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A COMPARISON OF GENERAL DRUG UTILIZATION IN A METROPOLITAN COMMUNITY WITH UTILIZATION UNDER A DRUG PREPAYMENT PLAN

by
Merwyn Ronald Greenlick

A dissertation submitted in partial fulfillment
of the requirements for the degree of
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A COMPARISON OF GENERAL DRUG UTILIZATION IN A METROPOLITAN COMMUNITY WITH UTILIZATION UNDER A DRUG PREPAYMENT PLAN

By Merwyn R. Greenlick

There are many indications that the payment for drugs presents a problem in the North American medical care system. While drug expenditures appear to be rising in the United States, health insurance coverage is not readily available for drug expenditures. There is evidence that drug expenditures are not evenly distributed among the various families of the population and that the families that are the most financially vulnerable bear a disproportionate share of the burden.

The purpose of this study was to investigate the drug utilization system in a community and to compare utilization under this system with the utilization in a drug prepayment plan in the same community. This allowed an evaluation of the out-of-pocket payment mechanism and an alternative prescription prepayment mechanism.

This study evaluated the payment alternatives using economic and functional criteria. The use of economic criteria involves measuring the impact of alternative systems in terms of dollar expenditures for the drug utilization distribution. Evaluation on functional criteria measures the degree to which each system functions to insure that individuals within it receive drugs appropriate to their disease situation, i.e., how well a system functions to meet its objectives.

Four specific hypotheses were tested:

1. Significant differences exist between the utilization of drugs in the community and under prescription prepayment. This hypothesis was affirmed. It was estimated that 427,125 prescriptions were dispensed in Windsor during the study year in the out-of-pocket system at a total expenditure of $1,616,428 and a mean prescription price of $3.78. This equals 2.19 prescriptions per person per year at an expenditure of $8.29 per person per year.

The P.S.I. prescriptions per person per year rate (age-adjusted) was 4.20, the annual expenditure was $16.64 per person and the mean price per prescription was $3.96. When these figures were applied to

the population base of the community in order to assess the potential impact of P. S. I., were it to be expanded to the community, it was estimated that 819,000 prescriptions would have been dispensed at a total expenditure of more than $3.2 million.

2. That drug prices are higher for utilization under the prescription prepayment plan, indicating that system's relative economic inefficiency. This hypothesis was also affirmed. Of the approximately $1.6 million increase that would have occurred under P. S. I., more than $300,000 was related to increased prices of drugs. The other 80% of the increase represents the amount of increased cost to the community due to people receiving more medication.

3. Financial factors operate in the community payment system to produce unmet need for drugs, indicating that system's relative functional inefficiency. This hypothesis was affirmed in the analysis of utilization by marital status, by family size, by therapeutic class and by the analysis of the delay in dispensing of prescriptions. In the analysis comparing utilization under the two systems the groups who were the most financially vulnerable were generally the ones with the greatest increase in utilization under P. S. I.

4. Patient influence has little effect on physician's prescribing patterns in the prescription prepayment plan. The data bearing on this hypothesis were mixed and while broad evidence of patient influence was not found, some evidence was examined that indicated effective patient pressure.

In summary, the study concluded that a modification of the out-of-pocket method of drug payment towards prescription prepayment would be highly functional. There does appear to be major areas of unmet need in the community. The evidence did not indicate that the prescription prepayment mechanism studied would necessarily be the most functionally efficient alternative. The study concluded that future research should study other forms of prepayment plans.

PREFACE

This study is presented with appreciation to the people whose contributions greatly aided its formulation and development. First among all these people is Benjamin J. Darsky, Ph. D., the chairman of the thesis committee. Dr. Darsky's constant support, encouragement and criticism are primarily responsible for the more admirable qualities of this dissertation. Without his efforts the task would have been much more difficult and certainly less worthwhile in its undertaking. Thanks are extended to the other members of the dissertation committee, Professors Avedis Donabedian, Leslie Kish, Charles Metzner and Mary Ellen Patno for the considerable effort they expended on behalf of this project.

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Fellow students, Bryan Lovelace, Jr., and Donald Freeborn

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The efforts of W. A. Wilkinson, President and Pharmaceutical Director of the Prescription Services, Inc. and of the pharmacists of the Windsor, Ontario are gratefully acknowledged. This study could not have been undertaken without their cooperation and aid. W. V. Walpole, General Manager of the Windsor Medical Service, contributed much to the success of the project, as it was through the efforts of his staff that 75% of the prescriptions dispensed in the community were identified. R. Riddell, the Social Services Department, City of Windsor, J. M. Farnam, Department of Veteran Affairs, Windsor and Sister F. Cazabon, Superintendent, Villa Maria aided in identifying a portion of the remainder of the population sampled.

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Public Health Service, which she directs. Arnold V. Hurtado, M. D., has given many valuable suggestions, as he has read the many drafts of this document, and he has been of tremendous help in stimulating the author intellectually and motivationally. Dolores Hurtado has read the final drafts for grammar and form.

Finally, my extreme appreciation must be noted to the four people to whom this endeavor must be dedicated; to my parents who instilled in me the need achievement and the desire for education that originally moved me along the path toward educational attainment; to the late Stephen Wilson, Ph. D., Dean of the College of Pharmacy, Wayne State University, Detroit, who inspired me as an undergraduate and who served as my early role-model; and most importantly, to my wife Harriet without whose support, understanding and encouragement this thesis simply would not have been possible.

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CHAPTER I

INTRODUCTION

There are many indications that the payment for drugs constitutes a problem in the medical care system. Approximately one billion prescriptions are dispensed annually in the United States at an annual expenditure of approximately $3 billion.[1] The total consumer expenditures for drugs has risen from $1.7 billion in 1950 to $4.3 billion in 1964.[2] This represents an increase in per capita expenditures of 101% in only 14 years.[3]

Drug expenditures do not appear to be evenly distributed among families of the population, apparently causing families that are the most financially vulnerable to bear a disproportionate share of the burden. For example, the aged people spend a higher proportion of their medical care dollar on medicine than do younger people; the poorly educated spend a higher proportion than the better educated; the

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[1] R. A. Liebson, "Rxs Near One Billion; Gain 75%," Drug Topics (March 22, 1965), pp. 66-70.

[2] L. S. Reed and R. S. Hanft, "National Health Expenditures, 1950-64," Social Security Bulletin, U.S. Dept. Health, Education and Welfare, Social Security Administration (Washington: U.S. Government Printing Office, January, 1966), XXIX, 1, Table 11, p. 15.

[3] Ibid, Table 12, p. 15.

lower income than the higher income; the non-white than the white; the rural than the urban; and the lower status occupation groups than the higher status occupation groups.[4]

Drug expenditures are distributed in the population so that approximately 10% of the population use more than 50% of the prescriptions. In addition, it appears that people and families remain in this high expenditure group year after year.[5] This group apparently remains greatly at risk.

Further, while the health insurance coverage for hospital expenses increased from 34.6% of total consumer expenditures for hospitalization in 1950 to 68.9% of expenditures in 1964 and for physician services from 12.0% to 38.4% in the same period, a negligible proportion of the expenditures for drugs, particularly out of hospital expenditures, has been paid for through third parties.[6] In addition, less than 10% of all drug acquisitions are given to patients

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[4]U.S., Dept. Health, Education and Welfare, Personal Health Expenses Per Capita Annual Expenses, United States: July-December, 1962, Public Health Service Publication No. 1000, Series 10, No. 27 (Washington: U.S. Government Printing Office, February, 1966), Table B, pp. 5-6, and W. O. Anderson, Private Expenditures for Drugs and Other Components of Medical Care (New York: Health Information Foundation, 1959).

[5]M. R. Greenlick and B. J. Darsky, "Prescription Utilization by the Aged," J. of Gerontology (April, 1964) XIX, 2, p. 153.

[6]Reed, op. cit., p. 14.

without charge.[7]

There has been pressure from many consumer and labor groups since the 1950's demanding solutions to the problem of paying the family drug bills. Organized consumer groups, such as the Citizens Committee for Children, have petitioned public hearings on health problems with statements like:

> We know that the only way most people can afford adequate care is through health insurance. Increasingly more and more American citizens are protecting themselves in this way, but with the minor exception of . . . experimental programs . . . they are unable today to protect themselves against the cost of necessary prescription drugs.[8]

Union groups, such as the United Automobile Workers, have started to demand that drug expense problems be given priority consideration. The Director of the Social Security Department of the UAW has said: "Here we have a service [the provision of drugs] for which our labor union members are asking and pleading -- and with

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[7]U.S., Dept. Health, Education and Welfare, Cost and Acquisition of Prescribed and Nonprescribed Medicines. United States - July 1964-June 1965, Public Health Service Publication No. 1000, Series 10, No. 33 (Washington: U.S. Government Printing Office, October, 1966), p. 7.

[8]See for example Mrs. M. Ascoli (Health Section, Citizens Committee for Children, New York City), Statement at public hearings, New York State Joint Legislative Committee on Health Insurance Plans, 80 Centre Street, New York, October 1, 1959.

good cause".[9]

The aged, individually and in groups, have appeared before congressional hearings to petition about the heavy burden of drug costs. Statements from this group can be found in the Senate Hearings on Administered Drug Prices,[10] the House Hearings for the Aged[11] and the Senate Hearings on the Health of the Elderly.[12]

Various methods of alleviating the problem of paying drug bills have been suggested. The suggestions have generally aimed at two aspects of the problem: high expenditures for prescribed drugs and the absence of prepayment for drug expenditures. The suggested methods for reducing the expenditures for drugs to the consumers are generally one of two types. The first suggestion involves the prescribing of less expensive but equally effective drugs. This suggestion involves substitution, either on the writing or the dispensing of prescriptions, of less expensive for more expensive drugs. The second

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[9]M. A. Glasser, "Rising Expectations of Group Health Care," Proceedings: 1964 Group Health Institute (Minneapolis: Group Health Association of America, May 14-16, 1964), p. 56.

[10]U. S., Congress, Senate, Committee on the Judiciary, Subcommittee on Antitrust and Monopoly, Estes Kefauver, Chairman, 86th Cong., 2nd Sess.

[11]U. S., Congress, House, Committee on Ways and Means, Wilbur D. Mills, Chai rman, 87th Cong., 1st Sess.

[12]U. S., Congress, Senate, Special Committee on Aging, Subcommittee on Health of the Elderly, Pat McNamara, Chairman, 88th Cong., 2nd Sess.

involves the community or union ownership of pharmacies to return the profits of ownership to the consumer.

Reducing the Cost of Drugs

Among the proponents of prescribing generic drugs or other lower cost drug products to reduce prescription expenditures have been various welfare agencies in the United States. The welfare agencies find this method particularly appropriate since they provide the financing of indigent medical care and therefore are able to maintain a high degree of control over the drug payment system. The Baltimore, Maryland City Health Department has been foremost in reporting experience with the use of a drug formulary and generic prescribing.[13] The Department reports a significant reduction in per capita expenditures for drugs since the adoption of a formulary and the insistence on generic prescribing.

Since the total public assistance expenditures for drugs reached almost $100 million in 1963,[14] many other welfare agencies are also

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[13] F. F. Furstenberg and R. Cline, "The Effect of a Drug Formulary on Cost and Quality of Medical Care in a Public Medical Program," Proceedings of Tenth Annual Group Health Institute of the Group Health Association of America (Columbus; 1960), pp. 167-179.

[14] U. S., Dept. of Health, Education and Welfare, Welfare Administration, Study of Drug Purchase Problems and Policies, Welfare Research Report 2 (Washington: U. S. Government Printing Office, March, 1966), p. 35.

becoming interested in reducing these expenditures. Connecticut, Massachusetts,[15] Illinois and Kentucky[16] have recently adopted generic formularies and report considerable reductions in drug expenditures.

There is some question as to whether this method can be successfully applied in a situation where the physician and the patient demand a greater amount of freedom of action than is found in the public welfare system. Physicians who are not under welfare control have traditionally insisted on freedom to prescribe as they see fit and have refused to accept the restrictions of a formulary. Further, preliminary evidence from unpublished studies indicates that only a small reduction (approximately 10%) can be achieved using generic substitution in a prescription distribution generated by the typical prescribing patterns of physicians in their normal practice.[17] This pattern has been found to include a preponderance of prescriptions for products for which there is no less expensive substitute.

The method of consumer ownership of pharmacies has been tried

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[15] P. D. Berlin, "Drug Costs and Utilization: The Massachusetts Public Assistance Experience," Unpublished paper prepared for the Program in the Economics and Administration of Medical Care, Harvard University, February 1, 1963, p. 7.

[16] S. Wester, Kentucky State Health Department, personal correspondence.

[17] Spencer Jones, Health Insurance Plan of New York, personal correspondence.

particularly by Teamster Union locals around the country. The large amount of capital necessary and the complexities involved in the operation of a pharmacy have somewhat limited this approach. Sources in pharmacy management indicate that the average total assets of an individual pharmacy in the United States (excluding land, buildings and other investments) exceeded $60,000 in 1965.[18] Of course, a small pharmacy, dispensing only prescriptions, would require less capital than $60,000. However, the need to invest a considerable amount of capital does have an inhibitory effect on union ownership of pharmacies. Further, some unions have believed that the limitation of prescription service to a single pharmacy or a small number of pharmacies in an urban area restricts the freedom of choice of union memberships to an extent that the lack of convenience makes the pharmacy service unsatisfactory.

The pharmacists in many communities have resisted the development of community owned drugstores. This opposition has led to the passage of pharmacy ownership laws in many states restricting the rights of non-pharmacists to own drugstores.

Despite these drawbacks this method is becoming more prevalent as unions become involved in general medical care prepayment and organization. Complete involvement of a union in a prepayment

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[18] The Lilly Digest, 1965, ed. G. F. Slavin, Jr. (Indianapolis, Indiana, 1966), p. 54.

medical care system allows the development of mechanisms to organize the distribution of drugs to members.

Prepayment for Drug Expenses

Two alternatives have been suggested for the prepayment of drug expenses. The first is the inclusion of drug benefits in established medical care prepayment plans and the second is the development of prepayment plans exclusively for drugs. Many medical care prepayment plans now include some drug prepayment components. Among these plans are: Group Health Association of Washington, D. C.;[19] Group Health Cooperative of Puget Sound, Seattle, Washington;[20] Blue Cross of Ontario, Canada;[21] Health Insurance Plan of Greater New York; and the Kaiser Foundation Health Plan.[22] Drug coverage has been included for some time in major medical

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[19] A. W. Brewster, S. I. Allen and L. M. Kramer, "Experience with Prepaid Drug Benefit," J. Health and Human Behavior (New York, 1963), pp. 14-22.

[20] J. Kahl, "Drug Program of the Group Health Cooperative of Puget Sound," Proceedings of Tenth Annual Group Health Institute of the Group Health Association of America (Columbus, 1960), pp. 180-184.

[21] "Blue Cross Launches Experimental Prepaid Rx Plan in Ontario," American Druggist, January 7, 1963.

[22] M. R. Greenlick and E. W. Saward, "Impact of a Reduced Charge Drug Benefit in a Prepaid Group Practice Plan," Public Health Reports (October, 1966), LXXXI, 10, pp. 938-940.

insurance plans.[23]

A recent study by the Health Economics Branch of the Division of Medical Care Administration, United States Public Health Service, surveyed the methods of reducing drug expenditures to members of existing general medical care plans.[24] The study, as yet unpublished, indicates that 97 different medical care plans provide some prescription drug coverage to about 3.3 million people. These plans include private group clinics, community-sponsored medical care plans and union, employer and employee association types of prepayment plans. The majority of people covered are in community-sponsored plans, which are non-profit organizations operated by a board of directors responsible to the community.

The prescription benefits under these medical care plans include both service and indemnity arrangements and cover prescriptions filled both in the plan pharmacies and in community pharmacies. Of the 3.3 million people covered, 1.9 million are in prepaid group practice plans. The benefits in the prepaid group practice plans are generally limited to the plans' pharmacies. Less than 25% of the population covered under general medical care plans have the full costs

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[23] J. F. Follmann, Jr., Drugs, Their Cost, and Health Insurance (Washington: American Pharmaceutical Association, 1960), 88 pages.

[24] U. S., Dept. Health, Education and Welfare, Digest of Drug Prescription Programs, Public Health Service Publication, To be published.

of prescribed drugs prepaid, the remainder sharing in payment through the deductible or co-insurance techniques.

Finally, there are insurance plans which were established expressly for the prepayment of drug expenses. These plans are both of the direct service and of the indemnity type.[25] The first of these plans, Prescription Services Incorporated (P.S.I.), of Windsor, Ontario which began operation on March 1, 1958, is a prescription prepayment plan sponsored by the pharmacists of Ontario and providing benefits (after a $.35 per prescription deductible) for out-of-hospital prescription expenses. The subscribers are also covered by a comprehensive fee-for-service physician plan, Windsor Medical Services (W.M.S.) and the province's hospital insurance program. The mechanics of this prepaid prescription operation will be fully discussed in a later section.

P.S.I. exemplifies the approach to pharmacy prepayment that is taken when a group of pharmacists sponsor an organization for the prepayment of drug expenses. An early statement by W. A. Wilkinson, the originator of P S.I. said that the plan must accomplish certain requirements.[26] These requirements were:

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[25] See M. R. Greenlick, "Comparison of Prepaid Prescription Plans," J. of A. Pharm. A. (October, 1961), Vol. NS1, No. 10, pp. 624-625, and Royal Commission on Health Services, Provision, Distribution, and Cost of Drugs in Canada (Ottawa, Canada: Queen's Printer, 1965). Particularly Chap. v, pp. 105-114.

[26] W. A. Wilkinson, A Letter to All Pharmacists of Windsor, Ontario, July 25, 1955.

1. It must be attractive enough for subscribers to buy in quantity.
2. It must be acceptable to organized labor as representing a forward step in social benefits for members.
3. It must provide necessary safeguards to prevent abuse by patients, pharmacists and physicians.
4. It must not in any way interfere with the practice of pharmacy or medicine or the traditional relationship between patient, pharmacist or physician.
5. If it is to be introduced, financed and operated by pharmacists it must have a reasonable chance of success and show a substantial benefit to pharmacy such as the following:
    a) Increase dispensing volume.
    b) Discourage bargain-hunting for prescriptions.
    c) Discourage office and clinic dispensing.

Another prepayment program has recently entered the field. Paid Prescriptions, Inc. serves more than 100,000 members in

California, prepaying all prescription expenses after a $1.25 per prescription deductible. Paid Prescriptions, Inc. is controlled by a group of pharmacists in the state and is recognized by the state pharmaceutical association. The organization appears to subscribe to an approach characterized by enlightened self-interest. The president of Paid Prescriptions in his annual report[27] says:

> Pharmacy would make a great mistake to view the Paid Prescription program solely as a possible means of increasing volume. That would be shortsighted, as would any other short-term strictly-business outlook. Today, through Paid Prescriptions, pharmacy is helping to build the profession and its status for tomorrow. Pharmacists must support the program before lay people . . . It is important that each pharmacist keep in mind that he is the program, that the program is a vital extension of his professional services.

While the statements by P.S.I. and Paid Prescriptions express a certain altruistic element, it can be asserted that these organizations are motivated basically by self-interest. Intense competition has served to interest pharmacists in methods that can be used to assure themselves a continuing share of the health care market.

These plans are characterized by similarities in structure as well as in purpose. They are both open to all drugstores in the community (upon payment of a fee) and stress the freedom of choice of a drugstore. They provide a prepayment system that requires a minimum of interference with the physicians' prescribing. Finally, the

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[27] S. Aronson, President's Report, Paid Prescriptions Annual Meeting, Sacramento, California, August 7, 1966, p. 6.

prices schedules for pharmacist reimbursement are dictated in both cases by the suppliers of the service. It is possible that these common characteristics can be expected whenever the provider of service sponsors the prepayment mechanisms for the service they provide.

These two pharmacist-sponsored programs are the only major plans presently providing direct service exclusively for the prepayment of drug expenses, and as yet they serve a very small proportion of the total population.

The Community Drug Distribution System

The dispensing of prescriptions for the greatest majority of the people in the United States is achieved through the more than 50,000 private pharmacies in the United States.[28] Patients who have received a prescription order from a physician present the order to one of these pharmacies. The order is dispensed, usually the same day, and the patient usually pays for the prescription when it is received. This system is referred to as the out-of-pocket payment system.

The main deviation from this system is when the drugstore extends irregular and short-term credit to a patient who does not wish to pay cash for the drugs immediately. Credit payment is not extensive and the average total year-end accounts receivable equalled less

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[28] U. S., Dept. of Commerce, Bureau of the Census, Statistical Abstract of the United States: 1966 (87th edition; Washington: U. S. Government Printing Office, 1966), p. 814.

than $10,000 in drugstores in the United States (with total sales of approximately $200,000).[29]

Only about 30% of the average drugstore sales are accounted for by prescriptions and only about 13% of the area of the drugstore is devoted to the dispensing of prescriptions, so pharmacies are devoted to the sale of a great variety of merchandise. However, the average drugstore dispenses approximately 20,000 prescriptions annually, approximately half of which are new prescriptions and half refills.[30]

The fee for dispensing prescriptions in the United States is calculated in many different ways. In general it can be stated that the retail price of the prescription includes three implicit components. One component represents the acquisition and overhead cost of the prescription, another a profit return on investment and the third a professional or dispensing fee. The professional or dispensing fee varies from drugstore to drugstore and the final retail price of an identical prescription might vary considerably among drugstores.

Studies comparing the prices of various products across drugstores have in fact shown a fairly wide range of deviation in the retail

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[29] Slavin, op. cit., p. 54.

[30] Ibid., p. 5.

price of identical prescriptions.[31] The coefficient of variation in the study cited averaged 20%, indicating a mean standard deviation of 20% of the mean price. In general, it can be said that the acquisition and overhead costs to the pharmacy account for less than 50% of the final price of the prescription.

Since most of the prescriptions in the United States are dispensed in a decentralized system there has been a paucity of reliable data in the drug field and it has been extremely difficult to evaluate whether the payment of drug costs does, in fact, constitute a problem in the North American medical care system. Little reliable information is available regarding the magnitude and the nature of annual drug expenditures facing people in the community or the relationship between individual and family characteristics and drug utilization. The only available data have come from plans that have offered drug prepayment. These data are of limited generalizability because of the limited population base typically involved in a drug prepayment plan. The specialized nature of these plans and the peculiar characteristics of their populations have meant that the available data have had limited utility.

Evaluation Criteria

There are very little reliable data available regarding utilization

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[31] M. H. Miller, "A Statistical Comparison of Prescription Prices in Retail Pharmacies and Outpatient Hospital Pharmacies," A. J. Hosp. Pharm. (July, 1961), XVIII, pp. 392-395.

under the prevalent drug distribution system. However, if reliable data concerning the utilization in this system were available it would still be necessary to develop uniformly accepted criteria for evaluating alternative drug payment mechanisms.

Various sets of criteria have been used to evaluate the payment mechanisms of the medical care sub-systems to determine if a change in mechanism is necessary. If a change is necessary the criteria guide society on the choice of a substitute mechanism. Initially, evaluation on functional criteria attempts to determine the degree to which a system performs its societal function, i.e., the distribution of the services of a medical care sub-system,in a manner appropriate to the disease situations of the people involved in the system.

The most pertinent reason to modify a payment mechanism in medical care is that the system is not adequately fulfilling its function or is in some way preventing people from receiving services appropriate to their diseases. Further, each possible alternative is evaluated to determine how well it would function in meeting the objectives of the sub-system.

Once a payment mechanism has been judged to be dysfunctional and potential alternatives to that mechanism are judged to be more functionally efficient, the alternatives are generally evaluated using economic criteria. This evaluation compares the total expenditures under the alternative methods of payment and investigates economic

differences in the different payment mechanisms. The use of economic criteria includes measuring the impact of the alternatives in terms of dollar expenditures for the provision of equal service packages. However, while the evaluation on economic criteria is quite central in the discussion of payment alternatives, it can only be used in conjunction with evaluation of the functional aspects of the alternatives.

In addition to evaluations on functional and economic criteria, it is possible to evaluate alternative payment mechanisms on the basis of other sets of criteria. Evaluation can, for example, be on the basis of political, social and social-psychological criteria. Changes of the payment mechanism in various medical care sub-systems have political, social and social-psychological implications.

The evaluation of the political implications of a change of payment mechanism has been involved in any attempt at modification of the existing form of medical care payment mechanism. Further, in evaluating the effect of a change in payment mechanism it is necessary to measure the impact of this change on established social patterns. The effect of such factors as resulting increased bureaucratization and shifts in power relationships of people involved in the medical care system can be investigated.

Proposed changes must also be tested as to whether they are congruent with the prevailing attitude systems of society. For example, the ideological implications of changes in payment mechanism

can be assessed as they relate to societal attitudes and values.[32]

Thus, in discussing a change in the present system of drug payment, various sets of criteria could be considered. This study, however, will consider only the economic and functional criteria in evaluating payment alternatives. The use of economic criteria involves measuring the impact of alternative systems in terms of dollar expenditures for the drug utilization distribution system. The evaluation will ask if an alternative method of payment would increase or decrease the dollar expenditures of the system. The analysis would compare the total expenditures under the alternatives and would investigate the basis of the economic differences in the systems.

As discussed above, the evaluation on economic criteria should be combined with evaluation on functional criteria. This evaluation would measure how well the payment system functions to insure that individuals within the system receive drugs that are appropriate to their disease situation. That is, the system is measured by how well it functions to meet its objectives.

Differences in expenditures between two drug payment mechanisms could be the result of a combination of changes in the price of drugs

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[32]The evaluation of an alternative payment mechanism for hospital charges for the aged, implicitly using the above criteria is in Eugene Feingold, Medicare: Policy and Politics. A Case Study and Policy Analysis (San Francisco: Chandler Publishing Co., 1966).

or changes in the utilization of drugs. The first set of changes involves economic factors and therefore necessitates evaluation on economic criteria. The difference in price can be measured, its cause determined and its implications analyzed.

On the other hand, changes in the utilization of drugs under two systems can only be evaluated using functional criteria. Since the functional efficiency of the system can be defined as the degree to which a system functions to insure that individuals within the system receive drugs appropriate to their disease situations, the possibility of defining a clinical ideal concerning drug utilization is assumed. This is a difficult if not impossible task. A demand for prescription drugs is not only or not even primarily a function of the patients' decision to use or not to use drugs. Inherent in the prescription utilization system is that the patient's demand for drugs is only a secondary demand. Before a patient can present his effective demand for drugs, a physician must first decide that a drug is appropriate for the patient's medical condition. Therefore, factors which influence utilization can either affect the physician or the patient.

At present, the criteria for evaluating physicians' prescribing patterns are at best tentative. Perhaps as studies on the quality of medical care develop general criteria, criteria for evaluating appropriateness of prescribing patterns will become more clearly

defined.[33]

However some criteria are available. In relation to drug utilization, much informed medical opinion is concerned about the increasing use of certain kinds of drugs, particularly anti-infectives, amphetamines and psychotropics.[34] Structural factors that caused or encouraged significant increases in the use of these kinds of drugs can be viewed as dysfunctional.

