance System for an Emergency Medical Servcice. *Ann Emerg Med* 1985; 14: 25-29.

Stimson DH, Charles G, Rogerson CL. Ambulatory Care Classification Systems. *Health Services Research* 1986; 20: 683-703.

Strelnick AH. The Community-Defining Process in COPC. In Nutting PA (ed), Community-Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; pp 35-39.

Thacker SB, Choi K, Brachman PS. The Surveillance of Infectious Diseases. *JAMA* 1983; 249: 1181-1185.

Trachtenberg A, Gardner L, Gould JB, Hutchison S. Building an Integrated Community Health Information Base. In Nutting PA (ed), Community-Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; : 109-125.

Valleron AJ, Bouvet E, Garnerin P, Ménarès J, Heard I, Letrait S, Lefaucheux J. A Computer Network for the Surveillance of Communicable Diseases: The French Experiment. *Am J Public Health* 1986; 76: 1289-1292.

Vandenbroucke JP, Pardoel VP. An Autopsy of Epidemiologic Methods: The Case of "Poppers" in the Early Epidemic of the Acquired Immunodeficiency Syndrome (AIDS). *Am J Epidemiol* 1989; 129: 455-457.

Voynick IM, Makuch RW. The Design and Implementation of a Software System for Clinical Studies: An Illustration Based on the Needs of a Comprehensive Cancer Center. *J Med Syst* 1988; 12: 295-304.

Walker RB. Evaluating Impact in COPC. In Nutting PA (ed), Community-Oriented Primary Care: From Principle to Practice. Rockville, MD: Health Resources and Services Administration, 1987; : 339-343.

Weitzman S. Use of Epidemiology in Primary Care. *Isr J Med Sci* 1983; 19: 739-741.

Weitzman S, Bar-Ziv G, Pilpel D, Sachs E, Naggan L. Validation Study on Medical Recording Practices in Primary Care Clinics. *Isr J Med Sci* 1981; 17: 213-214.

White KL. Epidemiologic Intelligence Requirements for Planning Personal Health Services. *Acta Socio-medica Scandinavica* 1972; 2-3: 143-152.

White KL. Primary Care Research and the New Epidemiology [editorial]. *J Fam Pract* 1976; 3: 579-580.

White KL. Computers, Epidemiology, and General Practice [letter]. *Lancet* 1988; : 1493-.

White KL, Williams TF, Greenberg BG. The Ecology of Medical Care. *N Engl J Med* 1961; 265: 885-892.

Wood M. The New International Classification of Primary Care: Genesis and Implications for Patient Care and Research. *J Fam Pract* 1987; 24: 569-571.

Wood M. The International Classification of Primary Care - An Update. *J Fam Pract* 1989; 28: 147-149.

World Health Organization , UNICEF. <u>Primary Health Care: Report of the International Conference on Primary Health Care, Alma-Ata, USSR, 6-12 September, 1978</u>. Geneva: World Health Organization, 1978.

Yekutiel P. Morbidity Recording in Primary Medical Care and its Use for Community Diagnosis. *Isr J Med Sci* 1981; 17: 160-169.

Zar JH. <u>Biostatistical Analysis</u>, 2nd edition. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1984.

Zyzanski S, Galazka SS. A Sampling Method for Defining Community in a Metropolitan Area. In Nutting PA (ed), <u>Community-Oriented Primary Care: From Principle to Practice</u>. Rockville, MD: Health Resources and Services Administration, 1987; pp 76-82.