While the physician's judgment on prescribing can at times be questioned, it can be asserted that the physician's judgment is better than the patient's judgment in determining which drugs should be taken in a disease situation. However, factors in a payment system may motivate the patient to veto the physician's orders. If financial barriers to the receipt of care result in unfilled prescriptions it is possible to posit functional inefficiency.

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[33]For a discussion of the problems involved in the evaluation of medical care see A. Donabedian, "Evaluating the Quality of Medical Care," The Milbank Memorial Fund Quarterly (July, 1966), XLIV, 3, Part 2, pp. 166-206.

[34]For discussions of this problem see: V. L. Ellicott, "The Use of Tranquilizing Drugs in Maryland's Medical Care Program," Presented before a Round Table discussion on Public Health Problems Arising from the Wide-Spread Use of the Tranquilizing Drugs, at 84th Annual Meeting of American Public Health Association, Atlantic City, New Jersey, November 15, 1956; W. Model, "Hazards of New Drugs," Science (March 22, 1963), CXXXIX, p. 1180-1185, and G. M. Wilson, "Ill-health Due to Drugs," British Medical Journal (April 30, 1966), pp. 1065-1069.

It is possible to evaluate utilization differences between alternative payment methods to determine if extraneous factors are interfering with appropriate drug utilization in one of the alternative systems. Comparison of different arrangements permit the development of criteria to evaluate the functional efficiency of the arrangements. Two sets of criteria are used in this evaluation. First, utilization determined by the financial resources of the patient rather than his medical need is dysfunctional. Second, utilization determined by patient interference with the physician's professional judgment is dysfunctional.

Various measures of the relative impact of economic barriers on utilization are appropriate. If groups with a lower per capita income exhibit a significant increase in use of drugs in a prepayment system, when compared to the increase in use of groups with higher income, it can be inferred that income factors interfere with the physician's judgment in an out-of-pocket system. Further, if delay in filling prescriptions is observed in the out-of-pocket payment system, particularly if this delay is related to the cost of prescriptions or the income characteristics of the patients, it can be inferred that a dysfunctional element exists.

Analysis of the distribution of drug utilization by therapeutic class under alternative drug payment systems can determine if patients allow economic factors to determine the demand for

prescriptions received in certain disease situations. A disproportionate increase in utilization for mild illness under drug prepayment can indicate substitution of patient judgment for that of the physician under the out-of-pocket system. When a patient is not faced with immediate drug expenditures he would be more likely to comply with the physician's recommendation even though he considers a disease unimportant.

It is also possible, of course, that an increase in utilization either in lower socio-economic classes or for mild illness can be the result of emancipating the physician from the constraints of financial consideration. However, even this emancipation can be viewed as functionally efficient. Financial barriers operating on the motivation of the patient would certainly be an inappropriate technique for restraining physicians from prescribing in an improper manner.

The relationship between physician characteristics and prescribing patterns under alternative methods of payment is investigated to investigate patient interference with the application of the physician's professional judgment. If the professional judgment of physicians is to be used as a yardstick in assessing functional efficiency it is necessary to investigate factors in the physician-patient relationship to determine the potential for interference with the application of that judgment. Pressure for improper prescribing might be placed on physicians by patients in a prescription prepayment plan. Physicians existing in a fee-for-service payment system could be viewed as

differentially vulnerable to this pressure. It could be argued that specialists, middle-aged physicians and high income physicians would be more economically secure and therefore less vulnerable to patient pressures. General practitioners, young and old physicians and low income physicians might be more vulnerable. To the extent that systematic differences exist between the prescribing patterns of the more and less vulnerable physicians under drug prepayment, it can be surmised that patient pressure exists and interferes with the application of the physician's best professional judgment.

Physician factors in drug utilization are central to this discussion because of the complementary relationship between drug utilization and physician utilization. A patient can only receive a prescription drug if this drug has been so ordered by his physician. Therefore, factors can influence drug utilization at various levels. One set of factors can influence the patient's probability of seeing a physician. Other factors can influence the physician's prescribing patterns. Still other factors can influence the probability of the patient's having his prescription filled once it has been written by a physician. An evaluation of the functional efficiency of a prescription prepayment mechanism must at least take into account the latter two sets of factors.

Objectives of the Study

The general objectives of this study are to analyze population differences in the drug utilization distributions of two alternative payment

systems within a community to evaluate each of these alternative systems using economic and functional criteria. In order to do so, it is necessary to estimate the parameters of the drug utilization distributions in the two systems. Thus, the specific objectives of the study are:

A. To determine if differences exist between utilization of prescribed drugs in the community and among subscribers to a prescription prepayment plan.

   1. To estimate the total number and total expenditures for prescriptions dispensed in the community.
   2. To estimate the number of prescriptions used and expenditures for prescriptions per person per year in the two systems.
   3. To estimate magnitude of the difference in number of prescriptions and expenditures for prescriptions between the actual community utilization and the community utilization had the prepayment rates been applied community-wide.

B. To evaluate the difference in utilization according to economic and functional criteria.

   1. Evaluation on economic criteria. The evaluation

on economic criteria is to determine the extent to which there are differences in the price of drugs in the two systems, to establish the basis of the price differences and to set forth the economic factors operating in differences in the demand for drugs in the two systems.

a) By estimating the proportion of the difference in expenditures that relates to higher drug prices and the portion that relates to greater use of drugs;

b) By determining the basis of price differences in drugs;

c) By discussing the economic basis of the portion of changes in demand for drugs that result from changes in the price of drugs facing consumers under drug pre-payment.

2. Evaluation on functional criteria. The evaluation on functional criteria is:

a) To determine if financial factors operate to produce unmet need in the community, resulting in income-related rather than need-related drug utilization:

(1) by comparing prescription utilization by demographic groups under two systems;

(2) by analyzing the delay in filling new prescriptions in the out-of-pocket system;

(3) by analyzing differential prescription utilization by physician insurance status and physician utilization in the out-of-pocket system;

(4) by comparing the utilization of prescriptions by therapeutic class under the two systems.

b) To determine if patient pressure is interfering with the application of the physicians' professional judgment under drug prepayment by analyzing the relationship between physicians' prescribing patterns and their vulnerability to patient pressure as measured by three sets of background characteristics: scope of practice, age, and income under the two

systems.

Working Hypothesis

The lack of available data about general prescription utilization makes it difficult to generate a detailed and systematic set of hypotheses that can be supported by applicable theory. This study is, therefore, exploratory. However, a set of working hypotheses can be set forth relating to the objectives of the study.

Hypothesis A

It is hypothesized that significant differences exist between the utilization of drugs in the community and under prescription prepayment. Studies that have investigated differences in utilization patterns for various medical care services by populations in a prepayment situation and an out-of-pocket system have invariably shown differences in utilization under the two payment mechanisms. Regression equations measuring the differential impact of background characteristics on medical care expenditures and on hospital admissions have shown insurance status to be a significant variable in determining differential utilization for medical care services.[35] It can be anticipated that

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[35]See American Medical Association, Report of the Commission on the Costs of Medical Care. Vol. 1, General Report (Chicago, 1964), Chap. iv, pp. 57-76, and W. J. McNerney and Study Staff, Hospital and Medical Economics: The Study of Population Services, Costs, Methods of Payment and Controls (Chicago: Hospital Research and Educational Trust, 1962), I, Chap. ix, pp. 122-155.

utilization under a drug prepayment system will differ from utilization in an out-of-pocket payment system as it has in payment systems for other medical care services.

Hypothesis B-1

It is hypothesized that drug prices are higher for utilization under the prescription prepayment plan, indicating that system's relative inefficiency. The price schedule under the prescription prepayment plan is dictated by the pharmacists of the area through an organization completely devoid of public representation. Since the demand for drugs will not be reduced by increases in the reimbursed price of prescriptions (the dynamics of the demand for drugs under the prepayment plan is discussed in Chapter V), it is expected that the price dictated will be somewhat higher than the community average. Various factors could account for a higher price in the prepayment system. One that will certainly have an impact is the absolute minimum reimbursement price of $1.90 per prescription under prepayment. It is unlikely that this minimum could be maintained in the community. The minimum price and other pricing factors could combine to increase the average price of prescriptions under prepayment.

Hypothesis B-2-a

It is hypothesized that financial factors operate in the community payment system to produce unmet need for drugs, indicating that

system's relative functional inefficiency. Studies that have investigated the magnitude and nature of unmet medical care need have consistently found unmet need where the populations are not covered by prepayment. The lack of medical care insurance has been shown to be associated with unmet need whether need was measured by peoples' subjective evaluation of their own need[36] or by professionally determined evaluation of need, such as the proportion of people who did not see a physician each year,[37] proportion of women who did not have a Papanicolaou test,[38] or of the proportion of prenatal care begun later than the first trimester of pregnancy.[39] It is likely that similar determinants of unmet need will exist in the drug utilization system and, therefore, that utilization in the out-of-pocket payment system will exhibit elements of unmet need.

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[36] McNerney, ibid., p. 224.

[37] Committee for the Special Research Project in the Health Insurance Plan of Greater New York, Health and Medical Care in New York City (Cambridge: Commonwealth Fund, Harvard University Press, 1957).

[38] J. R. Hochstin and L. Breslow, "Cervical Cytology in Alameda County," Human Population Laboratory, California State Dept. of Public Health, January, 1963, Processed, p. 289.

[39] S. Shapiro, L. Weiner and P. Densen, "Comparison of Prematurity and Perinatal Mortality in a General Population and in the Population of a Prepaid Group Practice, Medical Care Plan," Amer. J. Pub. Health (February, 1958), XXXXVIII, 2, p. 175.

Hypothesis B-2-b

It is hypothesized that patient influence has little affect on physicians' prescribing patterns in the prescription prepayment plan. It can be asserted that physicians are rarely aware of their patient's drug insurance since only 1,500 people were members of P. S. I. during the study year. Therefore, while P. S. I. would be important to pharmacists it would not be highly visible to the physicians, since studies have shown that patients provide non-medical information to the physcian at an extremely low level.[40]

It is possible that the patient would present a greater magnitude of illegitimate requests to the physician under prescription prepayment. However, the physician has many devices available to him to resolve any conflict between patient demands and professional norms. Physicians would likely be well armed because of his position of relative power to reduce any conflict that may exist between his views of appropriate prescribing and his patients' expectations. While patients therefore might attempt to exert influence on the physician it can be asserted that this influence would have little affect on the prescribing patterns of the physicians.

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[40] L. Pratt, A. Seligmann and G. Reeder, "Physicians' Views on the Level of Medical Information Among Patients," ed. E. G. Jaco, Patients, Physicians and Illness (New York: Free Press, 1958), p. 223.

CHAPTER II

STUDY DESIGN

Study Setting

The setting selected for this study was the Windsor, Ontario metropolitan area. This area was selected because both the Prescription Services, Inc. (P.S.I.), a comprehensive prescription prepayment service, and the Windsor Medical Services, Inc. (W.M.S.), a comprehensive fee-for-service medical prepayment plan, are in operation in Windsor.

Prescription Services, Inc.

P.S.I., which has been in operation since March, 1958, is sponsored and controlled by the pharmacists of Ontario. The Plan offers prescription prepayment for enrollees who pay a $.35 deductible to have each prescription filled. The plan was originally formed by the pharmacists of Essex county, although most of the pharmacists in the province of Ontario now participate. It enrolls employee groups and had approximately 1,500 members during the study period. The membership was composed basically of very small employee groups.

The service benefits are received by the members when they take a prescription, written by one of the physicians in the area,

to any one of the participating pharmacies. The pharmacist collects the $. 35 deductible fee from the member and bills P. S. I. monthly for all the prescriptions he has dispensed to P. S. I. members. With the billing, the pharmacist sends a data card for each prescription dispensed. Each data card shows the patient's name, subscriber number, group number, year of birth, sex, marital status, the type of prescription, the form of the prescription, whether it was new or repeat, whether it was ready-made or compounded, the cost of the prescription, the allowable price of the prescription under the P. S. I. price schedule, the pharmacy number and the date the service was rendered.

The bills of the pharmacies are submitted to the corporation by the 10th of each month. The corporation makes payment to the pharmacy for the amount billed minus $. 35 for each prescription already paid by the subscriber and minus an additional 10% to cover overhead expenses.

The price schedule used to calculate the allowable price of all prescriptions dispensed under P. S. I. has been established by the Board of Directors of the plan. There are no consumer or outside representatives on the Board. At the time of the study the board had four unpaid directors plus the president and pharmaceutical director, who at the time was paid a nominal stipend. The Board was elected by members of the corporation who are pharmacists in Ontario. Each pharmacist member had one vote. At the time of the study there were nearly 650

pharmacy members in the Province of Ontario.

The reimbursement schedule used to calculate the allowable price for the prescriptions dispensed under P. S. I. is based on the cost to the pharmacist of the smallest usual package instead of his wholesale price for the ingredient. It includes, as was discussed above, an amount that represents an entrepreneurial profit on the drug and a professional or dispensing fee. It is a schedule that returns a price to the pharmacist more than twice the cost of the drug. It also allows a time allowance for those few prescriptions that require compounding. The schedule calls for a minimum of $1.90 allowable price on each prescription.

There are no aspects of the pricing schedule that would stimulate the use of a less expensive brand of a generically prescribed drug. In fact, since the net return on each prescription increases as the wholesale cost to the pharmacy increases, the tendency would be to use a more expensive brand rather than a less expensive one. There is no drug formulary, and any out-of-hospital prescription written by a licensed physician or dentist is covered provided it is not specifically excluded as noted below. No savings can be provided by group purchasing of a limited number of drugs.

The basic limitation on benefits, other than the $. 35 deductible, is the requirement that covered prescriptions may contain no more than the amount in the smallest original size package of the drug or a

34-day supply, whichever is less. The plan does not cover prescriptions that are paid for by any governmental agency such as the Workmen's Compensation Board and does not cover specified appliances such as wheelchairs or non-prescription medicine such as insulin, diabetic supplies and dietary supplements. It also does not cover injectable medication or blood or blood plasma.

Windsor Medical Services, Inc.

Since approximately 90% of the population of Windsor is enrolled in W. M. S.[1] and therefore encounters little or no out-of-pocket expenses for physician service, the effective demand for physician service might be expected to be a closer approximation of medical need in Windsor than in most other communities.[2] The expenses of physician services are totally prepaid by W. M. S., which has been in operation for more than 25 years. The members receive services from physicians in solo practice who are compensated by W. M. S. on a fee-for-service basis. Physician services are provided in the home, office or the hospital.

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[1] This estimate, which is used subsequently, is based on figures derived from Windsor Medical Services, Inc., Annual Report (Windsor, 1962).

[2] For a description of Windsor medical service and a discussion of the Windsor community and its comparability with American communities see B. J. Darsky, N. Sinai and S. J. Axelrod, Comprehensive Medical Service Under Voluntary Health Insurance (Cambridge: Harvard University Press, 1958).

Since prescription utilization is related to physician utilization, this setting allows an opportunity to investigate the patterns of drug utilization where physician utilization is unencumbered by financial barriers. Since physician utilization is likely to be maximized, drug utilization is also likely to be maximum, under any drug payment system. When possible unmet need for drugs exists in a community together with possible unmet need for medical services, it would be impossible to distinguish the factors that influence the neutralization of need for medical services and those that influence the neutralization of need for prescription drugs. In some cases these factors are identical, in others they are likely to be different.

The financial barriers that reduce medical utilization are eliminated in Windsor. The presence of P. S. I. in this community provides a quasi-experimental design for studying the impact of a drug prepayment plan. In this situation the drug utilization patterns of the population (in the community and covered by drug prepayment) are not artificially distorted by differential financial access to a physician's care. A design is provided where two population groups have equal access to physician service, but where one population must pay for drugs out-of-pocket and the other has drugs totally provided for them through a third-party payment mechanism.

Further, this setting allows the study of drug utilization under the out-of-pocket drug payment system and under a drug prepayment

system in the same metropolitan community. Any differences thereby discerned cannot be attributed to differences in either of the community's population or, more important, in the prescribing patterns of the community's physicians. Looking at medical utilization data from various parts of the United States it can be seen that physicians in different parts of the country practice medicine in different ways.

It might be difficult to determine the impact of different practice patterns on the utilization of out-of-hospital prescription drugs. For example, the proportion of physician visits that occur in the home varies from 9.3% of all physician visits in the Northeast region to 3.6% of visits in the West region.[3] Differential use patterns by geographic regions have been shown to exist for duration of hospitalization and other kinds of medical care utilization.[4]

Non-experimental research attempts to reduce, as much as possible, factors that influence variation in outcome. Medical care studies comparing utilization patterns in different geographic areas have had limited acceptance because they have not effectively reduced the impact

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[3]U.S., Dept. Health, Education and Welfare, Age Patterns in Medical Care, Illness and Disability. United States - July 1963-June 1966, Public Health Service Publication No. 1000, Series 10, No. 32 (Washington: U.S. Government Printing Office, June, 1966), p. 35.

[4]Royal A. Crystal and Agnes W. Brewster, Selected Factors and Their Relationship to Day of Admission and Length of Hospital Stay, Presented to the Medical Care Section, American Public Health Association Meeting (San Francisco, November, 1966).

of geographic variation. An example of this is a study of medical care under three types of health insurance (group prepayment, Blue Cross-Blue Shield, and indemnity insurance) which has been criticized because geographic differences were not adequately controlled.[5] By studying drug utilization in two populations in the same community, where prescriptions for each are written by the same physicians, the factor of geographic differences in populations is controlled.

This study will have a serious limitation, however, in that the population under P. S. I. was not randomly selected into the prepayment plan. Presumably special factors have caused people to be enrolled in P. S. I. It will not be completely possible to assess the influence that these factors have had on producing the differential utilization patterns of the two populations. This will be somewhat controlled, as will be discussed in the methodology section, through the use of standardization techniques and through the analysis of the utilization patterns by specific demographic characteristics such as age, sex, marital status and family size.

Community Sample of Prescriptions

Data about utilization of drugs in the out-of-pocket payment system

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[5] Columbia University, School of Public Health and Administrative Medicine with the National Opinion Research Center, Family Medical Care Under Three Types of Health Insurance (New York: Foundation on Employee Health, Medical Care and Welfare, Inc., 1962).

could have been obtained from any of three major sources. These sources are the records of the physicians who originally prescribed the prescription, the patient who used the medication or the drugstores that dispensed the medication. The following considerations were taken into account in selecting the source of community-wide data for this study. First, time considerations dictated that the study be a retrospective one. Therefore, a permanent and accessible record system needed to be available. Second, funds were limited. Some study methods, such as household interview studies of an area-wide population, are relatively expensive.

In any case, a household interview study of an area-wide population did not appear to be the best study method for another reason. People do not maintain extensive records of the drugs that they utilize. Although data bearing specifically on recall of prescribed drugs are not available, data obtained on utilization of other medical services indicate that recall procedures would be quite unreliable for studying drug utilization.[6] If people are unreliable in reporting details of hospital and physician utilization it is possible to assert that they would be even less

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[6]See U. S., Dept. Health, Education and Welfare, "Health Interview Responses Compared with Medical Records," Health Statistics from the U. S. National Health Survey , Series D, No. 5 (Washington: U. S. Government Printing Office, June, 1961), and W. J. McNerney and Study Staff, op. cit., pp. 284-319.

reliable in reporting events such as the payment for a prescription.[7]

Studying the problem by sampling physicians' records also offers disadvantages. It is unlikely that a large group of physicians would cooperate with the study by allowing access to their complete patient records. Moreover, even if access could be obtained it would be difficult to evaluate the reliability and completeness of medical records with regard to prescriptions written, since physicians vary as to completeness of their records. A recent study, attempting to evaluate the quality of medical care utilizing physician's office records, has reported that almost one-third of all records were useless for the study because of their illegibility or incompleteness.[8]

Telephone prescriptions and prescription refills are among the items least likely to be recorded with any degree of regularity, since requests for this type of prescription occur at times when the physician

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[7]A recently released study by the National Health Survey attempts to overcome the recall problem by only studying the two-week period immediately preceding the interview. Validity measures are not yet reported. See U.S., Dept. Health, Education and Welfare, Cost and Acquisition of Prescribed and Nonprescribed Medicines. United States - July 1964-June 1965, Public Health Service Publication No. 1000, Series 10, No. 33 (Washington: U.S. Government Printing Office, October, 1966).

[8]Isidore Altman, Assessing the Quality of Records in the Physician's Office, Presented to the Medical Care Section, American Public Health Association Meeting (San Francisco, November, 1966), and H. H. Kroeger, I. Altman, D. A. Clark, A. C. Johnson and L. G. Sheps, "The Office Practice of Internists: I. The Feasibility of Evaluating Quality of Care," J. American Medical Association (1965), CXCIII, 371-376.

records are not quickly available. The use of physician records to estimate the extent of drug utilization in the community would, therefore, be questionable.

To further complicate the problem a study of the prescriptions that a physician wrote would not be the same as a drug utilization study. There would be no way to assess which of the prescriptions written by the physician were never filled by the patient. Since the patient factors in drug utilization are among the prime objectives of this study, a medical record study was not considered adequate.

Sampling the records of drugstores offered many advantages. These records were, first of all, accessible. Close cooperation in the past with the pharmacists in the area, through P. S. I., assured relative ease of access to their records. Since all of the prescriptions dispensed in the area were clustered in only 60 drugstores a sampling method could be adopted that would allow a relatively inexpensive study. Further, the records are likely to be complete and reliable. Provincial and federal legislation in Canada requires that all prescriptions be recorded and that the records be maintained in a readily available form for a number of years.

A previous study utilizing the records of a drugstore indicated that it is possible to collect information about dispensed prescriptions

using pharmacies' records.[9] This study, however, was not able to reliably relate the prescriptions dispensed to a population at risk, since the records of a single drugstore was studied. It did indicate that the method of collecting information from drugstore records is feasible.

For these reasons it was decided to select a probability sample from the universe of prescriptions dispensed by the pharmacies of the Windsor metropolitan area during the year from June 1, 1962 through May 31, 1963. In selecting this method it was necessary to make two assumptions. In order to relate the prescriptions dispensed to the population of Windsor it was necessary to assume that the drugs dispensed to the population were all filled in the pharmacies of the Windsor metropolitan area. Consultation with the pharmacists in the area indicated that this assumption was reasonable. Because of differing physician licensing laws not many prescriptions that were written in Windsor would be filled in Detroit, Michigan which is the nearest community nor would many prescriptions written in the United States be filled in Windsor. It was assumed that prescriptions dispensed outside to the Windsor population would be balanced by outside prescriptions flowing into Windsor.

Since variance estimates relate to individual utilization estimates, they would understate the true variance to the extent to which intra-family correlation exists in the utilization distribution. However, the estimation

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[9] M. Musulin and J. D. McEvilla, "Socio-economic Variables Related to Expenditures for Prescribed Medication," J. Amer. Pharm. A. (April, 1965), Vol. NS5, No. 4, pp. 197-200.

formulae would take this correlation effect into account if all of the prescriptions for a single family are dispensed in a single drugstore. While this is not always true, consultation with the pharmaceutical community indicate it is generally the case. The violation of this assumption would cause a slight understatement of the interpersonal variance estimates.

Sample Selection

The sample selection consisted of the following steps:[10]

1. Selection of strata

   a) The drugstores were classified first by ownership and management and then by the number of prescriptions dispensed in each. This was done to take into account the possibility that different types of prescriptions might be dispensed in different types of pharmacies. If this were the case it would be appropriate to take these factors into account in the design. If it were not the case no loss would be suffered by stratifying in this manner.

   The stores were classified as either independently operated drugstores or chain drugstores and departments in other stores.

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[10]For considerations involved in sampling with probability proportional to size see L. Kish, Survey Sampling (New York: John Wiley and Sons, Inc., 1965), Particularly Chapters vi and vii, pp. 182-253.

There were 21 drugstores in the chain category, accounting for approximately 1/3 of all the prescriptions dispensed in the community.

b) A measure of size (m. o. s.) was assigned to each drugstore, approximating the number of prescriptions estimated to have been dispensed by that store during the study year. This was done by subtracting the serial prescription number of a prescription dispensed from each store early in the year from the serial number of a prescription dispensed late in the year from that store.

This number was adjusted to take into account refilled prescriptions. An estimate of the ratio of refilled prescriptions to new prescriptions was made for each store from this ratio for that store in P. S. I. claims, and this factor was used to estimate the total number of prescriptions dispensed.

c) Six strata were set up, each containing a varying number of similar drugstores but an equal number of prescriptions.

d) Two drugstores were selected from each strata to allow the simple calculation of the appropriate variance estimates and to increase the number of degrees of

freedom of the overall estimates. In order to decide on the appropriate number of strata, the number of drugstores to be sampled and the number of prescriptions to be sampled, it was necessary to decide certain of these values, rather arbitrarily. Once these values were decided the others followed.

It was estimated, on the basis of the time available for the field-work phase of the study, that approximately twelve drugstores would be the appropriate number to survey. This amounted to a 20% sample of all drugstores. The exact number was selected because the relationship of the total m. o. s. in the two groups of stores facilitated the establishment of six strata. Since a minimum of two selections must be made from each stratum to allow the calculation of variance of estimates, a final selection of twelve stores was made in the six strata. It was appropriate to select the minimum number of drugstores from each stratum because this would allow the maximum number of degrees of freedom available in the study design.

It was also decided that between 250 and 300 prescriptions from each drugstore would generate the appropriate total number of prescriptions for the

sample to reduce the magnitude of the variance estimates. This led to the decision to aim for a sample of 280 prescriptions from each drugstore, an overall sample ratio of one out of 125 prescriptions.

2. Overall selection involves a two-stage sample drawn with probability proportional to size:

   a) The probability of selection in the first stage = $\frac{\text{m. o. s.}}{Fb^*}$ where $F = \frac{1}{f} = 125$ = the overall selection rate, and where $b^* = 280$ = the target number of prescriptions to be selected from each store.

   b) The probability of selection in the second stage (within each store) = $\frac{b^*}{\text{m. o. s.}}$

   c) Overall selection rate (probability) = $\frac{\text{m. o. s.}}{Fb^*} \cdot \frac{b^*}{\text{m. o. s.}} = f$

   d) In the sample frame the sum of the m. o. s. equals 420,000 and twelve stores were selected from six strata. Each stratum contained 70,000 prescriptions.

Information concerning the patient, the physician and the medication is recorded when a prescription is sampled: These items are:

1. Name and address of patient
2. Physician's name
3. Name of medication

sampled. The overall mean was $3.78. In two of the strata there were no differences in the mean price of the paired stores. In another two of the strata the differences were $.10 or less. In the third two strata the differences were around $.25. Overall, as will be shown later in assessing the design effect, there appears to be minor differences among the stores. The stores within the strata appeared to be relatively homogeneous. As will be seen later, there are relatively little gains in estimating the price factor by stratification.

TABLE 1.--Number of Prescriptions in Sample; Total Expenditures for Prescriptions and Mean Price of Prescriptions by Strata Selection Number for Community Sample

Strata Selection #	Number of Prescriptions (x)	Total Expenditures for Prescriptions (y)	Mean (y) Price (x)
Stratum 1(A)	227	$ 879.40	$3.87
" 1(B)	281	1,073.30	3.81
Stratum 2(A)	339	1,326.59	3.91
" 2(B)	364	1,326.35	3.64
Stratum 3(A)	114	436.85	3.83
" 3(B)	229	878.98	3.83
Stratum 4(A)	263	961.05	3.65
" 4(B)	222	790.05	3.55
Stratum 5(A)	500	1,820.70	3.64
" 5(B)	248	967.36	3.90
Stratum 6(A)	345	1,352.40	3.92
" 6(B)	285	1,118.47	3.92
Total	3,417	$12,931.50	$3.78

Table 2 shows the variance estimates of the total price of prescriptions (y), the variance of the total number of prescriptions (x) and their co-variance. These variance estimates are calculated by summing the square of the difference of the total sampled in each pair of stores of the same stratum. The sum of the Dy^2's in Table 2, a sum equal to 1,045,927, represents the variance of the stratum total price. The sum of the Dx^2's, which is 85,551, is the variance of the stratum total number of prescriptions. The co-variance of the stratum total of price and number of prescriptions, equal to 297,486 is the sum DxDy.

TABLE 2. --The Difference Between the Two Selections in Each Stratum on Number of Prescriptions (Dx) and Total Price of Prescriptions (Dy), Estimates of the Variance of the Totals of the Strata (D^2x) and (D^2y) and the Co-Variance (DyDx) in Community Sample

Strata	Dy	Dx	D^2y	D^2x	DyDx
Stratum 1	-193	- 54	37,249	2,916	10,422
Stratum 2	1	- 25	1	625	- 25
Stratum 3	-442	-115	195,364	13,225	50,830
Stratum 4	171	41	29,241	1,681	7,011
Stratum 5	854	252	729,316	63,504	215,208
Stratum 6	234	60	54,756	3,600	14,040
Total	...	...	1,045,927	85,551	297,486

However, in assessing the design effect, little difference exists between the variance calculated as above and the simple random sample (s. r. s.) variance estimates. The design effect, which is calculated by dividing the variance estimates calculated as above by variance estimates calculated using s. r. s. formulae, measures the clustering effect in the strata. The variance estimates calculated using the s. r. s. formulae had eleven degrees of freedom compared to five degrees for the estimates using the complex design formulae. Little differences were noted between the estimates, as the mean design effect for the five basic estimates presented in Table 3 equalled 0. 96 and for the 24 age/sex specific rates presented in Table 9 and Table 10 equalled 1. 82. Therefore, it was decided (upon consultation) to use the slightly biased but more precise s. r. s. variance estimates for the remainder of the study. All reported variance estimates are calculated using simple random sample formulae.

Identification of People for Whom Community Prescriptions Were Dispensed

Three sources of information were used to obtain population information not generally recorded on prescriptions for the person to whom each selected prescription was dispensed. First, the master subscriber file of W. M. S. was searched. This file is a listing of the family members of every family that has ever been enrolled in the Windsor Medical Service, and it contains demographic and medical

care utilization information about each person. The people to whom 2,424 prescriptions were dispensed, 70.9% of the total sample, were identified in the W. M. S. master subscriber file.

Second, a telephone interview was carried out in order to locate the individuals not identified in the W. M. S. records. The recipients of 501 prescriptions, an additional 14.7% of the sample, were contacted by telephone. Finally, auxiliary sources such as the records of the Department of Social Service of Essex County, Ontario, and the federal Department of Veterans Affairs were used to locate persons not identified by W. M. S. and the telephone survey. The recipients of 83 prescriptions, 2.4% of the sample, were located by these organizations. The recipients of 409 prescriptions, 12.0% of the sample were not identified.

The following information was recorded for each person identified:

1. Age and sex
2. Size of family
3. Marital status
4. Physician insurance status
5. Annual physician utilization

Prescriptions Dispensed Under P. S. I.

P. S. I. data for the same time period, for comparative analysis, were derived from two P. S. I. records. The first of these records is a set of punch cards, each containing information about one of the 4,472

prescriptions dispensed under P. S. I. during the study year. The second record is a person-year summary of the drug utilization of each of the 1,504 people who are eligible for service any time during the study year. This record contains identification information about these individuals and a summary of their year's prescription utilization. The first record contains all the information recorded for the community sample prescriptions except the date that the prescription was written. The person-year record includes the age and sex, marital status and size of family of the P. S. I. member but does not contain data concerning the member's physician utilization and physician insurance status. Unfortunately it was only possible to obtain this information for the community sample.

Analysis of Data

Both the population of prescriptions and the population of people receiving prescriptions under P. S. I. represent the total universe of data. The prescriptions sampled in the community are a probability sample of the total universe of prescriptions dispensed in the community. The data from these populations are therefore not homologous. The sample of prescriptions in the community estimates the total universe of prescriptions dispensed in the community. Community population data are related to this estimate to produce a set of estimates of the utilization of drugs by people. These estimates are compared with the known utilization parameters of the P. S. I. population, thereby

comparing estimates from a sample with universe parameters.

It will not be possible to utilize many of the common statistical tests of difference when comparing data from the community sample with data from P. S. I. The data concerning community utilization patterns are estimates from a probability sample and will be reported with their attendant estimates of sampling variance. The data from P. S. I. represent total information from a special universe of people that is in no sense a sample of any other universe.

The analytical approach used in this study presents comparisons between appropriate sub-sets of data from the two distributions and examines their apparent similarities and differences. Data from the community are reported as point estimates with appropriate confidence intervals and are compared to the analagous population parameters from P. S. I.

This technique tests a null hypothesis that the mean of the community distribution (for any variable) equals the mean of the P. S. I. distribution. The means from the community data are sample means. Confidence intervals developed state (at the 95% level) $\overline{X} - 2\ \text{S. E.}_{\overline{X}} < M_{comm} < \overline{X} + 2\ \text{S. E.}_{\overline{X}}$. If the mean in the P. S. I. parameter is not in this interval it is possible to state (with an unknown alpha error) that the universe means are not equal. Statistical significance is always measured at the 5% level.

The chi-square goodness of fit test is used in comparing equality

of distributions rather than means. In these cases the null hypothesis is that the two distributions are equal. The P. S. I. distribution is used to establish the expected value. This in effect asks: "Could the community sample have come from a universe with the distribution equivalent to the distribution of the P. S. I. universe?" In those situations where the standard errors are not calculated the data are presented as percentage differences between P. S. I. and the community sample.

Chapter Organization

The chapters which follow present the exposition of the data and their discussion. Chapters III and IV relate to objective A and present the data used in the determination of differences between the utilization of prescribed drugs in the community and among subscribers to a prescription prepayment plan. The gross estimates from the community sample are presented in Chapter III and the basic prescription per person and expenditure per person estimates are discussed.

Chapter IV presents the comparison of the P. S. I. and the community-wide gross utilization rates and describes the population distribution upon which these rates are based. Hypothesis A, that significant differences exist between the utilization of drugs in the community and under prescription prepayment is tested.

Chapter V relates to objective B-1 and presents the evaluation of the two payment mechanisms on economic criteria. The determination of the extent to which the price of drugs are different in the two systems

is presented, the basis for this difference is examined and the economic factors operating to produce differences in the demand for drugs in the two systems are discussed. The hypothesis is tested that asserts that drug prices are higher for utilization under the prescription prepayment plan.

Chapter VI through Chapter VIII relate to objective B-2-a and present the portion of the evaluation of functional criteria that determines if financial factors operate in the out-of-pocket payment mechanism to produce unmet need. These chapters test the hypothesis that financial factors do so operate, producing income-related rather than need-related drug utilization, indicating the community system's relative functional inefficiency.

Chapter VI compares utilization under the two systems, investigating the impact of the various demographic characteristics including age/sex, marital status and size of family as differential determinants of utilization. This analysis particularly asks if the most financially vulnerable population groups show the greatest utilization differential under prescription prepayment. Chapter VII analyzes delay in filling prescriptions and prescription utilization by insurance status and physician utilization in the community for evidence of dysfunctional aspects of drug utilization. Chapter VIII compares the drug utilization patterns of the two systems by therapeutic class.

Chapter IX investigates patient pressure on physician-prescribing

patterns to measure interference with the application of the physician's professional judgment under drug prepayment by analyzing the relationship in the two systems between the physicians' prescribing patterns and their vulnerability to patient pressure (objective B-2-b). Chapter IX presents the test of the hypothesis that patient influence has little effect on physicians prescribing patterns in the prescription prepayment plan. Chapter X summarizes and discusses the findings.

CHAPTER III

ESTIMATES OF TOTAL COMMUNITY PRESCRIPTION UTILIZATION

This chapter presents the first portion of the data used to determine differences in drug utilization in the community payment system and under drug prepayment. The data presented in this chapter are the estimates of the gross community utilization parameters:

1. The total number of prescriptions dispensed in the community.
2. The total expenditures.
3. The mean prescription price.
4. The prescription utilization.
5. Expenditure rates per person.

Table 3 summarizes the estimates for the community utilization distribution and the variance attendant to each estimate.

It is estimated that 427,125 prescriptions were dispensed in the community during the study year at a total expenditure of $1,616,438. The average price per prescription is estimated to be $3.78. There was an average of 2.19 prescriptions per person dispensed in the community during the study year at an average expenditure of $8.29 per

person per year. The latter two rates are based on a population of 195,000, the Dominion Bureau of Statistics estimate of the January 1, 1963 Windsor metropolitan area population.[1]

TABLE 3.--Estimates of Price Per Prescription, Total Number of Prescriptions Dispensed in Community, Total Expenditures for Prescriptions in Community, Number of Prescriptions Per Year and Total Expenditures for Prescriptions Per Person Per Year in Community with Variance and Standard Error Approximations

	Estimate	Variance	Standard Error
Price per prescription	$3.78	$.0015	$ .04
Total number of prescriptions dispensed in community	427,125	13.60×10^{8}	36,877
Total expenditures for prescriptions in community	$1,616,438	$\$1.83 \times 10^{10}$	$135,182
Number of prescriptions per person per year	2.19	.0361	.19
Total expenditures per person per year	$8.29	.4900	.70

The estimates of utilization per person per year were derived, as discussed in the design section, using the number of prescriptions

[1] M. D. Fleming, Current Population Estimates, Dominion Bureau of Statistics, Ottawa, Canada, personal correspondence, March 21, 1966.

and the total expenditure for prescriptions in the sample. These rates were multiplied by 125, the sampling rate, and divided by the estimate of the population, allowing the estimation of per person per year rates from a sample of prescriptions and an estimate of the population. Since the population values are estimated by census and not by sample they have no attendant variance. The variance of the person estimates can be derived by multiplying the variance estimate of the sample by the square of 125 and dividing by the square of the population.

Applying the estimates of the sampling error it can be stated, at the 95% confidence level, that the average price per prescription in the community was between $3.78 minus 2 times $.04 and $3.78 plus 2 times $.04. The use of confidence interval assumes normality of means. The very narrow confidence interval, $3.70 to $3.86, indicates that precise estimates can be made utilizing a very simple sampling method. Relatively precise estimates are shown in later chapters for each parameter studied. Since there appears to be so little variance in the distribution of prescriptions in the population it would appear to be unnecessary to use complex sample designs to generate overall parameter estimates.

The mean price of prescriptions estimated in the community, $3.78, is somewhat higher than estimates of mean prescription prices in other areas. An estimate by Fuller for the Royal Commission on Health Services set the mean prescription price for Canada at $2.98

for 1959.[2] This estimate, which was for all of Canada, was apparently made by dividing estimates of the total expenditures for prescriptions in Canada for the year by estimates of the total number of prescriptions dispensed. Estimates of the United States' prices vary from about $3.00 per prescription as reported by Liebson in Drug Topics[3] to about $3.50 as reported in the Lilly Digest for the year 1965.[4] These two estimates, however, are developed using estimation procedures of unknown reliability. Current estimates from the United States Health Interview Survey estimate the average price of a prescribed drug acquisition at $3.60.[5] However, this includes all prescribed drugs purchased at any one time for the same person and therefore over-estimates the average price of a single prescription.

The above estimates are for a whole country whereas the Windsor estimate is for a single industrial city. It is not possible therefore, to use direct price comparisons. However, the Lilly Digest reports mean prescription price by geographic area in the United States. There

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[2]Royal Commission on Health Services, op. cit., p. 14.

[3]Liebson, op. cit.

[4]Slavin, op. cit.

[5]U.S., Dept. Health, Education and Welfare, Current Estimates from the National Interview Survey. United States - July 1964-June 1965, Public Health Service Publication No. 1000, Series 10, No. 25 (Washington: U.S. Government Printing Office, November, 1965), p. 19.

is considerable geographic variation reported, with the average price varying between $3.16 in the East South Central states and $4.11 in the Pacific states. The Windsor estimate falls within this range. The average prescription price for the East North Central states, which is the region that most closely approximates the character of the Windsor area, is $3.44. This value is much nearer the U.S. national average than some other regional price estimates.

The sample contained 3,417 prescriptions. Since the sampling rate applied was 1/125 it is estimated that 3,417 times 125 or 427,125 prescriptions were dispensed in the Windsor area during the study period. The standard error of this estimate is 36,877. It therefore can be said, at the 95% confidence level, that the number of prescriptions dispensed from June 1, 1962 to May 31, 1963 was between 353,371 prescriptions and 500,879 prescriptions.

The point estimate of 427,125 prescriptions dispensed was very close to an approximation of that number, the sum of the measures of size for the drugstores of the community. This sum was 420,000. These measures were very simply estimated using the serial numbers of the prescriptions that were filled very early in the year and of the prescriptions that were filled very late in the year and subtracting the latter from the former. By calculating the proportion of refills that are dispensed in any drugstore a very simple measure was made estimating the total number of prescriptions dispensed. This approximation, of course,

had its hazards.

For example, this method assumed that all prescriptions were numbered serially either in one set of serial numbers for all prescriptions dispensed or perhaps in two sets; one for narcotics and one for non-narcotic prescriptions. It might have been that all pharmacies did not number their prescriptions serially. In fact, this occurred in one of the drugstores sampled.

However, the remainder of the drugstores in the study numbered their prescriptions serially, and the approximation proved to be a very precise estimate of the total number of prescriptions dispensed in the community. If consistency can be shown in further surveys the approximation method might prove to be a very simple and reliable approach to the estimation of the annual number of prescriptions dispensed in any community.

The estimate of the total expenditures for prescriptions in the community was calculated by multiplying the total expenditures for prescriptions in the sample, $12,931.50, by 125, equalling $1,135,182. It can be said, at the 95% confidence level, that the total expenditure for prescriptions in the community was between $1,346,074 and $1,886,802 for the study year.

The estimate of the average number of prescriptions dispensed per person per year in the community and the estimate of the average expenditure for prescriptions per person per year in the community are

derived by dividing the total number of prescriptions and the total expenditure for prescriptions by the estimated population of the community during the study year. The point estimates of the mean number of prescriptions dispensed per person per year in the community is 2.19 with a standard error of .19. Therefore, the mean in the community, at the 95% confidence level was between 1.81 prescriptions and 2.57 prescriptions. The estimate of the expenditure per person per year is $8.29. The standard error of this estimate is $.70. The 95% confidence interval for the expenditure estimate is $6.89 to $9.69.

The magnitude of these estimates is close to that of estimates developed from Fuller's figures in the Royal Commision report.[6] He reports 43.9 million prescriptions dispensed in Canada in 1959, at a total expenditure of $130.9 million, to a population of approximately 18 million people, an average of 2.4 prescriptions per person per year at an annual expenditure of $7.27 per person. These estimates are both within the confidence levels for the Windsor community as stated above. The Canadian expenditure estimate would have been even closer to the Windsor point estimate but for the lower average prescription price throughout the remainder of Canada.

All of these estimates are well below the estimate for the United States derived by dividing the Drug Topics figures of 1 billion

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[6]Royal Commission on Health Services, op. cit.

prescriptions and an expenditure of $2.8 billion by the present United States population. The estimates of approximately five prescriptions per person per year at an expenditure of $14 per person per year result.[7] Anderson, Collette and Feldman report similar annual mean expenditures of approximately $13 per person per year.[8]

It is possible that the United States' estimates are simply invalid. The Drug Topics estimates are based on sampling techniques from which no variance estimates are possible. It is conceivable that their estimates have very little validity. The Anderson, Collette and Feldman estimates are based on a family interview survey and therefore depend on recall by families of prescription utilization. Since this study was designed to investigate total medical care expenditures and not individual prescription expenditures the drug utilization estimates might be unreliable.

It is possible to compare the physician utilization from which these drug utilization estimates derive. It appears that the physician utilization rates are comparable between the United States and Windsor. The annual physician utilization rate in Windsor, excluding hospital calls, is

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[7] Liebson, op. cit.

[8] W. O. Anderson, P. Collette and J. J. Feldman, Changes in Family Medical Care Expenditures and Voluntary Health Insurance (Cambridge: Harvard University Press, 1963), p. 53.

about 4.8 visits per person per year.[9] The rate for the United States exluding telephone consultations is about 4.8.[10] It is unlikely that such considerable differences in drug utilization would result from similar physician utilization patterns.

It is probable that the estimates of drug utilization for the United States are overstated. This, at least, is true for the estimates of the number of prescriptions dispensed per person per year. Evidence of this is presented in a later chapter when comparing the P.S.I. and the Windsor community experience with experience under other forms of total drug prepayment. It is possible to state that utilization rates under total drug prepayment appear quite similar whether in Windsor or in the United States. If the drug utilization under prepayment is similar in various prepayment systems it may be possible to assume that it is also similar in the various out-of-pocket payment systems.

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[9] Windsor Medical Services, Inc., op. cit., pp. 6-7.

[10] U.S., Dept. Health, Education and Welfare, "Volume of Physician Visits, July 1957-June 1959," Health Statistics from the U.S. National Health Survey, Series B, No. 19 (Washington: U.S. Government Printing Office, August, 1960).

CHAPTER IV

COMPARISON OF P. S. I. AND COMMUNITY-WIDE GROSS UTILIZATION RATES

The remainder of the data relating to the first objective of the study, the determination of drug utilization differences between the community and P. S. I., are presented in Chapter IV. Specifically, the estimates of utilization rates in the two systems are presented, as are estimates of the difference in number of prescriptions and expenditures for prescriptions between the community utilization and the utilization for the community had the prepayment rates been applied community-wide. The first hypothesis (hypothesis A), that significant differences exist between the utilization of drugs in the community and under prescription prepayment, is tested.

The population distribution upon which the population-related utilization rates are based is also presented. Techniques to adjust for differences in the population distribution between P. S. I. and the community are discussed and age-adjusted calculations are presented.

Table 4 shows the derivation of the population estimates used as the base for population-related rates in later tables. Since the study

TABLE 4. --Census Population for Windsor, Ontario on June 1, 1961 and January 1, 1963 (Estimated), Community and P. S. I. Percentage Distribution by Age/Sex, Marital Status and Size of Family

Group	Census		% Distribution	
	June1, 1961	Jan. 1, 1963	Community	P. S. I.
Age/Sex				
Male	96,079	96,915	49.7	49.6
0-4	11,952	12,090	6.2	4.9
5-19	27,217	27,495	14.1	15.2
20-44	30,137	30,420	15.6	17.3
45-64	19,021	19,110	9.8	10.4
65 +	7,752	7,800	4.0	1.8
Female	97,286	98,085	50.3	50.4
0-4	11,223	11,310	5.8	4.1
5-19	26,636	26,910	13.8	13.0
20-44	32,239	32,565	16.7	20.9
45-64	18,815	18,915	9.7	10.7
65 +	8,373	8,385	4.3	1.7
Total	193,365	195,000	100.0	100.0
Marital Status				
Married	...	92,820	47.6	49.7
Single 0-14	...	64,545	33.1	29.6
Single 15 +	...	28,080	14.4	18.4
Widowed	...	9,555	4.9	2.3
Total	...	195,000	100.0	100.0
Size of Household (Number of Households)				
1	5,505	5,538	10.3	25.2
2-3	23,232	23,443	43.6	42.2
4-5	16,735	16,883	31.4	24.4
6-9	7,394	7,474	13.9	7.9
10 +	449	430	0.8	0.3
Total	53,315	53,768	100.0	100.0

year was from June 1, 1962 through May 31, 1963 the population base used was the January 1, 1963 estimated population of the Windsor Metropolitan area. Canadian census provided data as of June 1, 1961 for Windsor.[1] The population at this time was 193,365 people. As previously stated, Dominion Bureau of Statistics estimated that the January 1, 1963 population was 195,000. Since there did not appear to be a major population increase it was assumed that the internal distribution of the population remained stable in that short period and the age and sex percentage distribution of the 1961 census was applied to the 195,000 base.

This procedure resulted in the population distribution shown under the heading January 1, 1963. The percentage population distribution of the 1961 census by age and sex group was applied to the January 1, 1963 estimate as was the percentage distribution by marital status and by size of household. There were an estimated 53,768 households in the area, and their distribution by size is also shown on Table 4.

The percentage distribution of the P. S. I. population is also shown in this table. This is the distribution by age and sex groups of the total number of person-months of service in P. S. I. The person-months concept of service is used throughout in order to compensate for the fact

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[1]Canada Dominion Bureau of Statistics, 1961 Census of Canada: Population and Housing Characteristics by Census Tracts, Bulletin CT-16 (Ottawa, 1965).

that not all of the members were eligible for service for the full twelve months. The measure of service throughout therefore will be person-months of service or person-years of service and not actual persons. In comparing the P. S. I. population distribution to the community distribution it can be seen that the age/sex distributions are somewhat similar, although P. S. I. has fewer people in the very young and the very old age groups.

The distribution by marital status and by size of household, however, varies considerably between P. S. I. and the community. P. S. I. has proportionately more one-person subscriber units than the community has one-person households because employees were enrolled in P. S. I. and did not always wish to pay the extra premium sometimes necessary to enroll the remainder of the family. P. S. I. therefore also has a greater proportion of those people who are single and a smaller proportion of children. The proportion of widowed is twice as large in the community as it is in P. S. I. The impact of these differences in population distributions for analysis are minimized through the use of person or person-year rates by demographic categories throughout the discussion of results.

Table 5 is a compilation of five basic estimates used to determine gross differences between the drug utilization in the two systems. These estimates are:

1. The mean number of prescriptions dispensed per person

per year.

2. The mean expenditure per person per year.
3. The mean price per prescription.
4. The total number of prescriptions dispensed in the community.
5. The total expenditures for prescriptions in the community during the study year.

This table includes the estimate from the community prescription sample with a 95% confidence interval relating to these estimates.

Also presented in Table 5 are the annual data from the P. S. I. population. The gross P. S. I. number of prescriptions dispensed per person per year, gross expenditures per person per year, and mean price per prescription are included and the rates are age-adjusted to compensate for the difference in population distribution between P. S. I. and the community.

Table 4 indicated that, while the age/sex distribution of P. S. I. and the community were fairly similar, there were some differences in the two distributions. Studies of all forms of medical care utilization have shown that differences exist among the utilization of different age/sex groups in the population that are independent of all other utilization factors. It, therefore, is appropriate to adjust the data to compensate for differences between the two age/sex distributions. If this were not done it would be impossible to discern what proportion of the difference

in utilization rate between P. S. I. and the community was due to age/sex specific differences in the use of drugs and what portion was related to differences in the age distribution of these two populations.

TABLE 5. --Community Estimates with 95% Confidence Interval, P. S. I. and P. S. I. (Age-Adjusted) Rates of Annual Number of Prescriptions, Annual Expenditures Per Person, Mean Price Per Prescription, Total Number of Prescriptions and Total Expenditure for Prescriptions for Total Population

	Community	95% Community Confidence Interval	P. S. I.	P. S. I. (Age-Adjusted)
Annual number of prescriptions per person	2.19	1.81-2.57	4.08	4.20
Annual expenditures per person	$8.29	$6.89-$9.69	$16.48	$16.64
Mean price per prescription	$3.78	$3.70-$3.86	$4.03	$3.96
Total number of prescriptions	427,125	353,371-500,879	795,000	819,000
Total expenditures for prescriptions	$1,616,428	$1,346,064-$1,886,792	$3,213,600	$3,244,800

Table 6 shows the basis of the calculation of the age-adjusted rates for the P. S. I. population. The P. S. I. age-adjusted rates show the rates

TABLE 6. --Actual Number of Months of Service, Adjusted Number of Months of Service, Adjusted Mean Number of Prescriptions and Adjusted Mean Expenditure for Prescriptions Per Person and Adjusted Mean Price of Prescriptions by Age/Sex and Total, for P. S. I.

Age/Sex Group	Actual Months	Adjusted Months	Adjusted Number of Prescriptions [a]	Adjusted Expenditures [b]
Male				
0-4	637	814	225	$ 699.75
5-19	2,000	1,852	179	625.50
20-44	2,275	2,050	359	1,471.90
45-64	1,366	1,288	708	3,101.04
65 +	240	526	318	1,128.90
Female				
0-4	540	762	193	627.25
5-19	1,704	1,813	224	797.44
20-44	2,745	2,194	876	3,784.32
45-64	1,407	1,274	1,083	4,364.49
65 +	224	565	429	1,613.04
Total	13,138	13,138	4,594	$18,213.63

Adjusted Mean Number Prescription Per Person Per Year $= \frac{(4,594)(12)}{13,138} = 4.20$

Adjusted Mean Expenditure Per Person Per Year $= \frac{(\$18,213.63)(12)}{13,138} = \$16.64$

Adjusted Mean Price Per Prescription $= \frac{18,213.63}{4,594} = \$3.96$

[a]Calculated by adjusted number of months times age/sex specific utilization rate divided by 12.

[b]Calculated by adjusted number of prescriptions times mean expenditure of prescriptions for age/sex group.

that would have been derived in P. S. I. had the population distribution been the same as in the community but with age-specific rates remaining constant. The actual number of person-months of service for each age/sex group in P. S. I. is shown as is the distribution of months adjusted to the community's age/sex structure. It can be seen that the very young and the very old age/sex groups are under-represented in the P. S. I. population. The middle groups are over-represented.

The number of the prescriptions for each age/sex group was calculated by taking the adjusted number of months for that age/sex group, multiplying by the prescription per person per year rate for that age/sex group and dividing by 12. The expenditure per year estimate for that age/sex group was calculated by multiplying the number of prescriptions by the mean price of the prescriptions for that age/sex group. The number of prescriptions and expenditures were then summed and the total or overall mean prescription per person per year, expenditures per person per year and price per prescription rates were calculated.

The mean prescription per person per year rate for the subscriber population was calculated to be 4. 20 and the mean expenditure per person per year rate was calculated to be $16. 64. These rates were both somewhat higher than the true rates in the P. S. I. population. That they were both higher indicates that the P. S. I. population differed in distribution from the community population structure and that this difference

had utilization implications. The groups under-represented in the P. S. I. population were the groups having higher age-specific utilization rates. The difference between the gross P. S. I. rates and community estimates somewhat understates the true differences.

The opposite effect, however, can be seen in looking at the difference in the age-adjusted and true mean prescription prices. The mean price per prescription was only $3.96 in the age-adjusted population as opposed to the true price of $4.03. This indicates that while the groups under-represented in the P. S. I. population had a higher age-specific utilization rate, they had a lower mean price per prescription. As a result of this, the gross P. S. I. price per prescription figures tend to overestimate the difference in the mean price per prescription between P. S. I. and the community. The age-adjusted rates were therefore used in comparing P. S. I. and the community differences.

In comparing each of these age-adjusted rates with the community estimate it can be seen that the P. S. I. rates were both different from and higher than the community rates for the study year. Each P. S. I. rate was about double the analagous point estimate of the community parameter. Further, each P. S. I. rate fell outside the 95% confidence interval for the analagous community estimate, indicating that the means of the P. S. I. population utilization distribution were different than the means of the community utilization distribution.

The 95% confidence interval for the prescription per person per

year estimate of the community was from 1.81 prescriptions to 2.57 prescriptions, the point estimate being 2.19. The P.S.I. rate (adjusted) was 4.20. The P.S.I. rate was more than 90% greater than the community point estimate. The community confidence interval for the mean expenditure per person per year estimate of $8.29 was from $6.89 to $9.69. The mean P.S.I. expenditure (age-adjusted) was $16.64. The expenditure in P.S.I. was 100% greater than the estimate of the expenditure per person in the community. The estimate of the mean price per prescription in the community was $3.78 with a confidence interval of $3.70 to $3.86. The P.S.I. age-adjusted mean price per prescription was $3.96, a rate outside the confidence interval and about 5% higher than the point estimate in the community sample. These P.S.I. rates, therefore, were significantly higher than the same rate in the community.

The magnitude of these differences can be shown when these P.S.I. rates are applied to the community population base which indicates the cost to the community had the P.S.I. rates been applied community-wide. Had these rates been applied to the community, nearly twice as many prescriptions would have been dispensed in Windsor and more than twice as much money would have been spent for these prescriptions. The community estimate is that 427,125 prescriptions were dispensed in Windsor during the study year at an annual cost of $1,616,428. Had the P.S.I. rates been applied, 819,000 prescriptions

would have been dispensed at an expenditure of $3,244,800.

There is, then, evidence affirming the first hypothesis that there are significant differences in drug utilization under the two payment systems. Drug utilization rates are significantly higher,in each instance, under prescription prepayment than in the community payment system. These differences would have resulted in additional$1.6 million expenditure for additional 400,000 prescriptions had the P.S.I. rates been operative in the community. The remainder of the study investigates the economic and functional implications of the differential utilization patterns under the two payment mechanisms.

CHAPTER V

EVALUATION OF COMMUNITY AND P. S. I. ON ECONOMIC CRITERIA

This chapter presents the evaluation of the differences in drug utilization under the two payment mechanisms on economic criteria (objective B-1). This analysis determines the extent to which drug prices are different in the two systems. Hypothesis B-1, asserting that drug prices are higher for utilization under P. S. I., is tested. The portions of the difference in expenditures relating to higher drug prices in P. S. I. and to increased demand for drugs are estimated. The basis of price differences in the two systems are investigated by examining the etiology of increased price of drugs under P. S. I.

Finally, the economic factors operating to produce differences in the demand for drugs between the two systems are set forth by discussing the economic basis of changes in demand for drugs that result from lower drug prices facing consumers under drug prepayment.

The following analytical structure is used to determine what portion of the $1.6 million increase in expenditure is related to increased utilization of drugs and what portion is related to increased drug prices. The increase in expenditure is made up of three basic components.

The first is the expenditure for the increased number of prescriptions under P. S. I. utilization rates at the original (lower) community price per prescription. This represents the expenditure for the increase in utilization without taking into consideration the increase in the price of drugs under P. S. I.

The second component is the expenditure for the above number of prescriptions at the difference in price between the P. S. I. (higher) and the community (lower) prices. This represents the expenditure for the difference in utilization at the difference in price per prescription that results when P. S. I. use and price rates are applied to the community.

The third component is the expenditure for the original number of prescriptions in the community at the difference between the new (P. S. I.) and the old (community) price. This represents the increased expenditure that results when the higher price is applied to the number of prescriptions that had been dispensed at the old price.

The increase in the number of prescriptions per person per year dispensed under P. S. I. rates at the increased price can be further divided. First there is an increase in the amount of medication dispensed. Second there is an increase in the number of prescriptions per person dispensed to provide the same amount of medication when there is a reduction in the amount of medication dispensed per prescription.

This second effect is likely to appear in the P. S. I. utilization. As was discussed in Chapter II, the amount of medication allowed on each

prescription under P. S. I. is limited to a 34-day supply or the amount in the smallest available package. The result of this limitation is to increase the number of prescriptions that are dispensed to provide the same amount of medication.

In order to estimate the magnitude of this increase the number of tablets and capsules dispensed per prescription was tabulated for the community sample and for P. S. I. There were 49 tablets or capsules dispensed per prescription in the community but only 43 under P. S. I. This was a reduction of 12%. Since the same magnitude of reduction might not be expected for other types of prescriptions, the overall reduction was assumed to be 10%.

The contribution of each of the factors to the difference in expenditures under the P. S. I. rates are represented by the expression:

$$D = (N_c)(P_p - P_c)(B) + (N_p - N_c)_1(P_c)(B) + (N_p - N_c)_2(P_c)(B) + (N_p - N_c)_1(P_p - P_c)(B) + (N_p - N_c)_2(P_p - P_c)(B)$$ where :

N_c = the number of prescriptions per person per year in the community sample = 2. 19.

N_p = the number of prescriptions per person per year in P. S. I. (adjusted) = 4. 20

P_c = the mean price per prescription in the community = $3. 78

P_p = the mean price per prescription in P. S. I. (adjusted) = $3. 96

B = the population base -- 195,000

$T_{P.S.I.}$ = the total expenditures for prescriptions when P. S. I. rates are applied to community population = $(N_p)(P_p)(B)$ = (4.20)($3.96)(195,000) = $3,243,240

T_{comm} = the estimate of actual total expenditures of prescriptions in community = $(N_c)(P_c)(B)$ = (2.19)($3.78)(195,000) = $1,614,249[1]

D = the increase in tht total expenditure in the community had P. S. I. rates been applied rather than the actual rates = $T_{P.S.I.} - T_{comm}$ = $1,628,991

As stated previously, it can be said that D is made up of:

1. $(N_p-N_c)(P_c)(B)$ -- the expenditure for the increased number of prescriptions under P. S. I. utilization rates at the original community price per prescription.
2. $(N_p-N_c)(P_p-P_c)(B)$ -- the expenditure for the increased number of prescriptions per person at the increased price per prescription applied to the total community.
3. $(N_c)(P_p-P_c)(B)$ -- the increase in expenditure for the original number of prescriptions due to the increase in price.

Further, as stated above, (N_p-N_c), the increase in utilization,

---

[1]This estimate of $1,614,249 differs from the previous estimate of $1,616,428 because it was derived by actually multiplying $(N_c)(P_c)(B)$. Two of these numbers were rounded.

consists of two components: an increase in the amount of drugs people receive and an increased number of prescriptions dispensed in order to compensate for a decreased amount of medication on each prescription. The total of $(N_p - N_c)$ equals 2.01 prescriptions per person per year. Since a maximum decrease in quantity of 10% was estimated it is assumed that $(N_p - N_c)_1$ equals at least 1.81 prescriptions per person per year. This represents an increase in medication dispensed. The increased utilization rate, $(N_p - N_c)_2$, resulting from a decrease in the average number of units of medication per prescription is estimated to be a maximum of 0.20 prescriptions.

To summarize then, D can be divided into five factors. The difference in the total expenditures for prescriptions in the community under the P.S.I. rates would equal the increased expenditure for the original number of prescriptions at the increased price under P.S.I. plus both the portions of the increased number of prescriptions times the original community price plus both portions of the increased number of prescriptions at the difference in price between the old and new or P.S.I. price. More simply:

$$D = (N_c)(P_p - P_c)(B) + (N_p - N_c)_1(P_c)(B) + (N_p - N_c)_2(P_c)(B) + (N_p - N_c)_1(P_p - P_c)(B) + (N_p - N_c)_2(P_p - P_c)(B)$$

These five factors can be divided into an Alpha and a Beta portion. The portion called Alpha represents the increased utilization under the P.S.I. system. The only one of the five factors than can be considered

Alpha is $(N_p-N_c)_1(P_c)(B)$, the portion of the increased expenditures due to increased utilization at the old or the lower community price. Therefore, Alpha equals $(N_p-N_c)_1(P_c)(B) = (1.81)(\$3.78)(195,000) = \$1,334,151$. Beta equals the remaining four factors, $(N_c)(P_p-P_c)(B) + (N_p-N_c)_2(P_c)(B) + (N_p-N_c)_1(P_p-P_c)(B) + (N_p-N_c)_2(P_p-P_c)(B) + (2.19)(\$.18)(195,000) + (.20)(\$3.78)(195,000) + (1.81)(\$.18)(195,000) + (.20)(\$.18)(195,000) = \$294,840$.

D = Alpha + Beta = \$1,334,151 + \$294,840 == \$1,628,991. Therefore, \$1,334,151/\$1,628,991 or 82% of the increased expenditures for drugs relates to Alpha and \$294,840/\$1,628,991 or 18% to Beta. It can be said that 82% of the increased expenditures in the community, had P. S. I. been community-wide, would have been related to increased utilization and only 18% would have been related to increased price of drugs.

However, it cannot be stated unequivocally that the full 18% is due to actual increases in price. Some portion of this increase is due to changing prescribing patterns when a P. S. I. -like price mechanism is instituted. There may, for example, be a shift from less expensive non-antibiotic anti-infectives in the community to antibiotic anti-infectives in P. S. I. There will be some evidence later than changing patterns exist but do not appear to be the major factor in price changes.

Analysis of the prescription price distributions indicates that a major portion of this 18% increase in expenditure is due to increases in

the price of the same prescriptions rather than a shift to more expensive prescriptions. Table 7 shows the prescription price distribution for P. S. I. and the community including the number, percentage and cumulative percentage of prescriptions for each price break. This analysis can be used to discern the etiology of the higher average price of prescriptions in P. S. I.

TABLE 7. --Prescription Distribution for P. S. I. and the Community by Number, Percentage and Cumulative Percentage of Prescriptions by Price Groups

Price	P. S. I.			Community		
	Number	%	Cum. %	Number	%	Cum. %
$.01-$.99	6	0.1	0.1	83	2.4	2.4
1.00-1.99	437	9.8	9.9	383	11.2	13.6
2.00-2.99	1,398	31.2	41.1	920	27.0	40.6
3.00-3.99	821	18.4	59.5	818	23.9	64.5
4.00-4.99	603	13.5	73.0	509	14.9	79.4
5.00-7.49	855	19.1	92.1	533	15.6	95.0
7.50-9.99	270	6.0	98.1	106	3.1	98.1
10.00 +	84	1.9	100.0	65	1.9	100.0

The major difference between the P. S. I. distribution and the community distribution is in the portion of prescriptions priced at under $3.00. The P. S. I. and the community distribution have an approximately equal proportion of prescriptions priced under $3.00. Forty percent (40%) of the prescriptions in each distribution are so priced. However, there are essentially no prescriptions in P. S. I. priced under $1.00

whereas there are 2.5% of the community prescriptions priced under $1.00. This is obviously related to the maintenance of a minimum price for P.S.I. reimbursement.

The minimum which is included in the P.S.I. reimbursement schedule is $1.90, which means that regardless of the cost of the material to the pharmacist P.S.I. reimburses a minimum of $1.90 for each prescription. While 15.5% of all community prescriptions were priced under $2.00 there were only 9.9% so priced in P.S.I. However, 31% of the P.S.I. prescriptions and 27% of the community prescriptions were priced between $2.00 and $3.00. The overall cumulative percentage in the two populations were equal in the under $3.00 class, and the $2.00 to $3.00 class was modal for both populations.

While the total proportion of prescriptions under $3.00 was equal, so again was the total proportion of prescriptions between $3.00 and $10.00. About 58% of all prescriptions in each of the populations was priced within this range. However, 25% of the P.S.I. prescriptions were in the $5.00 to $10.00 class, whereas only 19% of the community prescriptions were in this class. Approximately 2% of the prescriptions were priced at over $10.00 in P.S.I. and the community. The difference in the distribution between $3.00 and $10.00 will be noted later in relation to the shift from non-antibiotic anti-infectives under P.S.I. patterns.

When the two distributions are compared using a chi-square

goodness of fit test, statistically significant differences between them are shown. In looking at the average prices in the two distributions it is seen that the difference between $3.78 and $3.96 is about 5%. When this 5% increase in price is applied to the approximately 800,000 prescriptions that would be dispensed in Windsor under the P.S.I. rate, the additional cost to the community for this factor alone would amount to more than $160,000. This is the cost to the community of creating a monopoly in the drug market.

Since the P.S.I. price schedule is established by a group of the suppliers, the pharmacists, the expansion of P.S.I. to the entire community would, in essence, create a monopoly. A pure monopoly exists when the suppliers of a given product in an area act as one seller in establishing the price at which their product is to be sold. The creation of a sellers' monopoly like this would raise public policy questions. If society were to allow the creation of a monopoly, it would be necessary to maintain some controls over the monopolists' actions. These questions are not very important when P.S.I. has enrolled only a small proportion of the community, but the implications of allowing the sellers to dictate the price of their product would be pertinent in a situation where the majority of the product is supplied under monopolistic conditions.

The monopoly was exerted under P.S.I. and the result was an increase in the price of drugs of approximately 5%. This price increase, together with some shift to more expensive prescriptions and a decrease

in the amount of medication dispensed on each prescription, accounted for 18% of the increase in expenditure of $1,600,000 that would have resulted had the P. S. I. rate been operative on a community-wide basis. This was the increased cost to the community due to the increased price of drugs.

The Dynamics of the Demand for Drugs

There are economic factors that operate to produce some portion of the 82% of increased expenditures that result from increased demand for drugs. These factors are set forth by discussing the economic basis of the portion of changes in demand for drugs that result from changes in the price of drugs facing consumers under drug prepayment. A traditional supply and demand analysis provides the conceptual framework within which to view the dynamics of the changes in demand.

The particular application of supply and demand analysis to be used in this exposition requires the statement of certain assumptions and certain caveats. This analysis will view demand and supply as composite curves representing the aggregate market behavior of the demanders and the suppliers in the whole community. A demand curve generally applies to the demand for a specific standard product. In the analysis of the Windsor situation, however, it is being used to represent a community average prescription and therefore represents a group of prescriptions dispensed rather than a specific type-size prescription. Further, while

a straight line is used to represent the demand of the community, it is clearly understood that the demand is not necessarily a straight line function and might, in fact, be curvilinear.

Given these assumptions Figure 1 is a representation of the population demand curve for drugs in a community without prepayment. The interpretation of this downward sloping curve is that as the price of a quantity of prescriptions decreases, the quantity demanded by the population will increase. While there is no specific evidence to indicate a downward sloping demand curve for drug products there is evidence from other medical care situations indicating that demand for medical care services is somewhat price-elastic, i.e., that the quantity demanded is responsive to price changes. Evidence shown later in the dissertation will indicate that there are financial barriers to the utilization of prescription drugs and that the removal of these barriers through P.S.I. led to an increase in demand. If this is the case it would appear to be a reasonable assumption that the demand for prescription services increases as the price decreases.

However, the pharmacists' supply curve (S_{comm}) in a community without prepayment can be viewed as horizontal (shown in Figure 2). The pharmacists adopt pricing schedules individually or collectively, and within reasonable limits can be expected to supply any number of prescriptions at the average price that evolves from the accepted pricing method. This price is \$3.78 for S_{comm}.

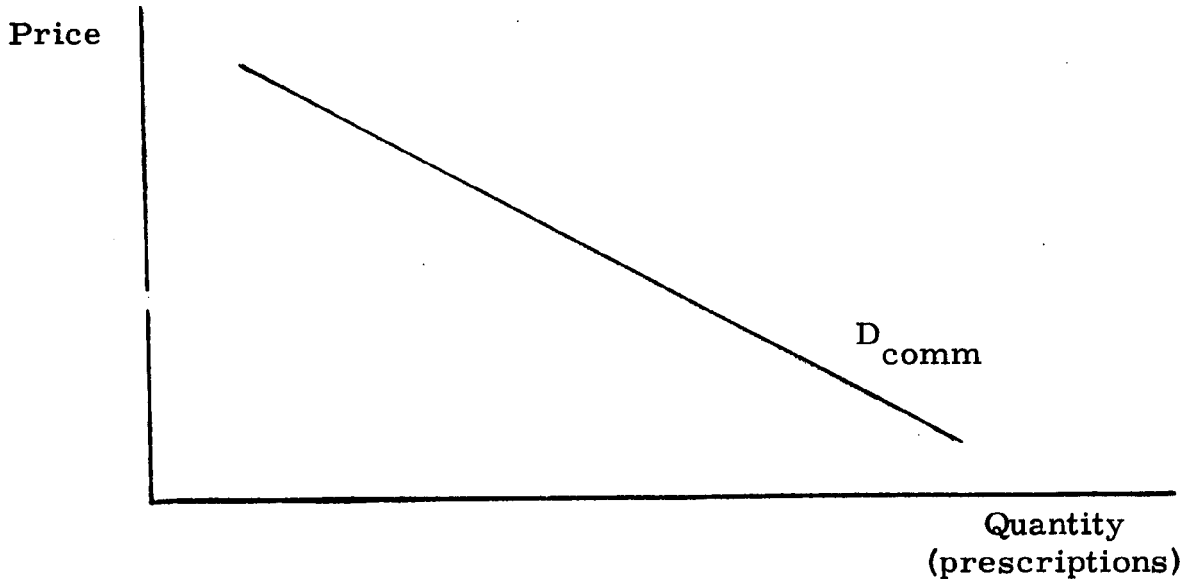


Figure 1

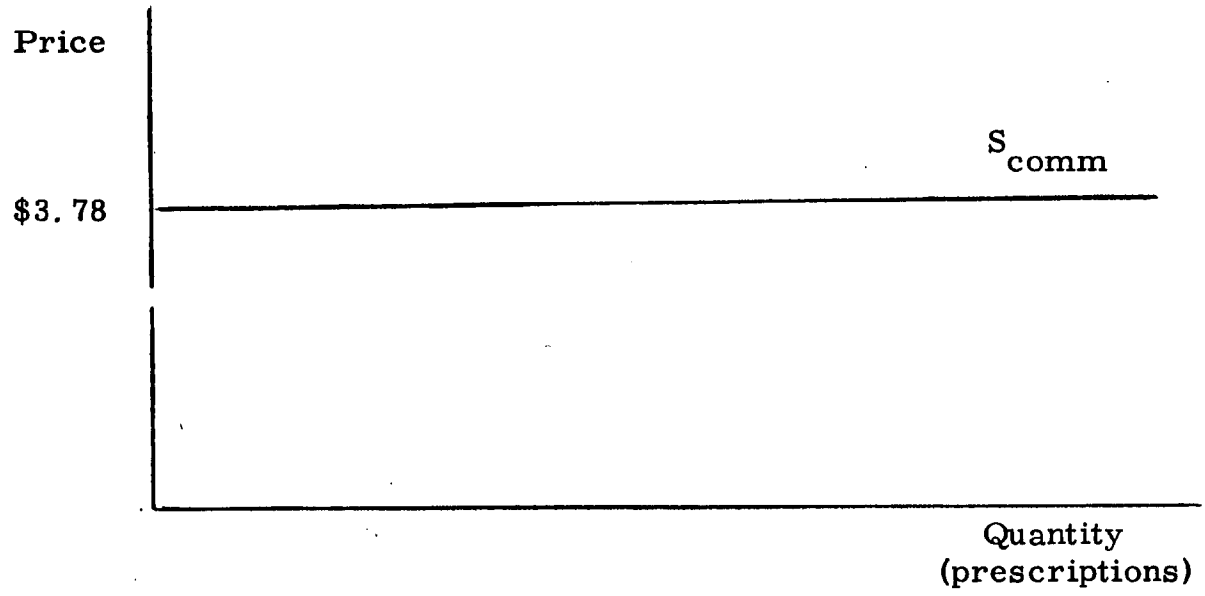


Figure 2

This assumption can be made because few pharmacies operate at their effective capacity in terms of their prescription dispensing. Since a major cost in prescription dispensing relates to the expense of having pharmacists on duty at all times, it follows that for most stores an increase in the number of prescriptions dispensed would result in a decreasing average cost for each prescription dispensed. Therefore, as long as the acceptable price schedule is maintained, most pharmacies in the community and therefore the whole community would be able to produce a much greater volume of prescriptions than they are now producing.

Given this horizontal supply curve it would follow that a community could supply a much greater volume of prescriptions than it is already supplying. It would not be very difficult to increase greatly the supply of prescriptions in an average community the size of Windsor. The basic limitation on this would be the extent of available pharmaceutical manpower. One result of a great increase in the demand for prescriptions would be a substitution of less expensive manpower for the time the pharmacists now spend in non-pharmaceutical services. These non-pharmaceutical services include selling merchandise in other areas of the store, doing such tasks as answering the telephone and making deliveries, and involvement with such things as accounting and advertising. The freeing of pharmacists from this sort of task would greatly increase the pool of available pharmaceutical manpower.

The equilibrium market system in the community during the study year then is shown in Figure 3. The price in the community at the time was $3.78. The quantity of prescriptions dispensed was 427,125. The equilibrium is at the small circle marked E_{comm}.

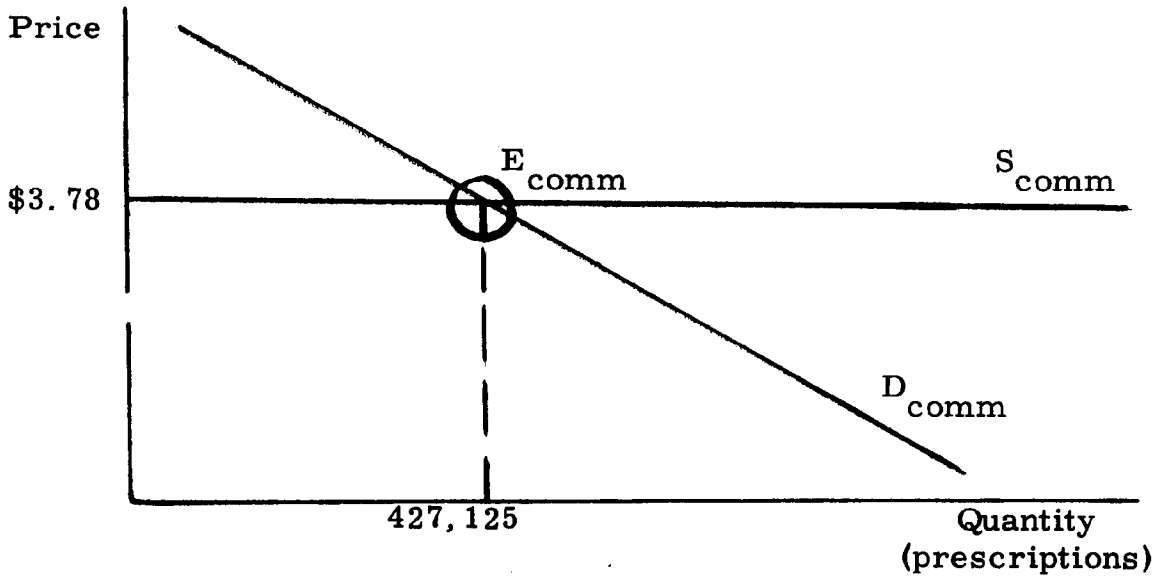


Figure 3

The demand curve under prepayment, however, is considerably different from the demand curve in the out-of-pocket payment system. The only price that concerns the consumer as he takes a prescription to the pharmacy, at least in the short run, is the deductible amount that he must pay out-of-pocket for each prescription. In the case of P.S.I. that amount is $.35. The price the pharmacists are allowed to charge the community or the plan is of indirect interest to the consumer

because they will affect his premiums over time. However, this price will not affect his immediate demand.

The new demand curve ($D_{P.S.I.}$) reflects this view, as the consumer will demand the number of prescriptions determined by the point where the community demand curve crossed the $0.35 price point. He will now demand the same number of prescriptions whatever the pharmacists are allowed to charge P.S.I. The new demand curve merges with the old community demand curve at the $0.35 point and continues to a certain extent downward sloping. This is represented in Figure 4.

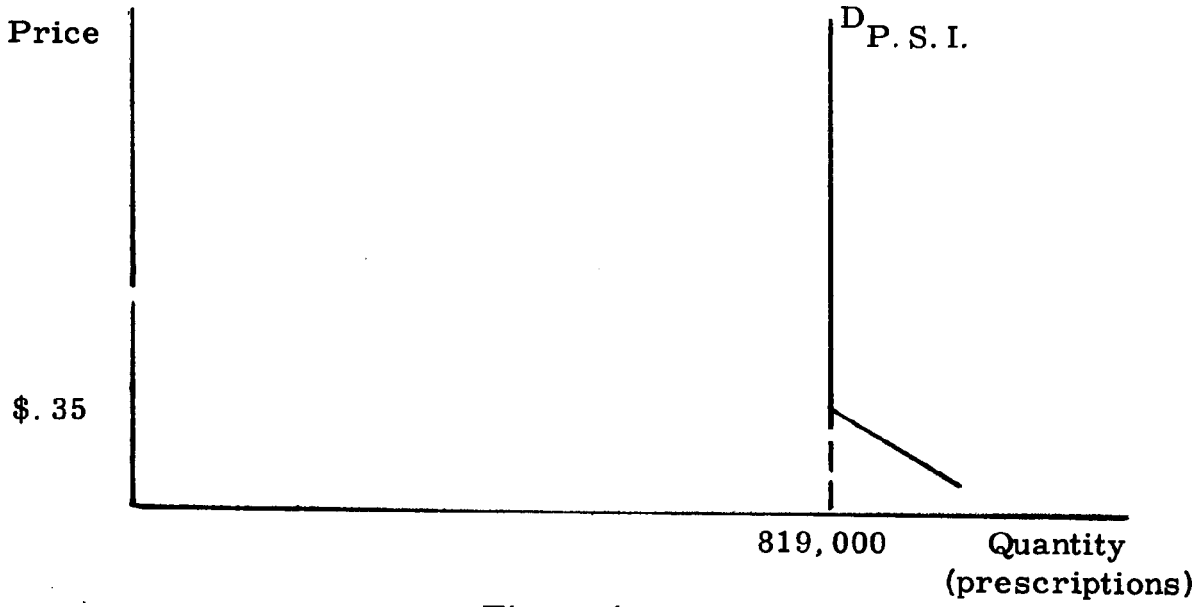


Figure 4

The pharmacists' supply curve under the P.S.I. situation ($S_{P.S.I.}$) is also horizontal as in Figure 2 but the pharmacists are allowed to set a price higher than was previously used in the community.

The mean adjusted price in P. S. I. is $3. 96. Again it must be assumed that the supply curve in the P. S. I. case represents the same mix of goods as in the general community case. This is true only in the very loosest sense because, in fact, it is likely that the prescriptions for which the demand is the most price-elastic are different from the prescriptions with the lowest price-elasticity. This would result actually in a new mix of goods. However, given this assumption, the new supply curve at the mean price of $3. 96 is shown in Figure 5.

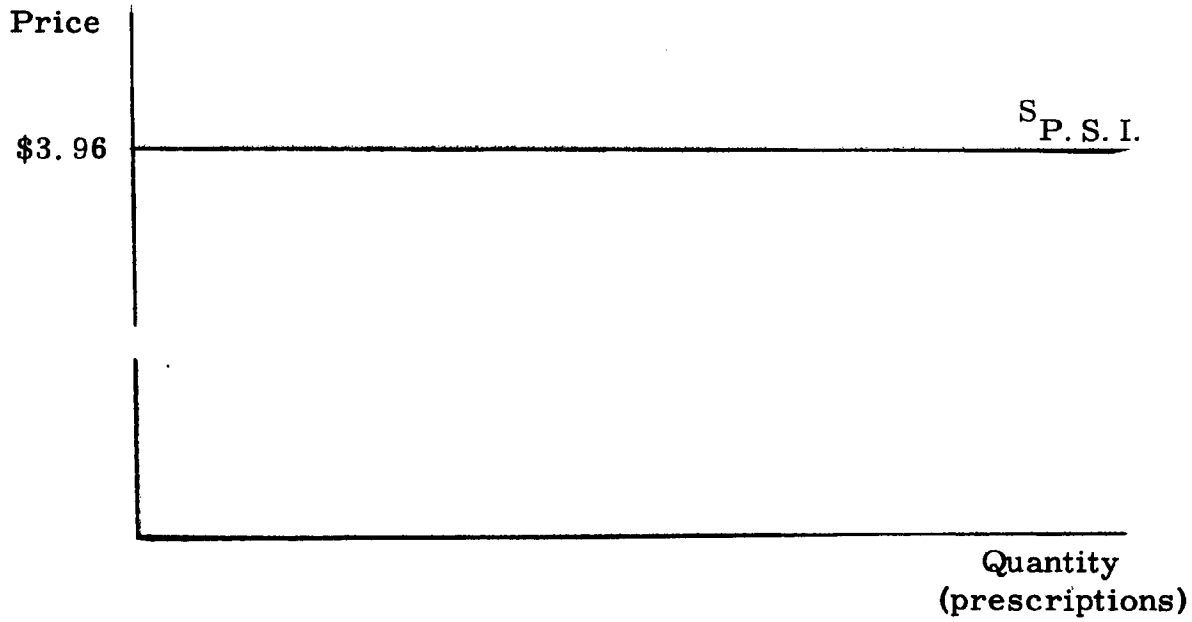


Figure 5

The equilibrium situation in P. S. I., marked $E_{P. S. I.}$, was extended to the total population as shown in Figure 6. Figure 6 shows the equilibrium situation in the community marked E_{comm} (as in Figure 3)

and shows the equilibrium which would result if P. S. I. rates had been extended to the community. It must be noted that the price axis is not drawn to scale.

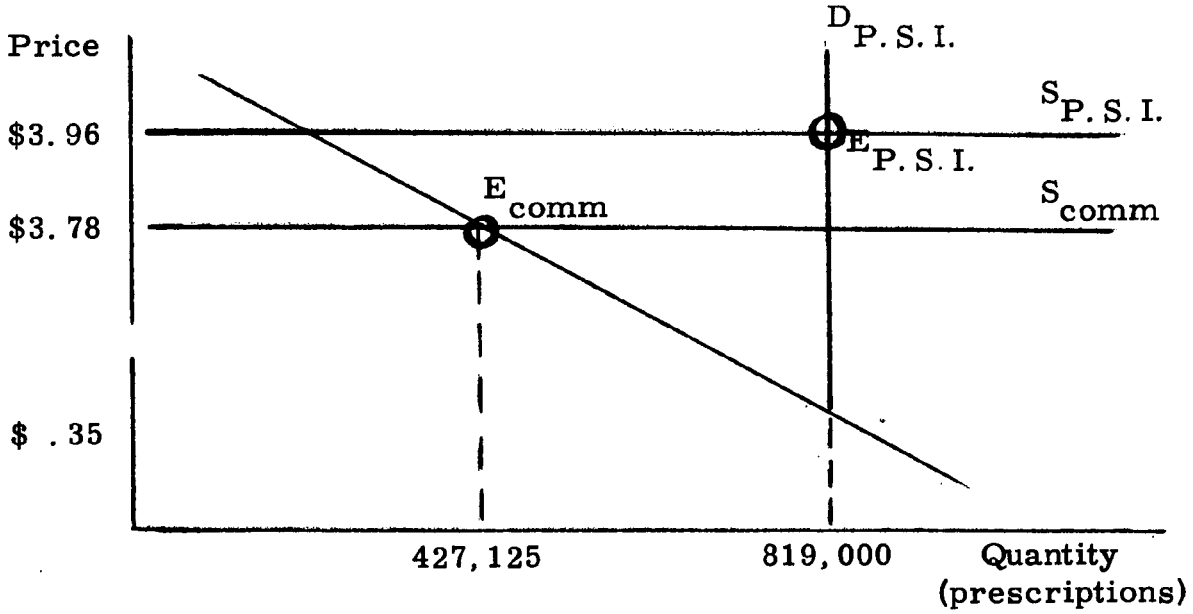


Figure 6

The community demanded 427, 125 prescriptions at an average price of $3. 78 at E_{comm}. At the new equilibrium point, $E_{P. S. I.}$ 819, 000 prescriptions would be demanded and the pharmacist would receive an average price for these prescriptions of $3. 96. However, only $. 35 of this new price would come directly from the consumer.

In summary it can be said that the demand for drugs under drug prepayment does not relate to the price of drugs paid to the supplier but rather to the deductible amount paid out-of-pocket by the consumer.

The amount demanded is shown at the deductible point on the consumer's original demand curve. A new demand curve develops which is essentially vertical, because the price paid to the supplier by the prepayment plan is unrelated to the consumer's demand.

The price-setting behavior of the suppliers under prepayment is free from demand constraints. Suppliers will set the highest price possible because it will be paid by a third person and will therefore not reduce the demand for the product. Since the supplier is willing to supply any amount of product at the price and since demand is not related to the price set by the seller, the price increased under drug prepayment because the supplier maintained control over the pricing mechanism under P. S. I. At the same time the consumer was faced with an apparent reduction in price of drugs, and the quantity of drugs demanded increased in response to the reduction of the financial barrier. This increase in demand is evaluated in functional terms in the remainder of the study.

Summary

This analysis indicates the prices are, in fact, higher under the P. S. I. utilization distribution, affirming hypothesis B-1. Approximately 18% of the $1,600,000 in increased expenditures that would have resulted had P. S. I. rates been community-wide was the result of the 5% increase in price of drugs under P. S. I. and other related price factors. The increase in prices stemmed mainly from the minimum reimbursement price maintained under P. S. I.

Economic factors also operate to produce a portion of the increased demand for drugs that results in 82% of the increased expenditures. The supply and demand analysis pointed out the dynamics through which the prepayment mechanism reduced the price of drugs facing the consumer, removing the financial barriers to drug utilization, resulting in an increase in the demand for drugs.

CHAPTER VI

EVALUATION OF COMMUNITY AND P. S. I. ON FUNCTIONAL CRITERIA: AGE/SEX, MARITAL STATUS AND SIZE OF FAMILY AS UTILIZATION DETERMINANTS

This chapter begins the evaluation of the increase in drug utilization under P. S. I. using functional criteria. The investigation determines if financial factors operate to produce unmet need resulting in income-related rather than need-related utilization in the community. The test of hypothesis B-2-a begins in this chapter. This hypothesis states that financial factors operate in the community payment system to produce unmet need for drugs, indicating that system's relative functional inefficiency.

This phase of the test compares the differential utilization under P. S. I. and in the community by age and sex groups, by marital status groups and by size of family, comparing the differential utilization of those groups which are the most financially vulnerable with those which are least financially vulnerable. If the demographic groups that are the most financially vulnerable show the greatest utilization differential under P. S. I. the above hypothesis can be affirmed.

Age/Sex

Table 8 presents the total number, the total expenditure and the average price of the prescriptions dispensed for each age/sex group of the community sample. Included in this table are 487 prescriptions, 14% of the overall total, whose age and/or sex are not identifiable. These 487 prescriptions have a mean price of $3.78, the same mean price of the remainder of the sample.

TABLE 8. --Number of Prescriptions, Total Expenditure for Prescriptions, and Mean Price of Prescriptions by Age/Sex, Community Sample

Age/Sex Group	Number of Prescriptions	Total Expenditure for Prescriptions	Mean Price of Prescriptions
Male	1,091	$4,123.69	$3.78
0-4	103	336.50	3.24
5-19	142	493.36	3.47
20-44	255	969.60	3.80
45-64	385	1,481.58	3.85
65 +	206	842.65	4.09
Female	1,839	$6,967.63	$3.79
0-4	108	320.49	2.97
5-19	152	525.67	3.46
20-44	696	2,739.78	3.94
45-64	578	2,236.66	3.87
65 +	305	1,145.03	3.75
Not ascertained	487	1,840.18	3.78
Total	3,417	$12,931.50	$3.78

The mean price in the age/sex groups vary from a low of $2.97 for the prescriptions dispensed to females under 5 years old to a high of $4.09 for the prescriptions dispensed to the males over 65 years of age. The mean price for both men and women is about equal. In general, the mean price increases with age, except that there is no significant difference between the 20 to 44 and the 45 to 64 groups. The young people in the sample used less expensive prescriptions than did the old people. This same trend is observed in data from the U.S. National Health Survey where the average cost per acquisition of prescribed medicine was $3.20 for those under 45 years of age but over $4.00 for those over 45.[1]

The percentage distribution of prescriptions by the age/sex characteristics of the people who received them is shown in Table 9. Three and five-tenths percent (3.5%) of the prescriptions in the sample were received by males under 5 years of age, 4.9% by males 5 to 19, 8.7% by males 20 to 44, 13.1% by males 45 through 64 and 7% by males 65 years of age and over, for a total of 37.2% to all men. Three and seven-tenths percent (3.7%) of the prescriptions were received by females under 5 years of age, 5.2% by females 5 through 19, 23.7% by females 20 through 44, 19.8% by females 45 through 64 and 10.4% by

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[1] U.S., Dept. of Health, Education and Welfare, "Current Estimates . . .", op. cit., p. 19.

TABLE 9.--Estimated Percentage Distribution of Prescriptions, Total Number of Prescriptions and Mean Number of Prescriptions Per Person with Standard Error by Age/Sex, Community Sample

Age/Sex Group	% of Prescriptions	Total # of Prescriptions	Standard Error	Mean # of Prescriptions Per Person	Standard Error
Male	37.2	158,890	11,505	1.64	.12
0-4	3.5	14,949	2,067	1.24	.17
5-19	4.9	20,929	3,373	0.76	.12
20-44	8.7	37,160	4,413	1.22	.15
45-64	13.1	55,953	4,994	2.93	.26
65 +	7.0	29,899	3,327	3.83	.43
Female	62.8	268,235	21,517	2.73	.22
0-4	3.7	15,804	2,307	1.40	.20
5-19	5.3	22,210	3,214	0.83	.12
20-44	23.7	101,229	11,319	3.11	.35
45-64	19.8	84,571	7.732	4.47	.41
65 +	10.4	44,421	4,144	5.30	.49
Total	100.0	427,125	36,877	2.19	.19

females 65 years of age and over, for a total of 62.8% to women.[2]

Table 9 shows, further, the estimated number of prescriptions dispensed to each age/sex group in the community during the study year and the standard error of each of these estimates. The age/sex specific utilization rates for the community during the study year, also shown in Table 9, are derived by dividing the estimate of the population in each age/sex group into the related estimate of the number of prescriptions dispensed to that group.

The same method is applied to the estimated expenditures for prescriptions for each age/sex group in the community and these estimates are shown in Table 10, which includes the estimated total expenditure for each age/sex group and the estimated mean total expenditure per person by age and sex. The percentage distribution by age/sex for prescriptions and prescription expenditures are relatively similar. The basic difference is in the very young age/sex groups where the average price of the prescription is considerably less than the overall average price.

The impact of the utilization of drugs by women of childbearing

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[2]The assumption is made that the N.A. portion of the sample has the same age/sex distribution as the remainder. However, since the unidentifiable segment equals only about 10% of the sample and since the mean price of the unknown segment approximates the mean price of the rest of the sample, it appears to be a reasonable approach. The number of prescriptions and the mean price of prescriptions for the N.A. portion are shown for each new variable.

TABLE 10. --Estimated Percentage Distribution of Prescription Expenditures, Total Prescription Expenditures and Mean Expenditures Per Person with Standard Errors by Age/Sex, Community Sample

Age/Sex Group	% of Expenditures	Total Expenditures for Prescriptions	Standard Error	Mean Expenditures for Prescriptions Per Person	Standard Error
Male	37.2	$601,315	$40,958	$6.22	.42
0-4	3.0	48,493	6,665	4.01	.55
5-19	4.4	71,123	12,234	2.64	.44
20-44	8.8	142,247	14,973	4.67	.49
45-64	13.4	216,603	19,373	11.32	1.01
65 +	7.6	122,849	14,833	15.73	1.90
Female	62.8	$1,015,123	$78,884	$10.32	.80
0-4	2.9	46,877	7,999	4.14	.71
5-19	4.7	75,973	12,076	2.82	.45
20-44	24.7	399,260	43,805	12.26	1.35
45-64	20.2	326,520	31,760	17.25	1.68
65 +	10.3	166,493	16,756	19.84	2.00
Total	100.0	$1,616,438	$135,182	$ 8.29	.70

age can be seen in these tables. Women age 20 to 44, who represent only 16.7% of the population, account for almost 25% of all prescriptions expenditures in the community. The women 20 through 64 account for nearly half. The men over 65 used 7% of the total number of prescriptions dispensed in the community. Men and women over 65 account for 17%.

The prescription per person per year rates in the community varied from 0.76 prescriptions per person per year for males 5 through 19 to 5.30 prescriptions per person per year for women over 65 years of age. The men used an average of 1.64 prescriptions per person per year. The women an average of 2.73. The combined mean was 2.19 prescriptions per person per year. The age group using the least number of prescriptions per person per year was the 5 through 19 group.

Women of childbearing age, i.e. 20 through 44, use a much higher rate of prescriptions than did men in the same age group. The men, using only 1.2 prescriptions per person per year, have about the same utilization rate as younger men. The women, using 3.1 prescriptions per person per year, have a utilization rate three times higher than the younger women. The utilization differential between women increases with age, with women 45 through 64 using more prescriptions per person, and women 65 years of age and older using still more. However, neither the women nor the men over 65 use very many more prescriptions per person than do the people of the same sex, age 45 through 64. In each

case the women use more prescriptions than do each corresponding age group of men.

The same type of pattern is discernable for the expenditure rates in Table 10 as for the prescription utilization rates in Table 9. The differences tend to accelerate for the older age groups because the average price of prescriptions increase as the average number of prescriptions per person per year increases. The age group 5 through 19 was the group with the lowest expenditure rate. The very lowest age/sex expenditure rate was that of males 5 through 19, who spent only $2.64 per person per year. The highest age/sex rate was for the women 65 years of age and over, who spent a total of $19.84 per person per year for prescriptions.

The average male expenditure was $6.22. The average for the women was $10.32 per person per year. The overall mean expenditure was $8.28. The women have a higher expenditure than the men in the same age group. The expenditures of women of childbearing age are two to three times as high as the men's. This sex differential is operative through the age 65 and over groups.

The Relationship of Physician and Drug Utilization

Since the demand for prescriptions is dependent on the use of physician services the prescription utilization patterns and the physician utilization patterns can be compared to determine the degree of similarity in these two patterns. These patterns are compared to determine if

differences in drug utilization relate to financial factors in the demographic groups or to differences inherent in the underlying physician utilization pattern. Since age/sex utilization rates for physicians services are fairly readily available for many populations it is also useful to determine if these rates can be used as predictors of age/sex utilization rates for drugs. Physician utilization and drug utilization for the Windsor are compared in Table 11.[3]

Certain caution must be used in making a comparison of drug and physician utilization. First, the physician utilization rates are devised from estimates from Windsor Medical Service. Since only 90% of the population of Windsor is in W. M. S. but 100% of the population were covered by the sampling procedures, there is some possibility of variation resulting from population differences in the two groups. The ratios are therefore derived using rates from different populations and cannot be treated as if they were derived from the same population. They provide only the grossest of comparisons between the classes.

As is shown in Table 11 the distribution of prescriptions and the distribution of physician services are not exactly equal. The young age groups use a higher proportion of physician services and a lower

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[3]The data for this table are estimated from data presented in Bureau of Public Health Economics, Report to the Board of Directors, Windsor Medical Services, The University of Michigan, Ann Arbor, Michigan, 1959. These data are estimates because the age/sex groupings of the two studies are not equivalent. The population figures are from Figure 3, p. 3 and the utilization rates are derived from Figure 13, p. 19.

TABLE 11. --Estimated Percentage Distribution of Prescriptions, Physician Services (W. M. S.), Prescription Per Person Per Year, Physician Service Per Person Per Year Rates and Ratio of Prescriptions Per Physician Service by Age/Sex, Community Sample

Group	% of Prescriptions	% of Physician Services	Prescriptions Per Person Year	Physician Services Per Person	Ratio of Prescriptions Per Physician Service
Male	37.2	39.8	1.64	4.44	.37
0-4	3.5	8.0	1.24	7.54	.16
5-19	4.9	7.6	0.76	3.13	.24
20-64	21.8	20.3	1.88	4.18	.45
65 +	7.0	3.9	3.83	9.24	.41
Female	62.8	61.2	2.73	6.48	.42
0-4	3.7	9.0	1.40	9.05	.15
5-19	5.3	8.4	0.83	3.49	.24
20-64	43.5	36.2	3.61	7.14	.51
65 +	10.4	6.6	5.30	14.16	.37

proportion of prescriptions. For example, whereas the under 4 year old population uses about 3.5% of all prescriptions, it uses about 8.5% of all physician visits. Conversely, as the over 65 group uses 8.9% of all prescriptions they use only about 5% of physician visits.

This pattern would be expected if American data are applicable to Canadian utilization. Data from the U.S. National Health Survey indicate that the proportion of visits to physician for diagnosis and treatment to total visits increases with age of patient.[4] If this is true the younger age groups would be expected to have a lower utilization of prescriptions per physician visit since the visits for preventive services would yield fewer prescriptions per visit than would visits for acute or chronic disease. The ratio for prescriptions for physician service appears to bear out this supposition.

Overall, the men used .37 prescriptions per visit and the women about .42, an approximately equal rate when the potential errors of the estimates are taken into account. The very young used a relatively small number of prescriptions per physician service, about 0.15 for each service. The older population used a greater amount, about 0.45 prescriptions per physician service. Differential utilization by the aged under P.S.I. would therefore result from financial factors rather than factors

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[4] U.S., Dept. Health, Education and Welfare, Volume of Physician Visits, Public Health Service Publication No. 1000, Series 10, No. 18, (Washington: U. S. Government Printing Office, June, 1965), p. 26.

in exposure rates. The aged already use a greater proportion of drug to physician service than do the younger. P. S. I. increments would not be related to greater physician exposure.

Age/Sex Utilization in P. S. I.

Table 12 shows the P. S. I. age/sex summary of the prescription utilization of 1, 504 people who were enrolled in P. S. I. during the study year. A total exposure of 13, 138 months of service, or the equivalent of 1, 095 person years of experience is reported. The mean number of person-months of service per person during this year is 8. 7. Fifty-five percent (55%) of all the members were enrolled for a full twelve months and the other 45% for a varying number of months less than twelve. A total of 4, 442 prescriptions were dispensed at a total allowed charge of $18, 041. 88.[5]

Since people were covered by P. S. I. for time periods in the study year that varied from one to twelve months all utilization rates were calculated on a person-year basis by multiplying the total number of prescriptions or the total expenditures by twelve and dividing by the total months of service for the appropriate age/sex group and for the total population. One thousand ninety-five (1, 095) person-years of service are represented, since the 1, 504 people enrolled were enrolled for

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[5]Allowed charge in P. S. I. is the equivalent of expenditures in the community. The member pays $. 35 of this charge and P. S. I. reimburses the member pharmacy the remainder, less a 10% overhead charge.

TABLE 12. --The Number of Prescriptions, Expenditure for Prescriptions, Total Months of Coverage, Mean Number of Prescriptions, Mean Expenditure Per Person Per Year and Mean Price Per Prescription by Age/Sex, P. S. I.

Age/Sex Group	Number of Prescriptions	Expenditure for Prescriptions	Total Months	Prescriptions Per Person Year	Expenditure Per Person Year	Price Per Prescription
Male	1,664	$6,659.08	6,518	3.06	$12.26	$4.00
0-4	176	546.55	637	3.32	10.30	3.11
5-19	194	679.53	2,000	1.16	4.09	3.50
20-44	398	1,631.30	2,275	2.10	8.60	4.10
45-64	751	3,286.65	1,366	6.60	28.87	4.38
65 +	145	515.05	240	7.25	25.75	3.55
Female	2,808	$11,382.80	6,620	5.09	$20.63	$4.05
0-4	137	444.60	540	3.04	9.88	3.25
5-19	210	747.10	1,704	1.48	5.26	3.56
20-44	1,095	4,730.95	2,745	4.79	20.68	4.32
45-64	1,196	4,820.50	1,407	10.20	41.11	4.03
65 +	170	639.65	224	9.11	34.27	3.76
Total	4,472	$18,041.88	13,138	4.08	$16.48	$4.03

13,138 months of 13,138/12 years.

The age/sex distribution of the P. S. I. prescription population is very similar to the one discussed for the community, with 37.1% of the prescriptions dispensed for men and 62.9% of the prescriptions dispensed for women. As was true in the community, the women 20 through 64 used about 50% of all services and expenditures. The basic difference between the prescription distribution in the community sample and the P. S. I. sample is that the P. S. I. distribution has a relatively larger proportion of prescriptions in the age group 45 through 64 and a relatively smaller proportion of prescriptions in the age group 65 and over. These differences are functions of both the differential population distribution and the differential utilization rates.

The average price per prescription by age/sex group for the P. S. I. population is also shown in Table 12. The mean price of prescription increased with age as in the community. However, the 65 and over age group does not have the same relationship to the P. S. I. population that it has to the community either for utilization rates or for mean price prescriptions. The over 65 age group uses a smaller number of prescriptions and has a smaller expenditure than does the 45 to 64 group in P. S. I., but this is not the pattern in the community sample.

This relationship is expected in comparing over 65 populations that are enrolled in prepayment plans with over 65 populations that are in general community populations. In the P. S. I. population, as in any

other prepaid populations, the people over 65 are generally enrolled through employment groups. A large proportion may still work and the over 65 groups would therefore include a large proportion between 65 and 69. The over 65 population under prepayment would be healthier than the over 65 population in the community. In P. S. I., 66. 7% of the over 65 population are between the ages of 65 and 69 whereas in the general community population only 40. 4% of the over 65 population are between 65 and 69.[6] Since this is the case and since there are data reporting trends of higher utilization among older portions of the population over 65,[7] it might be expected that a younger and healthier 65 and over population under prepayment would use less prescriptions than a relatively older and less active group in the community.

Mean utilization for men in the P. S. I. population is 3. 06 prescriptions per person per year and for women 5. 09 prescriptions per person per year. The overall utilization rate is 4. 08 prescriptions per person per year. Age/sex utilization rates vary from a low of 1. 16 per person per year for the males 5 through 19 to a high of 10. 20 prescriptions for women age 45 through 64. The total expenditure estimates vary in the same way. A low of $4. 09 per person per year is spent by males 5 through 19 and a high of $41. 11 is spent by women 45 through 64. The average expenditure per person per year for men is $12. 26 and for

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[6] Dominion Bureau of Statistics, op. cit., p. 4.

[7] Greenlick and Darsky, op. cit., p. 152

women $26.63. The overall mean is $16.48.

Comparison of Age/Sex Utilization Rates in Community and P. S. I.

Table 13 compares the mean prescription per person per year and expenditure per person per year rate in P. S. I. to the estimates of these rates in the community. In each age/sex group the utilization rate is significantly higher in P. S. I. than in the community. In no case did the P. S. I. rate fall within the 95% confidence interval of the analagous community estimate. However, in certain age groups, namely 0 through 4 and the 45 through 64, the differences are much greater than the overall differences between P. S. I. and the community. The extent that the P. S. I. rates are greater than the community rates varied from the male 5 through 19 age/sex group where the P. S. I. prescription per person per year rate is only 53% higher than the same community rate to the male 0 through 4 age group where the rate is 168% higher in P. S. I. than in the community. The expenditure rates followed the same pattern.

One way that the financial barrier could operate in the community is by preventing already high drug utilizers from utilizing even more drugs. In order to investigate the relationship between utilization in the community and the rate of increase a null hypothesis was tested stating that the age/sex groups with the highest expenditures in the community would be the ones with the greatest increase in P. S. I. This relationship is not observed. The rank order correlation comparing rank of

TABLE 13. --Mean Total Prescription Per Person Year and Expenditures Per Person Year Rates, P. S. I. and Community Sample and Percent P. S. I. Rate Greater than Analogous Community Rate by Age/Sex

Age/Sex Group	Prescription Per Person Year			Expenditures Per Person Year		
	P. S. I.	Community	% P. S. I. Greater	P. S. I.	Community	% P. S. I. Greater
Male	3.06	1.64	...	$12.26	$6.22	...
0-4	3.32	1.24	168	10.30	4.01	157
5-19	1.16	0.76	53	4.09	2.64	55
20-44	2.10	1.22	72	8.60	4.67	84
45-64	6.60	2.93	125	28.87	11.32	155
65 +	7.25	3.83	89	25.75	15.73	63
Female	5.09	2.73	...	$20.63	$10.32	...
0-4	3.04	1.40	118	9.88	4.14	139
5-19	1.48	0.83	78	5.26	2.82	87
20-44	4.79	3.11	54	20.68	12.26	69
45-64	10.20	4.47	128	41.11	17.25	138
65 +	9.11	5.30	72	34.27	19.84	73
Total	4.08	2.19	...	$16.48	$ 8.28	...

expenditures in the community and rank of the percentage increase under P. S. I. approaches 0. There appears to be no relationship between these two factors.

It is therefore necessary to seek elsewhere for the explanation of the varying increments by age/sex groups in the P. S. I. population. The factors that generally tend to increase utilization can be classified into patient factors, physician factors and pharmacist factors. First, prescription prepayment could cause members to seek physician care more frequently or to comply more frequently with physician recommendation by filling prescriptions that had been written.

Second, the utilization could be increased because the physicians write more prescriptions, either prescribing more drugs or a smaller amount of drugs on each prescription. Third, there could be pharmacist factors such as a differential fee schedule or the 34-day limit on medication that would cause increases in utilization.

Given this multiplicity of factors it must be said that the use of age and sex alone does not provide a great deal of explanatory power in examining the increased utilization under P. S. I. It would appear that age and sex must be used in relation to the other demographic factors such as size of family and marital status in order to provide any insight into the differential determinants of utilization under P. S. I. Since no distinct and specific patterns emerge from the analysis of the impact of age and sex on utilization these factors will be taken into consideration in the

discussion of marital status, family size and the delay in the dispensing of prescriptions.

Marital Status

An analysis of the relationship between marital status and prescription utilization in the community and under P. S. I. allows an opportunity to investigate the functional efficiency of the prepayment mechanism. If the financial barrier were acting to produce unmet need in the community the marital status groups that were the most financially vulnerable would be expected to show the greatest differential utilization under P. S. I. In this case the widowed group would be expected to have the highest differential utilization increase under P. S. I. and the single people over 15 to have the smallest increase.

Table 14 presents the mean prescription per person per year and expenditure per person per year rates by marital status under P. S. I. and the community. These rates are presented for the married population, the single age 0 to 14 (the dependent children), single age 15 and over and the widowed.

Under both of the payment mechanisms, the single 0 to 14 have the lowest utilization rate and the widowed have the highest. The range in prescription utilization is from 0. 95 prescriptions per person year for the people single 0 to 14 in the community to 12. 36 per person per year for the widowed group in P. S. I. These gross differences, of

TABLE 14. --Mean Total Prescription Per Person Per Year and Expenditure Per Person Per Year Rates, P. S. I. and Community Sample and Percent P. S. I. Rate Greater than Analogous Community Rate by Marital Status

Marital Status	Prescription Per Person Year			Expenditure Per Person Year		
	P. S. I.	Community	% P. S. I. Greater	P. S. I.	Community	% P. S. I. Greater
Married	5.56	2.99	86	$23.31	$11.62	101
Single 0-14	1.96	0.95	106	6.38	3.08	107
Single 15 +	2.49	1.81	38	10.08	7.08	42
Widowed	12.36	3.93	215	50.33	14.72	242

course, are age related, since the widowed population is much older than the children.

However, Table 14 also shows the percentage by which the P. S. I. rate exceeds the community rate for each marital status group. Age differences should be controlled in this comparison because it is assumed that the age distribution for each of the marital status populations is the same in the community and P. S. I. The population that was single, 15 years and older, have the very smallest increment under P. S. I., 38% for prescriptions and 42% for expenditures. The increment for the married was 86% for prescriptions and 101% for expenditures, for single 0 to 14, 106% for prescriptions and 107% for expenditures, and finally the widowed group had the greatest differential in utilization, 215% for prescriptions and 242% for expenditures.

The pattern is exactly as would be expected were the prepayment mechanism the most functionally efficient. If the financial barrier was creating unmet need in the community it is reasonable to posit that the widowed would have the most difficulty paying drug expenses and would therefore have the greatest unmet need when the payments for prescriptions were out-of-pocket. The single adults would be expected to have the least problem paying for drugs in an out-of-pocket system and consequently would have the least unmet need.

When the financial barrier was removed these groups responded as would be expected. It appears that financial factors do interfere

with the utilization for drugs in the community indicating some dysfunctional aspects of the out-of-pocket payment mechanism.

Size of Family[8]

Size of family is another variable that offers much for the evaluation of the functional efficiency of P. S. I. In order to evaluate the drug utilization in the community and under P. S. I., comparisons with the medical care utilization for other services and the per capita income by family size in the Windsor community will be included. If financial factors do not interfere with utilization of prescription drugs, then utilization of drugs in the community should be closely related to the utilization of physician services. If, on the other hand, financial barriers do interfere, utilization would be expected to relate rather to per capita income. The utilization under P. S. I. should reverse the pattern and should allow drug utilization to relate more closely to other medical care utilization.

Table 15 shows the prescription utilization rates per family by size of family. It also shows the percent that the P. S. I. rates exceed the community rates for each family size. The prescriptions dispensed

[8]The prescription per family data for this section were derived using slightly different definitions of family size. The size of family measure related to prescriptions dispensed under P. S. I. was generally the size of the subscriber unit. This measure might or might not be identical with the size of family measure in the community which was based on census size of household data. Since these two types of measures of family size are not necessarily identical these data must be viewed in comparative rather than absolute terms.

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TABLE 15.--Mean Total Prescription Per Family Per Year and Expenditures Per Family Per Year Rates, P. S. I. and Community Sample and Percent P. S. I. Rate Greater than Analogous Community Rate by Family Size

Size of Family	Prescription Per Family Per Year			Expenditure Per Family Per Year		
	P. S. I.	Community	% P. S. I. Greater	P. S. I.	Community	% P. S. I. Greater
1	4.60	11.95	-62	$17.82	$45.49	-61
2-3	14.61	7.76	88	59.78	29..69	101
4-5	12.33	7.03	75	50.78	26.59	91
6-9	17.17	7.31	135	63.65	27.66	130
10 +	17.00	6.95	145	75.65	26.29	188
Total	11.74	7.94	...	$47.35	$30.03	...

per family and expenditure per family estimates do not vary with family size in the community. As the size of family increases, the prescription rate per person decreases rapidly. Under P. S. I. the number of prescriptions and the expenditure per prescriptions per family increases as the family size increases.

In relating this data to estimates of physician utilization by family size and median income by family size it would appear that the people in large families exhibit a great deal of unmet need in the community. Table 16 shows the mean number of physician services per family in W. M. S. and the median income per family by family size. Unfortunately, the median income estimates are United States data since data are not available from the Canadian census. It can be seen that the utilization of physician services increases as the number of people in the family increases when physician services are completely prepaid. However, the median income per family does not increase greatly as the famkly size increases.

It would, therefore, appear that the prescription utilization in the community is more closely related to the family income than to need, whereas the P. S. I. situation would appear to be one where utilization is more clearly determined by need than by income.

However, the data on Table 15 also show one deviant case in this analysis. The families of only one person had a higher utilization rate per family in the community than in P. S. I., a pattern different than for

all other demographic classes. Further, the community utilization rate for family size one is higher than the rate per family of any other size family. However, the family size one in P. S. I. is considerably different than this size family in the community. For one thing, widows are twice as prevalent in the community as in P. S. I., with 5% of the community population widowed but only 2. 3% in P. S. I.

TABLE 16. --Mean Number of Physician Services Per Family[a] (W. M. S.) and Median Income Per Family[b] (U. S.) by Size of Family

Number in Family	Physician Services Per Family	Median Income Per Family
1	6. 4	...
2	15. 1	$5, 108
3	15. 5	6, 771
4	20. 2	7, 488
5	22. 8	7, 430
6	31. 7	7, 305
7 or more	...[c]	6, 490
All families	15. 7	$7, 289

[a]Bureau of Public Health Economics, op. cit., Figure 14, p. 21. Services per participant month were multiplied by 12 and by the number of people in the family (2. 9 per family for all families).

[b]U. S., Dept. of Commerce, Bureau of Census, "Consumer Income--Income in 1964 of Families and Persons in U. S., " Current Population Reports, Series P-60, No. 47 (September 24, 1965), Table No. 4, p. 25.

[c]Data not available for families of 7 and more because the average size of these families was unavailable.

Further, there are many young single employees in P. S. I. because of the enrollment technique which takes in whole occupational groups. Seventy-two percent (72%) of people in family size one in P. S. I. are under 45 years of age and only 28% are over 45. It can be asserted that the family size one in the community are an older population than this. The single group are 80% of the P. S. I. subscriber units size one whereas the widowed are only 11%. Married subscribers account for 9%. Further, since only 140 of the members of P. S. I. were in this group it does not represent a major proportion of the population.

Summary

Age and sex did not prove to be very powerful factors in the analysis of the community payment system and P. S. I. on function criteria. The variation by age and sex appeared rather mixed between P. S. I. and the community and it is concluded that age acts in combination with other factors. The impact of age, particularly for people over 65, can be seen in combination with other factors and was discussed with regard to marital status. It will be further analyzed in combination with delay, physician insurance status and physician utilization.

However, marital status and size of family did appear to be important variables in the analysis of the two prescription payment mechanisms on functional criteria. In analyzing the differential use between the community and P. S. I. on both of these variables, evidence affirming hypothesis B-2-a appeared. The groups that would appear to be the most

financially disadvantaged did have the greatest increase in utilization under P. S. I. The single over 15 group which would be expected to have the least financial problems of the marital status groups had a very small differential in utilization under P. S. I. However, the widowed group which would be financially disadvantaged had the greatest differential in utilization under P. S. I. It appeared, therefore, that at least the economic barrier to drug utilization did create unmet need in the community.

The evidence of relating to utilization by size of family appeared even stronger. The drug utilization in the community did not increase generally as the family size increased, in spite of the fact that physician utilization per family did increase as size of family increased. Since evidence from United States data indicates that median family income does not increase with size of family, it appears that drug utilization is more closely related to family income in the community than to physician utilization. On the other hand, the drug utilization under P. S. I. did increase as family size increased and therefore appeared to be more related to need. It appeared, therefore, that the analysis by size of family indicated major dysfunctional elements of the out-of-pocket mechanism.

CHAPTER VII

EVALUATION OF COMMUNITY AND P. S. I. ON FUNCTIONAL CRITERIA: DELAY IN FILLING PRESCRIPTIONS AND PRESCRIPTION UTILIZATION BY PHYSICIAN INSURANCE STATUS AND PHYSICIAN UTILIZATION IN COMMUNITY

This phase of the analysis continues the test of Hypothesis B-2-a: that financial factors operate in the community payment system to produce unmet need for drugs, indicating that system's relative functional inefficiency. The data under consideration in this chapter relate (1) to delay in filling prescriptions, (2) to prescription utilization by physician insurance status and (3) to prescription utilization by physician utilization in the community sample.

These data, which are available only for the community sample, offer the possibility of evaluating aspects of the out-of-pocket payment mechanism on functional criteria. The first part of the analysis ascertains the proportion of prescriptions dispensed in the community that is delayed in filling and if this delay is related to the price of the prescriptions. If a great deal of delay exists, further evidence is provided of the

functional inefficiency of the community payment system, validating the above hypothesis.

Since prescription utilization is so closely related to the utilization of physicians' service, evaluation of the relationship between physician utilization in the community and prescription utilization can help specify the dynamics of prescription utilization and provide additional data regarding the relationship between the patient's financial condition and his utilization of prescription drugs.

Delay in Filling Prescriptions

In order to analyze delay in filling the prescriptions that were eventually dispensed in the community, the date the prescription was written by the physician and the date the prescription was dispensed by the pharmacy were compared. The prescriptions were distributed by the difference between these two dates as shown on Table 17. The number of prescriptions, the mean price of prescriptions and the percent of prescriptions priced at $5.00 and over are shown for the following classes: those dispensed the same day as written, one day after written, two to seven days after written, eight to thirty days after written and more than thirty days after written.

This classification was chosen partially as a result of combining the data into categories containing meaningful numbers of prescriptions and also because these categories seemed to have inherent meaning. If

TABLE 17.--Number of Prescriptions, Mean Price of Prescriptions and Percent of Prescriptions Priced at $5.00 or More by Elapsed Time from Date Prescription Dispensed to Date Prescription Written for Community Sample (New Prescriptions Only)

Prescriptions Dispensed	Number of Prescriptions	Mean Price of Prescriptions	% of Prescriptions $5.00 or More
Same day as written	2,128	$3.67	19.0
One day after written	223	3.74	19.7
2-7 days after written	176	4.21	20.5
8-30 days after written	97	4.21	33.0
More than 30 days	38	3.72	26.3
One or both dates missing	288	3.85	22.6
Total	2,950	$3.74	20.1

a prescription is dispensed the same day as written or the day after there would appear to be no delay in dispensing. A delay of up to a week could be called moderate delay. The remainder was distributed into more or less than a month's delay.

The $5.00 price break was selected because it was felt that a prescription priced at $5.00 or more would appear to the great majority of people as being a rather expensive prescription. Since this was a rather arbitrary choice, the mean price of prescriptions in each class was also calculated.

There appears to be very little delay in the receipt of prescriptions that are eventually dispensed. In fact, as shown on Table 17, 88.3% of all prescriptions were dispensed either the same day the physician wrote them or one day after, and only 11.7% of all prescriptions were dispensed after the second day. There appears to be a remarkable lack of delay in the dispensing of those prescriptions that were eventually dispensed.

There does appear to be a slight relationship between price and delay. Whereas only 19% of the prescriptions that were filled the same day as written or one day after cost $5.00 or more, 25% of the prescriptions that were filled sometime later cost over $5.00. Further, the mean price of prescriptions seems to increase as the delay increases. That group of prescriptions dispensed between eight and thirty days after they were written, a period of one week to one month, had an

average price of $4.21 and one-third of the prescriptions in this class were priced at $5.00 and more.

Even though there was very little delay in the dispensing of prescriptions the prescriptions that were delayed two days or longer were further analyzed in an attempt to find out the characteristics of the people who delayed in having their prescriptions dispensed. Table 18 shows the percentage distribution of delayed prescriptions on the basis of age and marital status. The percentage distribution of delayed prescriptions by family size was almost identical to the overall distribution of prescriptions on family size so this was not included in the table.

Age does appear to be a factor in the delay for those few prescriptions that were delayed. There was a much lower proportion than was expected in the delayed category for the ages 0 to 4 and 5 to 19. Apparently when the prescriptions are written for children they are filled as soon as possible. On the other hand, however, there was a statistically significant difference in the proportion of over-65 people in the delayed and non-delayed categories. Whereas there was only 16% of over-65 prescriptions in the non-delayed category, there were 20.8% in the delayed. The population over 65,who would be the most financially vulnerable group,did delay longer in having their prescriptions filled.

In comparing the delayed and non-delayed distribution by marital status the impact of the children can again be seen. The single 0 to 14 who are the dependent children, had a smaller proportion of the delay

than might be expected. The married population had a somewhat greater proportion. Apparently there is some willingness to delay filling the prescriptions of the parents but very little willingness to delay on the prescriptions for the children. The widowed and the single adult proportion does not vary significantly in the delayed and the non-delayed distribution.

TABLE 18. Percentage Distribution of Prescriptions Dispensed the Same Day as Written or the Next Day and Thos e Prescriptions Delayed Two Days or Longer by Age and Marital Status

	% of Non-Delayed Prescriptions	% of Delayed Prescriptions
Age		
0-4	8.1	2.6
5-19	10.6	7.2
20-44	31.9	35.4
45-64	32.6	34.0
65 +	16.8	20.8
Total	100.0	100.0
Marital Status		
Married	63.6	70.7
Single (0-14)	15.8	7.6
Single (15+)	11.8	13.1
Widowed	8.8	8.6
Total	100.0	100.0

However, factors other than the financial barrier can delay the dispensing of drugs and therefore the financial factor cannot be considered very important when such a small amount of delay is found. A physician may give the patient a sample of drugs instead of a prescription, with instructions to fill the prescription if no adverse effects result from the drug. The physician could also give the patient serial prescriptions, one written for medication to be taken for two or three days and the second for medication to be taken after the first one is completed.

There are potential drugstore-related factors that could also delay the dispensing of prescriptions. The pharmacy, for example, might be out of the medication and the patient might be willing to wait to have it dispensed. Certain prescriptions might take a longer time to prepare and this could cause a certain amount of delay. This could certainly be consistent with the higher price of delayed prescriptions because the more complicated prescriptions and those that take longer to prepare would be the ones that are higher priced.

A further factor in the delay of prescriptions could involve the self-limiting nature of many kinds of acute illnesses. In acute illnesses it is possible that if the prescriptions was not filled within a day or two of being written, the need for it might disappear. The delay factor might, therefore, be more important for persistent but troublesome chronic illnesses. There was some evidence of this in the evaluation of the

delay by therapeutic class of drugs. In analyzing the delay by therapeutic class it was found that the antibiotics, the analgesics and the cough preparations were the ones with the smallest proportion of delay in relation to their total proportion in the prescription distribution. On the other hand, the ones with the greatest proportion of delay were the cardiovascular products and the hormones. The overall differences were quite small, however.

There seems to be a slight relationship between delayed prescriptions and the financial barriers of utilization. There is a slightly higher proportion of more expensive prescriptions in those that are delayed and there is a significantly higher amount of delay for the over 65 population. The analysis of delay, however, does not produce significant evidence of functional inefficiencies of the out-of-pocket system.

In conclusion it can be said that there are many factors that could delay prescriptions being dispensed, only some of which are evidence of a dysfunctional element in the system. Nearly 90% of all new prescriptions that were eventually dispensed were dispensed on the same day as written or the following day. Very little evidence is presented to support the hypothesis that economic factors in the out-of-pocket system delay the delivery of drugs to people in the community.

Prescription Utilization by Physician Insurance Status

The analysis of prescription utilization by physician insurance status seeks to determine if financial factors operating in the use of

physicians' services and in physician insurance further affect the utilization of prescription drugs. The distribution of population,[1] the estimates of the number of prescriptions and prescription expenditures, and the prescription utilization and expenditures rates by insurance status are shown for the community in Table 19. Seventy-seven percent (77%) of the prescriptions of the community were dispensed to the 90% of the population who were W. M. S. members and 23% were dispensed to the remainder of the population, including 2. 5% to indigent and Department of Veteran Affairs recipients.[2] Over 56% of the prescriptions were dispensed to regular group enrollees, 17% to pay-direct enrollees who had converted from group membership, and 6% to non-group enrollees of W. M. S., those who had been individually enrolled. The other category includes all the people in the community who were not W. M. S. members.

There is little difference in the utilization rates of W. M. S. group,

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[1]Since W. M. S. membership figures are not tabulated on the basis of the metropolitan area it is necessary to estimate the percent of the metropolitan area enrolled in W. M. S. The assumption for this section is that 90% of the population of the metropolitan area are W. M. S. members. The distribution of members within the 90% is from: Windsor Medical Services, Inc., op. cit., p. 2.

[2]Twelve percent (12%) of the prescriptions in the sample were dispensed to people whose insurance status could not be identified, 71% to people who were identified as W. M. S. members and 17% to people who were definitely not W. M. S. members. It was decided to allocate half of the 12% Not Ascertained's to W. M. S. and half to the non-W. M. S. group.

TABLE 19. --Percentage Distribution of Population, Prescriptions, and Prescription Expenditures, Mean Number of Prescriptions and Mean Prescription Expenditures Per Person Per Year and Mean Price of Prescription by Physician Insurance Status in Community

Physician Insurance Status	% of Population	% of Prescriptions	% of Expenditures	Prescriptions Per Person Per Year	Expenditures Per Person Per Year	Mean Price Per Prescription
W. M. S. (Group)	67.7	56.1	57.4	1.82	$7.03	$3.87
W. M. S. (P.-D.)	16.5	14.9	14.7	1.98	7.40	3.73
W. M. S. (N.-G.)	5.8	5.9	5.6	2.21	7.93	3.64
Other	10.0	23.1	22.3	5.06	18.49	3.65
Total	100.0	100.0	100.0	2.19	$8.29	$3.78

pay-direct and non-group members. The range is from 1.82 prescriptions per person per year for the group members to 2.21 prescriptions per person per year for the non-group members. Even this slight difference is age-related, as only 11.3% of the prescriptions to group members were for people 65 and over, whereas almost 40% of the few prescriptions to non-group people were for people 65 and over.

However, there is a major difference between the 1.87 prescriptions dispensed per person per year for the total W. M S. population and the 5.06 prescriptions per person per year used by the non-W. M. S. population. This utilization rate resulted in an expenditure of $7.16 per person per year for W. M. S. members and $18.49 per year for the remainder of the population.

A proportion of this increment is explained by the difference in the proportion over 65 years of age in each group. It is estimated that 6% of the W. M S. population is 65 years or older.[3] There are an estimated 16,185 people in the metropolitan area 65 years of age and older.[4] Six percent (6%) of the 175,000 estimated W. M. S. population is 10,530 people. This means that 5,655 of the 19,500 non-W. M. S. population, or 29%, are 65 years of age and older.

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[3] Five percent (5%) of the W. M. S. population was 65 + in 1959 whereas 7% of the metropolitan area was 65 +. However, 8.3% of the population was 65 + in 1962. Therefore, it is reasonable to expect an increase to 6% in the W. M. S. population. See Bureau of Public Health Economics, op. cit., p. 3.

[4] See Table 3.

Given this difference in population some difference in the prescription utilization rate is expected. If the age distributions of the two populations are standardized and the mean under-65 and over-65 age specific utilization rates are applied, the W. M S. population would use 2.13 prescriptions per year and the other population 2.73. This means that on the basis of the differential age structure alone, 0.60 of a prescription per person per year difference would be expected. However, this only explains 20% of the differential utilization rate between the two groups.

The other 80% of the difference must, therefore, be explained on the basis of factors other than age alone. The factors that account for the difference are inherent in the non-W. M. S. population. A significant proportion of this population are the recipients of public assistance. The remainder of the population is made up of other diverse population groups. The difference in drug utilization between the W M. S. population and the non-W. M. S. populations points out the dangers inherent in interpreting prescription utilization data from population groups in a single prepayment plan or those involved in a welfare medical care system. It is obvious that many factors can influence the drug utilization of this type of group and the generalizability of data from single groups is therefore limited.

Prescription Utilization by Physician Utilization

This section further explores the relationship between physician

utilization and drug utilization. The analysis measures prescription utilization by physician utilization and investigates the dynamics of the drug utilization system by analyzing this relationship.

Table 20 shows the distribution of population,[5] prescriptions,[6] and prescription expenditures and the prescription utilization and expenditure rates for the community by physician utilization. Because these estimates of physician utilization were gathered from the W. M. S. records for some people and from a telephone interview survey from others the estimates of the two groups had great differences in reliability and validity. The physician utilization classes were, therefore, arbitrarily kept quite broad. The classes used were 0 services, 1 through 5, 6 through 25 and 25 plus services for the study year.

It is noted in Table 20 that nearly 5% of the prescriptions dispensed in the community were dispensed to people who had no physician

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[5]This estimate is calculated from a special tabulation of the 1960 sample of utilization of W. M. S. members made by B. J. Darsky of the Department of Medical Care Organization, University of Michigan, July, 1966. It is assumed that the physician utilization of the total population approximates that of the W. M. S. population.

[6]This is based on 2,809 prescriptions for which data are available on physician utilization. Six hundred and eight (608) prescriptions, having a mean price of $3.79, were not ascertained. These prescriptions were distributed as were the other 2,809 on physician utilization. The data on this variable were gathered mostly from the W. M. S. records, but in some cases the information was received directly from the interviewed population. Since there were two different sources of data the service categories were kept relatively broad.

TABLE 20. --Percentage Distribution of Population, Prescriptions, and Prescription Expenditures, Mean Number of Prescriptions and Mean Prescription Expenditures Per Person Per Year and Mean Price of Prescription by Physician Utilization in Community Sample

Annual Number of Physician Services	% of Population	% of Prescriptions	% of Expenditures	Prescriptions Per Person Per Year	Expenditures Per Person Per Year	Mean Price Per Prescription
0	27.3	4.7	4.9	0.38	$ 1.49	$3.90
1-5	47.7	33.6	32.6	1.54	5.66	3.68
6-25	22.1	48.1	48.7	4.77	18.25	3.87
26 +	2.9	13.6	13.8	10.27	39.41	3.84

services. People who received no physician services used an average of 0.38 prescriptions per person per year at an average expenditure of $1.49. This apparent incongruity stems from a definitional problem. Physician services in W M. S. are defined as services for which the physician is reimbursed.

Patients do, however, receive physicians' services in cases where the physician is not reimbursed. For example, many prescriptions were likely ordered as a result of a telephone call to the physician. This is a quite frequent situation, as 90 million telephone calls are annually provided by physicians in the United States.[7] It can be assumed that people who had no other contact with the physician during the year received a certain number of prescriptions by telephone. Another possibility is that patients received refills for prescriptions originally dispensed in the previous year.

As would be expected, Table 20 shows that prescription utilization is related to physician utilization. People with 1 to 5 physician services received 1.54 prescriptions per person per year; those with 6 to 25 services received 4.77 prescriptions per person per year; those with more than 25 services received 10.27 prescriptions per year. However, the relationship between physician utilization and prescription utilization is not a linear one. To quantify this relationship the

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[7] U. S., Dept. Health, Education and Welfare, "Volume of Physician Visits," op. cit., p. 23.

ratio between the mean number of prescriptions per person per year and the mean number of physician services was calculated. The results of this calculation are shown in Table 21.

TABLE 21.--Mean Number of Physician Services Per Person, Mean Number of Prescriptions Per Person Per Year and the Ratio of Number of Prescriptions Per Physician Service in Community Sample

Annual Number of Physician Services	Physician Services Per Person Per Year[a]	Prescriptions Per Person Per Year	Ratio of Prescriptions Per Physician Service
0	...	0.38	...
1-5	2.94	1.54	0.52
6-25	10.63	4.77	0.45
26 +	42.19	10.27	0.24
Total	4.73	2.19	0.46

[a]Calculated from tabulation discussed above in footnote 5 of this chapter.

This table shows that while the prescription utilization increases as people use more physician services the rate of prescriptions per physician visit decreases. The expenditure for prescriptions per physician service also decreases. The explanation for this decreasing rate is complex, but the following factors are possibly involved. People with fewer number of physician visits are likely to be those people who have seen a physician for cases of acute disease. The likelihood of receiving a prescription at each visit for acute disease is probably high.

The people who have high physician utilization rates are most likely to be those people who are seeing a physician periodically and regularly for continuing episodes of chronic disease. It is likely that the prescription rate per physician visit would be lower for this group.

Another factor that is involved in the declining ratio is the use of physicians' service for preventive medical care. As was shown on Table 11 the very young age groups, such as those less than 1 year of age, had a high ratio of physician services per person and a very low prescription per person per year rate. This group, therefore, had a very low rate of prescriptions per physician service. A large portion of people in the high physician utilizer group are from the young population who are using preventive medical services in the early years of life.

The W. M. S. age/sex specific utilization rates show that the female children age 0 to 1 used an average of 24 physician services per person per year.[8] Therefore, a large proportion of the 0 to 1 age group would fall into the 25 plus physician service class. They would use a very small number of prescriptions and would bring the use ratio for the high physician utilizers down considerably.

It is unfortunate that physician utilization data are not available for the P. S. I. group, as it is possible to posit that the high physician

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[8]Bureau of Public Health Economics, op. cit., Figure 13, p. 19.

utilizers are older and sicker and therefore the most financially vulnerable. If this were so, then the lower prescription rate per physician visit might reflect depressed utilization of drugs due to economic barriers to drug utilization in the community, as with large families. It is, however, left to future research to test this hypothesis, since data derived only from the community distribution is not adequate for this purpose.

CHAPTER VIII

EVALUATION OF COMMUNITY AND P. S. I. ON FUNCTIONAL CRITERIA: PRESCRIPTION UTILIZATION BY THERAPEUTIC CLASS UNDER P. S. I. AND IN THE COMMUNITY

The analysis of the drug distributions in the community and in P. S. I. by therapeutic class provides further evaluation of the functional efficiency of the two systems. Differential drug utilization between P. S. I. and the community is analyzed by therapeutic class to determine which classes of drugs exhibit the greatest utilization differential under P. S. I. The purpose of this analysis is twofold. First, evidence is sought to determine if the financial barrier to drug utilization is operating to cause the patient's judgment to be substituted for the physician's judgment with regard to the use of drugs. Substitution of the patient's judgment for the physician's in the community system would be dysfunctional.

Analysis of the utilization by therapeutic class under the alternative drug payment systems provides a further test of Hypothesis B-2-a. A disproportionate increase in utilization for mild illness under drug prepayment is posited to indicate substitution of patient judgment for

that of the physician under the community payment system. It could therefore be asserted that a patient with drug prepayment and not faced with immediate drug expenditures would be more likely to comply with the physician's recommendations even when he considers a disease unimportant or non-threatening. This would indicate the relative functional inefficiency of the out-of-pocket payment system.

Secondly, however, the analysis examines the P. S. I. distribution for evidence of dysfunctional elements. It has been said that a prepaid prescription insurance plan could encourage the increased utilization of the types of drugs which should have limited distribution. Specifically, the analysis attempts to determine if the implementation of P. S. I. encourages a disproportional utilization increase for antibiotics, amphetamines and psychotropics. As discussed in Chapter I, many "experts" feel that a disproportionate increase in the utilization of these drugs might, by definition, be a sign of inappropriate utilization under P. S. I.

The original therapeutic classification used in the P. S. I. recording system includes approximately 90 therapeutic classes, some of which overlap and some of which are redundant. The P. S. I. classification was considered too cumbersome for this study and a simplified therapeutic classification made up of 14 discrete therapeutic classes was substituted. This simplified therapeutic classification is used in the Brewster, Allen and Kramer study of drug utilization among subscribers

to the Group Health Association of Washington, D. C.[1] Since the Brewster, Allen and Kramer article was the first study reporting data from a prepaid drug plan, it appeared useful to classify the prescription distributions by therapeutic class so as to allow comparisons between the two plans.

Table 22 shows the percentage distribution of prescriptions, prescription expenditures and the mean price of prescriptions by therapeutic class for P. S. I. and the community. The drug class with the greatest proportion of prescriptions and prescriptions expenditures in the community and in P. S. I. is the anti-infective class which includes antibiotics and other anti-infectives. This therapeutic class accounts for 18. 4% of the prescriptions and 19. 1% of the expenditures in the community and 14. 5% of the prescriptions and 15. 7% of the expenditures under P. S. I. Sedatives account for the next largest proportion of prescriptions in both P. S. I and the community, although the proportion of expenditures in each case is not as great because of the low mean price of sedative prescriptions.

The therapeutic class with the smallest proportion of prescriptions in both P. S. I. and the community is the diuretics. Diuretics account for 2. 4% of the prescriptions in the community and 1. 7% under P. S. I. Slightly over 7% of the prescriptions, representing about the same proportion of expenditures in P. S. I. and the community, fall into the

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[1]Brewster, Allen and Kramer, op. cit.

TABLE 22. --Percentage Distribution of Prescriptions, Prescription Expenditures and Mean Price for P. S. I. and the Community by Therapeutic Class

Therapeutic Class	% of Prescriptions		% of Expenditures		Mean Price	
	P. S. I.	Community	P. S. I.	Community	P. S. I.	Community
Total anti-infective	14.5	18.4	15.7	19.7	...	...
Antibiotic	12.6	12.7	13.9	14.3	$4.47	$4.26
Other anti-infective	1.9	5.7	1.8	5.4	3.70	3.60
Sedative	13.2	11.6	9.5	8.2	2.90	2.66
Antispasmodic and gastrointestinal	9.6	7.8	9.8	6.8	4.09	3.30
Cardiovascular	9.3	7.9	10.4	9.2	4.52	4.39
Dermatological	8.4	6.5	8.6	5.7	4.14	3.33
Psychotropic	7.6	7.9	11.4	10.8	6.01	5.17
E. E. N. T.	7.5	3.8	5.2	2.8	2.80	2.75
Analgesic	7.4	9.9	6.7	9.5	3.65	3.65
Amphetamine	4.3	4.0	6.0	5.5	5.55	5.18
Cough Preparation	4.1	4.8	2.9	3.6	2.91	2.85
Antihistamine and anti-asthmatic	3.0	4.4	2.6	4.0	3.56	3.37
Hormone including steroids	2.0	3.5	3.3	4.5	6.66	4.92
Diuretic	1.7	2.4	1.7	2.4	3.92	3.82
Other, unclassified, not identified	7.4	7.1	6.2	7.3	3.37	3.88
Total	100.0	100.0	100.0	100.0	$4.03	$3.78

classification called "other, unclassified and not identified". The percentage distributions by prescriptions and by expenditures do not vary greatly between the community sample and P. S. I., but the difference is statistically significant as determined by a chi-square test.

The magnitude and the direction of the difference in mean price of prescriptions between the community and P. S. I. are approximately the same for the various therapeutic classes. The mean price in P. S. I. is slightly higher than the mean price in the community for each therapeutic class. In most cases the difference is not more than a few cents. However, the mean price of hormone prescriptions under P. S. I. is about $1. 75 greater, with a $4. 92 mean price in the community and a $6. 66 mean price under P. S. I. The $6. 66 price for hormones in P. S. I. is the highest mean presciption price for any therapeutic class. Since there were relatively few prescriptions for hormones, a portion of this price difference could relate to sample variation in the community sample. A price of $5. 18 for amphetamines and $5. 17 for psychotropics are the highest prices in the community.

Table 23 presents the annual prescription utilization rate by therapeutic class for the community and for P. S. I. This rate is expressed in terms of the number of prescriptions dispensed per 1, 000 persons per year in each of the therapeutic classes for P. S. I. and the community. It is derived by multiplying the number of prescriptions dispensed in each therapeutic class in the community and in P. S. I. by

1,000 and dividing by the respective population factors.

TABLE 23. --Prescriptions Per 1,000 Persons Per Year for P. S. I. and the Community and Percent that the P. S. I. Rate is Greater than the Community, by Therapeutic Class

Therapeutic Class	Prescriptions/ 1,000 Persons		% P. S. I. Greater
	P. S. I.	Community	
Total anti-infective	592	393	50.6
Antibiotic	513	279	83.9
Other anti-infective	79	124	-36.3
Sedative	539	255	111.4
Antispasmodic and gastrointestinal	394	170	131.8
Cardiovascular	380	173	119.7
Dermatologic	342	142	140.8
Psychotropic	311	173	79.8
E. E. N. T.	305	84	263.1
Analgesic	302	216	39.8
Amphetamine	177	88	101.1
Cough preparation	169	104	62.5
Antihistamine and anti-asthmatic	122	97	25.8
Hormone including steroids	80	76	5.3
Diuretic	69	53	30.2
Other, unclassified, not identified	302	156	93.6
Total	4,086	2,190	86.6

Table 23 also shows the percent by which the P. S. I. utilization rate exceeds the community utilization rate. The therapeutic classes in Tables 22 and 23 are ranked on the basis of the magnitude of the utilization rate in P. S. I. These rates vary in P. S. I. from the high of 592 prescriptions per 1,000 persons per year for anti-infectives to a low

of 69 prescriptions per 1,000 for diuretics. The highest rate in the community, also for the anti-infectives, was 393 prescriptions per 1,000. Diuretics were low in the community, also, with a rate of 53 prescriptions per 1,000 people per year.

It is possible that the financial barrier could operate to restrict utilization of the most expensive prescriptions in the community. If this were the case, it would be expected that the therapeutic classes with the highest mean prices in the community would have the greatest utilization differential under P. S. I.

In order to test the relationship between the mean prescription price by therapeutic class in the community and the differential utilization under P. S. I., a Spearman rank order correlation was calculated for the two variables. The rank of the mean price of prescriptions in the community by therapeutic class was related to the rank of the utilization differential under P. S. I. The results show that the price in the community was not a significant positive factor in the utilization differential, as the rho equaled -. 3, indicating a slight negative correlation. This small negative relationship means that the cheaper prescriptions in the community tended to be the ones with the greatest rate of increase under P S. I. Factors other than the average price of prescriptions appear to determine the utilization differential among the therapeutic classes. If financial barriers operate to restrict prescription utilization in the community, the impact of these barriers on the utilization by

therapeutic class must be related to population financial factors rather than to the differential prices of prescriptions.

It has been asserted that a disproportionate increase in the use of antibiotics, amphetamines and psychotropics could be taken as evidence of functional inefficiency in the P. S. I. The data presented in Table 23 do not show disproportionate utilization for these three classes. The antibiotic differential of 84%, the psychotropic differential of 80% and the amphetamine differential of 101% approximate average overall differential of 87%.

It is true, however, that non-antibiotic anti-infectives are not prescribed as frequently under P. S. I. and antibiotics appear to be substituted. Any substitution of an antibiotic for an equally effective non-antibiotic could be viewed as dysfunctional because of the additional dangers involved and the additional costs of the antibiotics. However, this dysfunctional aspect appears to be minimized since the P. S. I. anti-infective utilization rate was only about 50% greater than the community, whereas the overall P. S. I. utilization rate was about 87% greater than the community. It is also possible that some of this increased utilization of antibiotics resulted from a shift from injectable to non-injectable forms of antibiotics under P. S. I. since injectables are not covered under P. S. I.

The therapeutic classes which have the greatest utilization differential can be grouped, as can those which have the smallest. Eye, ear,

nose and throat prescriptions have the highest differential rate in P. S. I. The P. S. I. rate is 260% greater than the community rate for these preparations. The EENT prescription rate upon which this percentage was based was among the lowest in the community, but the absolute differential from 84 prescriptions per 1,000 in the community to 305 prescriptions per 1,000 in P. S. I. was the second largest absolute differential. The proportional differential of the dermatological class was the next largest, and the antispasmodic and gastrointestinal classes followed.

The classes with the lowest differentials are the hormone class with a 5. 3% increase; the antihistamines which are 26% greater in P. S. I.; the diuretics where the P. S. I. rate is 30% greater; and the analgesics where it is about 40% greater. Since the first three of these drug classes have very small absolute rates in the community the increases are very small both in absolute and relative terms.

Alternative explanations could account for the observed differential utilization patterns by therapeutic class in the two systems. The differential patterns could be a result of physician factors. A possible explanation for the differential behavior based on physician factors would be that the physician feels freer to prescribe discretionary drugs (that he might not always prescribe) when the patient has drug insurance and does not have to pay out-of-pocket for the costs of these drugs.

An alternative explanation could be that the patient accepts

prescriptions from a physician in an out-of-pocket system, but may in certain situations override the physician's judgment. The patients may decide which drugs are important independently of their physician's judgment. If this were the case the patient's judgment would determine which prescriptions were filled in an out-of-pocket system. The patient might, for example, decide that a disease is not important enough or threatening enough to dictate spending money for the prescription that the physician has written. He might ignore the disease and take no medicine or he might substitute a cheaper over-the-counter preparation in an attempt to alleviate the symptoms of what he considers an unimportant disease.

Medical care studies of physician utilization in prepaid and non-prepaid situations provide some insight into this matter. A study of physician utilization in the Windsor area analyzed the difference in physician utilization of people who were covered by W. M. S. and those who had no insurance at all. A basic difference between the utilization patterns of those populations was that the W. M. S. population showed a greater rate of initiation of service.[2] When people were covered by comprehensive medical care insurance they were more likely to go to the physician to seek care when they viewed themselves as being sick. Once they were in a physician's hands they still received more services than the people who were not insured but this difference was less

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[2]Darsky, Sinai, Axelrod, op. cit., p. 80.

significant than the differential in initiation of care. The patient's judgment was the major factor in the decision to initiate care, and the physician's influence was very slight. The impact of the removal of the financial barrier in this situation affected patient behavior much more than it affected physician behavior.

The differential use of surgical procedures such as tonsillectomies and appendectomies has also been studied under two insurance systems.[3] This situation is quite analagous to the above question of drug utilization, as patient factors are secondary to physician factors in the demand for surgical procedures. There are, however, two major differences between the utilization of tonsillectomies and appendectomies and the utilization of drugs. First, the patient does not generally pay for the surgical procedure out-of-pocket because it is covered under medical care insurance. Second, in a fee-for-service situation even under prepayment, the physician is likely to profit directly from performing the surgical procedure. He does not profit directly from drug utilization. Studies which have compared utilization in insurance and non-insurance situations show that the tonsillectomy rate is lower in a situation where the physician does not profit directly from the utilization of these medical care services.

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[3]A group of these studies in New York City comparing tonsillectomy rates under H. I. P. and other plans is summarized in: Bureau of Public Health Economics, "Medical Care Chart Book" (University of Michigan, Ann Arbor, 1964). (Mimeographed.)

Since the physician does not profit directly from the use of drugs and further since the patient directly feels the impact of the economic barrier to receipt of care, it would seem that the factors acting on drug utilization under prepayment and non-prepayment situations are analogous to those affecting the initiation of care situation for physicians. If this were so, it could be expected that the financial barrier to drug utilization would affect the patient's behavior in seeking care by presenting prescriptions to be dispensed.

Evaluation of the classes of drugs that show the greatest utilization differential under P. S. I. provide further strength to the argument that the patient's judgment operates in this situation and not the physician's. It can be posited that the patient might not view the diseases requiring prescriptions for EENT, dermatological and antispasmodic preparations as serious. Were this so,the patient might be expected to override the physician's judgment by not purchasing some of the prescriptions that the physician had written. Since over-the-counter preparations for the symptomatic relief of these kinds of diseases are among the most readily available, the patient might purchase over-the-counter preparations as functional substitutes for the physician's prescriptions. Since these diseases are also the most self-limiting, the symptoms may disappear in a short time whatever action is taken by the patient.

On the other hand, conditions calling for prescriptions for hormones, diuretics or analgesics might be viewed as serious by the patient, and

the prescriptions for these diseases might more likely be filled regardless of the cost. Thus the physician's and the patient's views as to the danger inherent in a situation might not always correspond. The patient therefore, may play a major role in determining his demand for drugs in the out-of-pocket payment system. If this is so, the patient is redefining his needs and allowing the financial barrier to influence his decision concerning which components of the physician's advice he will accept.

Were the physician prescribing more discretionary drugs under prepayment, discretionary prescribing would have operated for most therapeutic classes. This was not found. Certainly discretionary drugs, which the physician might be willing to prescribe even if he were not certain they would help, are available for even the most serious disease situation. The disease situation calling for analgesics is one where a physician would be likely to use discretionary drugs. There are many drugs in this class that might be of questionable value. However, analgesics show little increase under P. S. I., indicating that the patient views his pain as very serious or very threatening and readily purchases a prescription for analgesics regardless of the cost.

The literature is filled with references citing differential perceptions between patients and informed scientific opinion. Koos early presented evidence that many patients did not view significant symptoms

as serious.[4] Feldman has more recently shown the great differences in perceptions and information about health matters in the population.[5] The patient must take the positive step in the out-of-pocket drug payment system of presenting the physician's prescription at a pharmacy to be dispensed. Further, he must pay for the prescription. It appears reasonable to posit that the patient's perception about the seriousness of his disease or the discomfort related to it would affect his probability of paying the price.

To determine if the same classes of drugs exhibit increased utilization in other drug prepayment systems,the estimates shown in Table 23 are compared with claims data from the drug benefit of the Group Health Association of Washington, D.C. (G.H.A.).[6] This analysis asks if the increased utilization by therapeutic class was a random event in this study or appears to occur in other forms of prepayment. Table 24 compares the utilization rates in the Windsor community, in P.S.I. and in G.H.A. The G.H.A. figures represent claims from those people in the population who had spent more than $25.00 for prescriptions during the year and who had submitted the bills to G.H.A. for reimbursement.

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[4]E. L. Koos, The Health of Regionville (New York: Columbia University Press, 1964).

[5]J. J. Feldman, "The Dissemination of Health Information. A Case Study in Learning" (unpublished Ph.D. dissertation, Dept. of Sociology, University of Chicago, March, 1965).

[6]Brewster, Allen and Kramer, op. cit.

TABLE 24. --Mean Number of Prescriptions Per 1,000 Persons Per Year for P. S. I., Community and G. H. A. by Therapeutic Class

Therapeutic Class	P. S. I.	Community	G. H. A.
Anti-infective	592	403	100
Sedative	539	255	76
Antispasmodic and gastrointestinal	394	170	41
Cardiovascular	380	173	57
Dermatological	342	142	46
Psychotropic	311	173	78
E. E. N. T.	305	84	23
Analgesic	302	216	50
Amphetamine	177	88	...
Cough preparation	169	104	13
Antihistamine and anti-asthmatic	122	97	59
Hormone	80	76	52
Diuretic	69	53	38
Other, unclassified, not identified	302	156	91
Total	4,084	2,190	723

It is likely that the utilization rates in G. H. A. would be the closest to the Windsor community utilization rates for those therapeutic classes with the highest mean expenditure per person in G. H. A., because of the deductible provision. Because of the deductible, therefore, the therapeutic classes with the highest expenditure would be the most likely to fall into the G. H. A. claims study. However, the relationship between the rank of the difference between the P. S. I. and the community's utilization rate by therapeutic class and the rank of the difference between G. H. A. and the community utilization rates by therapeutic class were tested.

The utilization rates with the highest increase under the prescription prepayment mechanism of G. H. A. would be the ones that would be closest to the Windsor community rate, since all the G. H. A. utilization rates were lower than the Windsor community rate. There was a meaningful correlation between the ranks of the increases by therapeutic class under the two prepayment systems. The disease situations involving the largest differential utilization under P. S. I. also were involved in the larger utilization differentials under G. H. A. The same type of diseases caused the increased utilization under both prepayment situations. This provides some evidence that consistant phenomena caused some unmet need in the community.

The physician has little to gain by the patient's inappropriate use of prescriptions and further, the physician is, by definition, a better judge of what medication a patient should receive than is the patient himself. While the physician's use of drugs may be inappropriate, and this study does not investigate the quality of the physicians' prescribing, it is almost certainly inappropriate for the patient to decide which of the prescriptions the physician writes should be dispensed.

Since the greatest increase in utilization when the financial barrier is removed is for those disease situations that the patient might view as not very serious, the patient is likely to receive a closer approximation of what the physician desires him to receive under P. S. I. than in the

community payment system. The most efficient payment system has been defined as the one that delivers to the patient the drugs most appropriate to his condition, which can be posited to be the one that delivers to the patient the drugs most closely approximating those prescribed by the physician. According to this criteria, P. S. I. appears to have greater functional efficiency and further evidence is provided to affirm the hypothesis that financial factors operate in the community payment system to produce unmet need for drugs.

CHAPTER IX

EVALUATION OF COMMUNITY AND P. S. I. ON FUNCTIONAL CRITERIA: PHYSICIAN PRESCRIBING PATTERNS

This chapter presents the final phase of the analysis evaluating the two alternative systems on functional criteria. This analysis determines if patient pressure interferes with the application of the physicians' professional judgment under drug prepayment by investigating the relationship between physicians' prescribing patterns under the two systems and their vulnerability to patient pressure as measured by three sets of background characteristics: scope of practice, age, and income. This analysis tests Hypothesis B-2-b stating that patient influence has little affect on physicians' prescribing patterns under the prescription plan.

As previously stated, it is possible to argue that pressure for inappropriate prescribing might be placed on physicians by patients who are members of a prescription prepayment plan. If the physician's judgment is to be used as a yardstick in assessing the functional efficiency of a drug payment system, it is necessary to discern if patient pressure impinges on the free application of the physician's judgment.

Physicians can be posited to be more vulnerable or less vulnerable

to patient pressure for improper prescribing when drugs are totally prepaid. The hypothesis tested in this analysis asserts that patient influence will have little affect on physicians' prescribing patterns. The assumption underlying the test of this hypothesis is that to the extent to which patient pressure exists and interferes with the application of the physician's best professional judgment, it will be manifest in systematic differences between the prescribing practices of the more vulnerable and the less vulnerable physicians in P. S. I. and in the community.

The prescribing patterns by therapeutic class and by physician characteristic will be analyzed in P. S. I. and in the community. If pressure does effectively exist it is expected that a systematic pattern of differences will emerge between prescribing under the two systems. If the differential prescribing patterns produce differences that appear to be random it will be assumed that the patient pressures are not influencing the physician prescribing under P. S. I. more than in the community.

It has been asserted that physicians operating in a fee-for-service system, albeit prepaid as in W. M. S., are vulnerable to patient pressures. Goode[1] and Freidson[2] have indicated how client choices

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[1]W. J. Goode, "Community Within a Community: The Professions," American Sociological Review (April, 1957), Vol. XXII, pp. 194-200,

are a form of social control in the physician-patient relationship. Friedson posits a continuum upon which a medical practitioner can be measured. At one end of the continuum is the type of physician who operates independently of colleagues. The type is characterized by the solo practice, general practitioner. His existence is predicated on attracting his own clientele. Physicians surviving on this end of the continuum are least able to resist control by clients and the most able to resist control by colleagues.

The type of physician at the other end of the continuum has a type of practice which does not attract its own clientele but instead serves the needs of other physicians. This type is characterized by physicians in the specialty or referral types of practices. It is this type of physician who is most able to resist control by clients but the least able to resist control by colleagues.

To extend this formulation it is asserted that physicians with certain characteristics would be more vulnerable to patient pressure for inappropriate prescribing. If patient pressure is effective it would most likely manifest itself in the prescribing patterns of the most

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see particularly pp. 196-197.

[2]E. Freidson, Patients' Views of Medical Practice (New York: Russell Sage Foundation, 1964), Particularly Chapter x, "The Structure of Doctor-Patient Relationships," pp. 192-207, and E. Freidson, "Client Control and Medical Practice," American Journal of Sociology (January, 1960), LXV, 374-382.

vulnerable physicians. It seems reasonable to assert that the specialist, the middle-age, and the high income physicians would be less vulnerable to patient pressure than the general practitioners, the young and old physicians and the low income physicians. This latter group of physicians would be more concerned with attracting patients through the lay referral system and would therefore be more susceptible to client control.

Fifty-seven percent (57%) of the physicians of Windsor are classified as general practitioners, 43% are specialists; 47% are between 40 and 59 years of age, and 53% are either older or younger than this age group; 59% reported net professional earnings of less than $20,000 a year before taxes and 41% reported earnings of $20,000 or more.[3]

Of the prescriptions for which the physicians' background characteristics were ascertained, 74% in the community were written by general practitioners and 26% by specialists. In the P. S. I. group 72% of the prescriptions were written by general practitioners and 28% by specialists. Sixteen percent (16%) of the prescriptions in the community and 15% of the P. S I. prescriptions were not identified by type of practice. Forty-seven percent (47%) of the prescriptions dispensed in the community sample that were identified by physician's age were written by physicians between 40 and 59 years of age, 53% were written by physicians who were either

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[3]The characteristics of Windsor physicians were determined by a survey directed by B. J. Darsky, Department of Medical Care Organization, School of Public Health, University of Michigan.

older or younger; 54% of the prescriptions dispensed in P. S. I. were written by physicians 40 to 59, 46% by the younger or the older physicians. Eighteen percent (18%) of the community sample prescriptions and 15% of the P. S. I. prescriptions were not identified by age of physician.

Forty-two percent (42%) of all prescriptions for whom the physicians income was identified were written by physicians who earned under $20,000 in the community sample, while 58% had been written by physicians who earned $20,000 or more. Fifty-two percent (52%) of the identified P. S. I. prescriptions had been written by physicians with an annual income of $20,000 or more, 48% by physicians whose annual income was under $20,000. However, the prescriptions for which the physician's income was not ascertained equalled 29% of the community sample prescriptions and 24% of the P. S. I. prescriptions.

Tables 25, 26 and 27 show the prescription utilization rate per 1,000 people by therapeutic class and by physician's background characteristics. These tables list the rates for P. S. I. and the community and include the percent by which each P. S. I. rate exceeds the analogous community rate. In analyzing these tables, it is only possible to compare utilization of similar physicians across P. S. I. and the community, or utilization of different categories of physicians within the same system, since the categories of physicians account for different proportions of prescriptions in the two systems.

TABLE 25. --Annual Prescription Rates Per 1,000 Persons by Type of Physician's Practice for P. S. I. and the Community Sample, Including the Percentage P. S. I. Rate Greater than Analogous Community Rate by Therapeutic Class

Therapeutic Class	General Practitioner			Specialists		
	P. S. I.	Commu-nity	% P. S. I. Greater	P. S. I.	Commu-nity	% P. S. I. Greater
Anti-infective	442	276	60	160	114	40
Sedative	353	194	82	160	63	154
Antispasmodic and gastrointestinal	324	130	149	69	34	103
Cardiovascular	264	146	81	92	23	300
Dermatological	147	65	126	206	80	158
Psychotropic	264	130	103	69	40	73
E. E. N. T.	177	32	453	114	51	124
Analgesic	206	178	16	126	40	215
Amphetamine	177	81	119	11	17	-35
Cough preparation	118	97	22	34	11	209
Antihistamine and anti-asthmatic	88	81	9	23	23	...
Hormone including steroids	59	49	20	23	28	-18
Diuretic	59	49	20	23	11	109
Other, unclassified, not identified	264	113	134	34	34	...
Total	2,942	1,621	82	1,144	569	101

TABLE 26. --Annual Prescription Rates Per 1,000 Persons by Physician's Age for P. S. I. and the Community Sample Including the Percentage that P. S. I. Rate Greater than the Analogous Community Rate by Therapeutic Class

Therapeutic Class	Physicians Younger than 40 and 60 Years of Age and Older			Physicians 40-59 Years of Age		
	P. S. I.	Commu-nity	% P. S I. Greater	P. S. I.	Commu-nity	% P. S. I. Greater
Anti-infective	313	209	51	280	196	43
Sedative	218	126	73	298	124	140
Antispasmodic and gastrointestinal	197	86	129	197	80	146
Cardiovascular	138	85	62	215	80	169
Dermatological	193	93	108	166	58	186
Psychotropic	144	70	106	177	95	86
E. E. N. T.	190	67	183	114	23	396
Analgesic	91	118	-23	223	98	128
Amphetamine	95	52	83	92	45	104
Cough preparation	61	56	9	107	44	143
Antihistamine and anti-asthmatic	47	59	-20	59	38	55
Hormone including steroids	46	40	15	37	42	-12
Diuretic	27	21	29	44	33	33
Other, unclassified, not identified	137	68	101	180	83	117
Total	1,897	1,150	65	2,189	1,039	111

TABLE 27. --Annual Prescription Rates Per 1,000 Persons by Physician's Income for P. S. I. and the Community Sample Including the Percentage Each P. S. I. Rate Greater than the Analogous Community Rate by Therapeutic Class

Therapeutic Class	Physicians With Income Less Than $20,000			Physicians With Income $20,000 or More		
	P. S. I.	Community	% P. S. I. Greater	P. S. I.	Community	% P. S. I. Greater
Anti-infective	298	156	91	275	241	14
Sedative	276	120	130	235	140	68
Antispasmodic and gastrointestinal	212	64	231	196	101	94
Cardiovascular	213	74	188	118	76	55
Dermatological	128	55	133	255	102	150
Psychotropic	148	64	131	177	102	74
E. E. N. T.	148	28	429	137	63	117
Analgesic	213	101	111	118	114	4
Amphetamine	106	46	130	79	51	55
Cough preparation	85	46	85	78	51	53
Antihistamine and anti-asthmatic	64	46	39	39	51	-24
Hormone including steroids	21	37	-43	78	51	53
Diuretic	43	19	126	39	38	3
Other, unclassified, not identified	170	64	166	137	89	54
Total	2,125	920	131	1,961	1,270	54

Table 25 differentiates prescriptions written by general practitioners and by specialists. There were 1,621 prescriptions per 1,000 dispensed in the community sample that had been written by general practitioners, 569 per 1,000 written by specialists. Of the prescriptions dispensed in P. S. I., general practitioners wrote 2,942 prescriptions per 1,000 people, specialists 1,144. This means that the P. S. I. rate for prescriptions by general practitioners is 82% above the community rate whereas the specialists rate is 101% greater. The specialists and the general practitioners appear to have an equal differential utilization rate between the community and P. S. I.

There appears to be no systematic pattern of increase in Table 25 as indicated by a higher P. S. I. rate for general practitioners or for specialists across the various therapeutic classes. For certain therapeutic classes it is greater for specialists, and for most therapeutic classes the rate of increase appears to be about the same for general practitioners and specialists. There is no indication of systematic association between the scope of practice and the rate of increase by therapeutic class. The increases appear to be relatively random.

Table 26 relates the differential between P. S. I. and the community in prescription rate per 1,000 people by therapeutic class and age of physician. Of the 2,189 prescriptions per 1,000 people dispensed in the community, 1,039 were written by physicians between age 40 and 59 and 1,150 were written by physicians who were either younger or older.

In P. S. I. 2,189 prescriptions per 1,000 had been written by physicians 40 to 59 and 1,897 had been written by physicians who were younger or older. The utilization rate of the middle-aged physician was 111% greater in P. S. I. than the community, whereas the differential utilization for the younger and the older physicians was only 65%. As in the previous table there appears to be no systematic differences shown across the therapeutic groups. As before, the more vulnerable age groups showed greater increases in P. S. I. for certain therapeutic classes, the less vulnerable group for others. There also appears to be a somewhat random pattern in this table with the less vulnerable group showing a greater overall increase.

Table 27 shows the relationship between utilization rates by therapeutic class in P. S. I. and the community and the physician's income. In the community sample 920 prescriptions per 1,000 were written by physicians whose annual income was under $20,000, and 1,270 per 1,000 were written by physicians whose income was over $20,000. In P. S. I., 2,125 prescriptions per 1,000 were written by physicians with income under $20,000 and 1,961 prescriptions per 1,000 were written by physicians whose income was over $20,000.

The differential rate of prescriptions by the lower income physicians can be viewed as evidence that the P. S. I. population used somewhat different physicians than the remainder of the community. It is possible however that this apparent difference is a statistical artifact.

As stated before, the community prescriptions were divided 42% to 58% by physician income (under $20,000 - $20,000 or more); in P. S. I. 52% to 48%. However, these estimates were made in a situation where the incomes of the physicians writing more than 25% of the prescriptions of the sample were not ascertained, whereas the not ascertained portion for the estimates of the two previous variables was only about 15%. Since the community estimate is subject to a sampling error and since there were so many physicians reluctant to admit their income, it is possible that the difference between the community and the P. S. I. proportions is within the bounds of sampling error. A further possibility is that high income physicians have a high income because they readily yield to patient requests.

The rate per 1,000 by physicians earning under $20,000 was much higher in P. S. I. than in the community (131% higher), whereas the rate per 1,000 for physicians earning $20,000 or more was not much higher in P. S. I. than in the community, only 54% higher. This pattern is exactly the opposite of what was seen in the analysis by physician age. The physicians presumed to be more vulnerable had a much higher differential utilization rate under P. S. I. with regard to income, but those presumed to be less vulnerable had the greater differential under P. S. I. with regard to age. The increase was similar with regard to type of practice.

Systematic differences are not discerned in analyzing physician

background characteristics and differential utilization rates by therapeutic class. In each table and in the tables combined it appears that the differential utilization rates across therapeutic classes are fairly randomly distributed. In some therapeutic classes the more vulnerable physicians have a higher differential, in other therapeutic classes the less vulnerable have a greater differential. The pattern does appear to be random for most therapeutic classes. In the broad analysis of these therapeutic classes there does not appear to be consistent differentials between the use by those physicians presumed to be more or less vulnerable. No convincing evidence of effective patient pressure appears in this analysis.

However, since an assumption has been made that disproportionate increases in anti-infectives, psychotropics and amphetamine preparations would be a priori evidence of dysfunctional aspects of the prepayment system, the differential utilization of these three classes of drugs were related to the physician vulnerability. With three physician background characteristics and three different classes of drugs, nine specific cases were available to see whether the more vulnerable physician or the less vulnerable physician had a greater differential in P. S. I. than in the community. If the patient influence was not being manifest in the more vulnerable physician's prescribing patterns for these three classes of drugs the greater differential in P. S. I. would have occurred equally often for the more vulnerable and the less

vulnerable physician.

In comparing these estimates (see Table 28) it was found that the more vulnerable physician had the greater differential in utilization rates under P. S. I. in eight cases out of nine. General practitioners and lower income physicians had a higher differential rate in P. S. I. on anti-infectives, psychotropics,and amphetamines and the younger and older physicians had a higher differential on anti-infectives and psychotropics. The only reversal to this pattern was that physicians aged 40 to 59 had a higher differential rate for the amphetamines.

TABLE 28. --Percentage Increase in Prescribing Rate from Community to P. S. I. Distributions by Physicians Presumed to be More and Less Vulnerable to Patient Pressure to Anti-infectives, Psychotropics and Amphetamines by Type of Practice, Age and Income of Physicians

	% Increase by More Vulnerable Physicians	% Increase by Less Vulnerable Physicians	Test Sign
Anti-infectives			
Type of practice	60	40	+
Age of physician	51	43	+
Income of physician	91	14	+
Psychotropic			
Type of practice	103	73	+
Age of physician	106	86	+
Income of physician	131	74	+
Amphetamine			
Type of practice	119	-35	+
Age of physician	83	104	-
Income of physician	130	55	+

Applying a sign test[4] to these data indicates that at least eight out of nine plus cases would have occurred by chance less than 1% of the time if there had been an equal probability of the more vulnerable and the less vulnerable physicians having a higher differential rate in P. S. I. for these therapeutic classes. This difference in prescribing pattern is statistically significant for these three therapeutic classes and these classes are the ones most susceptible to patient pressure. The hypothesis that patient pressure is exerted in a system where the expenses for prescription drugs are totally prepaid does seem to be somewhat valid. The more vulnerable physicians have apparently yielded in some cases to pressure for the prescribing of these three rather dangerous classes of drugs.

In light of this it would appear that there are both functional and dysfunctional aspects of both P. S. I. and the community system. A substantial portion of the increased utilization in P S. I by therapeutic class relates to patients filling prescriptions under P S. I. that they had not filled before. This was discussed in the previous chapter and is evidence for dysfunctional aspects of the out-of-pocket system. However, based on the evidence relating to anti-infectives, psychotropics and amphetamines it appears that patients exert some influence on

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[4] S. Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill Book Company, 1956), pp. 68-75.

physicians, and the more vulnerable physicians, at least, are relenting to this pressure in certain cases.

In conclusion, however, and despite this influence, there appears to be relatively little systematic difference between the prescribing patterns of physicians presumed to be more or less vulnerable to patient pressure. It is possible that physicians rarely recognize that a small number of their patients have prescription insurance and physicians write prescriptions in similar ways for patients under P. S. I. and the community. There appears to be little impact upon physicians' actual prescribing patterns attributable to the benefits of the P. S. I. system for a small group of people.

It also appears that patients having all their prescriptions paid for by prepayment: (1) received prescriptions that they would not have purchased were they paying for drugs out-of-pocket and (2) exerted some additional pressure on the physician to dispense prescriptions for anti-infectives, psychotropics and amphetamines. This second finding would provide some evidence of a major dysfunctional element in prescription prepayment.

CHAPTER X

SUMMARY AND CONCLUSION

This chapter presents a summary of the problem under study, reviews the objectives and hypotheses, presents a summary of findings relating to the various objectives and hypotheses,and discusses the findings, particularly in relation to their applications for future research. The general objectives of this study were to analyze the drug utilization distribution in two alternative payment systems and to evaluate each of these alternative systems using economic and functional criteria.

There are many indications that the payment for drugs presents a problem in the North American medical care system. While drug expenditures appear to be rising in the United States, health insurance coverage is not readily available for drug expenditures. There is evidence that drug expenditures are not evenly distributed among the various families of the population and that the families that are the most financially vulnerable bear a disproportionate share of the burden. There has been pressure from many consumer and labor groups since the 1950's demanding solutions to the problem of paying family drug bills.

There have been various suggestions that have been aimed at

alleviating the problem of paying these drug bills. The suggestions were aimed at two aspects of the problem, high expenditures for prescribed drugs and the out-of-pocket payment mechanism for drug expenditures. The purpose of this study was to investigate the drug utilization system in a community and to compare utilization under this system with the utilization in a drug prepayment plan in the same community. This allowed an evaluation of the out-of-pocket payment mechanism and an alternative, prescription prepayment mechanism.

This study evaluated the payment alternatives using economic and functional criteria. The use of economic criteria involves measuring the impact of alternative systems in terms of dollar expenditures for the drug utilization distribution. Evaluation on functional criteria measures the degree to which each system functions to insure that individuals within it receive drugs appropriate to their disease situation, i.e., how well a system functions to meet its objectives.

In order to do this, three specific sets of objectives were set forth. The first was to determine if differences exist between the utilization of prescribed drugs in the community and among subscribers to a prescription prepayment plan. The second objective was to evaluate the alternative payment mechanisms on economic criteria to determine the extent to which there are differences in the price of drugs in the two systems, to establish the basis of the price differences and to set forth the economic factors operating in the demand for drugs in the two systems.

The third objective was to compare the alternative methods of prescription payment using functional criteria to determine if financial factors operate to produce unmet need in the community, resulting in income-related rather than need-related drug utilization and to further determine if patient pressure interferes with the application of the physician's professional judgment under drug prepayment.

It was specifically hypothesized that:

A. Significant differences exist between the utilization of drugs in the community and under prescription prepayment.

B-1. Drug prices are higher for utilization under the prescription prepayment plan, indicating that system's relative inefficiency.

B-2-a. Financial factors operate in the community payment system to produce unmet need for drugs, indicating that system's relative functional inefficiency.

B-2-b. Patient influence has little affect on physicians' prescribing patterns in the prescription prepayment plan.

To test hypothesis A the parameters of utilization in the two systems were set forth. These were: (1) the total number of prescriptions dispensed in the community; (2) the total expenditures for these prescriptions; (3) the mean price of prescriptions; (4) the mean number of prescriptions dispensed per person during the year; (5) the mean

expenditure per person for these prescriptions. It is estimated that 427,125 prescriptions were dispensed in Windsor during the study year, at a total expenditure of $1,616,428 and a mean prescription price of $3.78. This equals 2.19 prescriptions per person per year at an expenditure of $8.29 per person per year.

The P.S.I. prescriptions per person per year rate (age-adjusted) was 4.20, the annual expenditure was $16.64 per person and the mean price per prescription was $3.96. When these figures were applied to the population base of the community in order to assess the potential impact of P.S.I., were it to be expanded to the community, it was estimated that 819,000 prescriptions would have been dispensed at a total expenditure of more than $3.2 million. Hypothesis A, which posits significant differences between the utilization of drugs in the community and under prescription prepayment, was affirmed.

The difference in the estimated total cost to the community, had P.S.I. rates been applied, amounted to approximately $1.6 million. This was divided into two portions. One portion, 82% of the total, represents the amount of increased cost to the community due to people receiving more medication. The remainder, 18% of the total, or nearly $300,000, represents the amount of increased cost due to an increase in the price of prescriptions, affirming Hypothesis B-1 which posited the relative economic inefficiency of the prepayment system.

This $300,000 increase related to two factors. The first factor

was in the prescription pricing schedule under P. S. I. which yielded a higher price of prescription. A large share of this increased price was due to the $1. 90 minimum reimbursement on all prescriptions dispensed under P. S. I. Since this minimum was not operative in the out-of-pocket system, an overall price increase resulted. The second factor was in the reduction in the amount of medicine dispensed on each prescription resulting in more prescriptions being dispensed to provide the same amount of medicine. The magnitude of this reduction is estimated to be no more than 10%.

The minimum estimate of the cost of economic inefficiency that would result if P. S. I. is expanded to the whole community is $300, 000. Had the sole distribution process in the community been the P. S. I. system the pharmacists could act more like a monopoly. Had the P. S. I. price schedule been used for all prescriptions in the community overall prices would have been 5% higher. The mean prescription price under P. S. I. was $3. 96 and in the community was $3. 78.

However, the $300, 000 must be viewed as a minimum estimate of the cost of economic inefficiency that would result. This is the cost that would result in the movement from the out-of-pocket payment system to a prepayment system organized by the pharmacists of the community. This prepayment system utilizes the existing organizations of pharmaceutical services. It would also be possible to organize the provision of drug services in a way that might be much more economically

efficient.

There are drug prepayment systems that have a much higher degree of economic efficiency. The Group Health Cooperative (G. H. C.) of Seattle, Washington reports a very similar drug utilization rate of 4.18 prescriptions per person per year for the 90,000 people covered by this total drug prepayment system. The average expenditure per prescription, however, is only $1.62[1] as opposed to the $3.96 per prescription paid by the community for P. S. I. prescriptions.

The G. H. C. totals are, of course, much lower than could be achieved in any general drug prepayment system. The drug prepayment mechanism has been operative in G. H. C. for about 20 years. Since the institution of this system the physicians of the group practice plan have only prescribed preparations that are listed in a limited drug formulary. Since the plan employs a drug formulary system with a limited number of drug preparations listed, it can achieve many economies. The first set of economies are achieved through purchasing efficiency. The plan pharmacies purchase all the drugs to be used by about 90,000 people, and the purchases are extremely concentrated because of limitations under the formulary system. Drug prices facing the plan are very low. Further, G. H. C. expenditures do not include an entrepreneurial profit since the group practice prepayment plan is a non-profit consumer-sponsored organization. The cost estimates

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[1]Group Health Cooperative of Puget Sound, op. cit.

from G. H. A. probably represent the upper limit on economic efficiency. The P S. I. type of prepayment must rank near the bottom in terms of efficiency.

Since only 18% of the increased expenditures for what can be attributed to economic variables, the remaining 82% of the increase was evaluated using functional criteria. There were four steps involved in the testing of Hypothesis B-2-a. They were: (1) the comparison of the prescription utilization by demographic groups under the two systems; (2) the analysis of the delay factor in filling new prescriptions in the community; (3) the analysis of the differential prescription utilization by physician insurance and physician utilization in the community; (4) the comparison of the utilization of prescriptions by therapeutic class under the two systems. Hypothesis B-2-b was tested by analyzing the relationship between physicians' prescribing patterns under the two systems and their vulnerability to patient pressure as measured by three sets of background characteristics: type of practice, age and income.

There was considerable variation in utilization rates among the age/sex groups both in the community and in P. S. I. The women 20 to 64 used nearly 50% of all prescriptions dispensed in both the community and under P. S. I. the 65 + age group used 17% of all prescriptions in the community. The mean price of prescriptions increased by age both in the community and under P. S. I.

The P. S. I. age/sex utilization rates were significantly higher than the analogous community rate. The differences were relatively greater in the 0 to 4 and 45 to 64 age groups. The range that P. S. I. rates exceeded the community rates was from 53% for males 5 through 19 to 168% for males 0 to 4. It was found that the over-65 population in P. S. I. had a smaller relative utilization differential compared to the community distribution than did the other age groups. This was attributed to the special nature of aged populations in prepayment plans. It was also estimated that the ratio of prescriptions to physicians' services increases with age.

The utilization rates by marital status also varied differentially between P. S. I. and the community. The utilization of single adults (age 15 and older) showed the smallest differential under P. S. I. (only 38%), and the utilization of the widowed group showed the greatest differential (215%). The utilization of the married people and the children showed equal differentials, the P. S. I. rate being about twice as high as the community rate. The range of the absolute rates was from 0. 95 prescriptions per person per year for children in the community to 12. 36 prescriptions per person per year for the widowed group in P. S. I.

The utilization rate was related to the size of family, and prescription utilization rates were calculated on a mean number and mean expenditure per family basis. The utilization rate per family in the community did not increase with size of family, and the utilization of family

size one was the greatest, with all other size families equalling about 7 prescriptions per family per year in the community. The rate did increase, however, by size of family in P. S. I. The conclusion was reached that in the community the family prescription utilization was closely linked with family income which also does not increase with family size, but that under P. S. I. family prescription utilization was more closely linked with medical utilization.

In order to analyze delay in filling prescriptions that are eventually dispensed in the community, the date the prescription was dispensed was compared to the date it was written. It was established that more than 88% of all prescriptions that were eventually dispensed were dispensed the same day they were written or the next day. There did appear to be some limited relationship between expenditure and delay in that a greater proportion of delayed prescriptions were priced at more than $5.00.

Even though there was very little delay in the dispensing of prescriptions the prescriptions that were delayed two days or longer were analyzed further in an attempt to find the characteristics of the people who did delay. The population over 65, who would be the most financially vulnerable group, had a significantly higher proportion in the delayed group. Children had a much smaller delay rate than was expected, whereas the parents had a somewhat greater proportion of delay. It was concluded that many factors could delay the dispensing

of prescriptions, only some of which are evidence of a dysfunctional system. There appeared to be very little evidence to support the hypothesis that economic factors in the out-of-pocket system delayed the delivery of drugs to the people in the community.

Prescription utilization was found to be linked with physician utilization as was expected, as the high utilizers of medical services in the community were also the high utilizers of prescriptions. However, this relationship was not found to be linear. There were indications that while prescription utilization increases as people use more physicians' services, their rate of prescription and prescription expenditure per physician services decreases. It is probable that this decreasing rate of utilization of drugs per physician services relates first to the very high use of preventive medical services in certain of the high user groups, and secondly to the use of physician's services for chronic disease among other high utilizers. In both these cases the rate of prescriptions per physician visits would be expected to be much less than when physician visits are being used for acute disease.

The percentage distribution of prescription expenditures by therapeutic class did not differ greatly between the community sample and P.S.I. although the differences were statistically significant. The community distribution had a somewhat greater proportion of anti-infectives, analgesics and hormones and a somewhat lower proportion

of EENT preparations, dermatologicals and antispasmodics. The mean price of prescriptions varied between the community and P. S. I. in the same way across the therapeutic classes. In each therapeutic class the mean price in P. S. I. was slightly higher than the mean price in the community.

There are great differences in the utilization rates per 1, 000 people by therapeutic class. The therapeutic classes which have the greatest differential utilization rates per 1, 000 people between P. S. I. and the community and those which have relatively small differentials were grouped. EENT, dermatological, antispasmodic and gastrointestinal prescriptions in that order had the greatest utilization differential under P. S. I. Hormones, diuretics and analgesics were the most similar in the two systems. These estimates were compared to prescription claims data from G. H. A. of Washington, D. C., and the relationships between G. H. A. and the community sample appeared to be quite similar to the relationship between P. S. I. and the community.

It was asserted that patients appear to judge which diseases are most important without regard to their physicians' judgment, redefining their needs and letting the financial barrier, in the out-of-pocket system, influence them differentially on the basis of the evaluation. It was further asserted that if they decide their disease is unimportant they often do not purchase the prescription written by the physician, perhaps substituting cheaper patent medicines or perhaps ignoring the

symptoms altogether. These symptoms may soon disappear without medicine in many self-limiting disease situations.

A basic assumption of this study was that the professional judgment of the physician should dictate which drugs are appropriate for the individual to receive in a given disease situation. Evidence that some factor has interfered with the application of the physician's best professional judgment of the situation is evidence of functional inefficiency.

The following points indicate that the P. S. I. utilization was functionally more efficient than the out-of-pocket method of payment, validating Hypothesis B-2-a.

1. Utilization by marital status. Increases in the differential utilization rates by marital status under P. S. I. indicate unmet need in the community system. The group that could most easily pay for prescriptions out-of-pocket (single adults) had the smallest differential utilization rate under P. S. I., and the group that could least afford to pay for prescriptions (widowed) had the greatest differential rate when the financial barrier was removed.

2. Utilization by family size. Utilization by family size in the community is directly related to income and not to need. Utilization by family did not increase as size of family increased in the community but did increase as the size of the family increased under P. S. I.

3. Delay in dispensing prescriptions. The community system does

not appear to delay greatly the dispensing of prescription, as almost 90% of all prescriptions that were eventually dispensed were dispensed within one day after the physician had written them. However, the existent delay appears to be related to economic factors. There is a slightly greater delay for the more expensive prescriptions, and the aged population exhibits a significantly larger proportion of delay, although the larger families do not.

4. Utilization by therapeutic class. It appears that patients in the out-of-pocket system judge which diseases are the most threatening and serious and redefine their drug needs on the basis of this evaluation. The greatest differential utilization rates under P. S. I. are found for the therapeutic classes that the patient could view as the least serious or threatening. The definition of functional efficiency which states that the most efficient system is the one that delivers to the patient the drugs most appropriate to his condition is restated to say that the most efficient system is the one that delivers to the patient a pattern of drugs that most closely approximates what the physician feels the patient should have. By this definition it would appear that the P. S. I. system is more efficient.

The data bearing on Hypothesis B-2-b are mixed. The findings of this portion of the study suggest that physicians wrote prescriptions in similar ways for patients under P. S. I. and in the community and that there is little evidence of a major impact on their prescribing patterns

due to P. S. I. The patients under P. S. I. do not appear to influence greatly the physicians' prescribing patterns. Demonstrated utilization differentials appear to be more related to patient characteristics than to physician characteristics.

However, significant evidence of functional inefficiency in P. S. I. appeared. When the prescribing patterns of the physicians presumed to be the most vulnerable to patient pressure were compared to those physicians presumed to be least vulnerable, there did not appear to be overall systematic differences between P. S. I. and the community. However, in comparing the least vulnerable and the most vulnerable physicians on prescribing of anti-infectives, psychotropics and amphetamines the most vulnerable physicians had the higher differential rate in eight cases out of nine. This statistically significant difference indicates that patient pressure is most likely to occur in the dispensing of these three classes of drugs even though the overall increase in utilization of these three preparations in P. S. I. was very close to the average overall increase for all therapeutic classes.

The fact that the vulnerable physicians had a greater differential increase than the least vulnerable physicians indicates that patient pressure is apparent in this system and further that it is effective in overriding the physician's best judgment in a certain proportion of cases. Although this was not a major factor it does indicate that patients can and do influence the prescribing of physicians who are the most

vulnerable in a fee-for-service system.

Over-all, the literature on the physician-patient relationship would suggest that the physician is fairly well armed to resist patient pressure for illegitimate prescriptions. If the patient does present an illegitimate request to the physician, the physician has many devices available to him to resolve the conflict. Freidson concludes that the physician generally will not adjust too radically to lay demands because he feels by doing so he might deny his heritage of special knowledge that marks him off as a professional.[2] Parsons analysis suggests that the expectations of the physician role require for him to act "responsibly" in a situation where the interest of others are very vitally affected.[3] It would seem that physicians are well armed to reduce any conflicts that may exist between their views of appropriate prescribing and their patients' expectations.

In summary, it appears that a modification of the out-of-pocket method of drug payment towards prescription prepayment would be highly functional. There do appear to be major areas of unmet need in the community, and further the out-of-pocket mechanism appears to be influencing the prescription utilization rates differentially by therapeutic

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[2]E. Freidson, Patients' Views of Medical Practice (New York: Russell Sage Founcation, 1964), Particularly Chap. x, "The Structure of Doctor-Patient Relationships," p. 192-207, and E. Freidson, "Client Control and Medical Practice," A.J. Sociology (January, 1960), LXV, pp. 374-382.

[3]T. Parsons, The Social System (Paperback edition; New York: The Free Press, 1964), p. 470.

class. It would appear that safeguards to prevent patient influence on physician prescribing of anti-infective, psychotropic and amphetamine drugs might be useful if a P. S. I. -like mechanism were to be adopted.

The evidence does not necessarily indicate that the P. S. I. method is the most economically efficient. Therefore the hypothesis that a prescription prepayment plan sponsored by the pharmacists of the community will be relatively economically inefficient does appear to be validated. The major factor influencing the evaluation of the economic efficiency involves the reimbursement formula which produces a rise in the average prescription price under P. S. I. This rise appears to be relatively uniform across the therapeutic classes and results largely from the imposed minimum price of nearly $2. 00 per prescription under P. S. I.

In conclusion, the implications of these findings for research are threefold. First, traditional American estimates of drug utilization appear to be overestimates. This study has produced a set of estimates of community utilization parameters that do not substantiate the estimates of drug utilization made by most traditional American sources of this information. The methods used in this study are relatively simple and inexpensive to apply. They also appear to be quite precise, as the confidence intervals surrounding the estimates are generally very narrow. It would be useful if the methods of this study could be applied in other communities to validate the general estimates reported. If

these estimates are valid they can serve as baseline data for further evaluation of other alternative prepayment mechanisms.

The second implication therefore involves the study of other prepayment plans. The data from this study are conclusive enough to imply that there is a body of unmet need in the community. They do not clearly indicate that the alternative mechanism studied is necessarily the appropriate one to neutralize this need. It would be valuable to investigate plans representing the multiplicity of alternatives to evaluate their relative functional efficiencies.

The third implication is one for social science research. There appears to be evidence that patients may evaluate their physician's advice and systematically disregard important segments. The patients appeared to decide to fill certain prescriptions and not others on the basis of their interpretations of the seriousness of their disease. Of course, this assertion would require validation by a study designed to test this particular hypothesis. If however, the finding is valid it has many implications for medical practice and would require investigation of this communication and interpretation process aimed towards a better understanding of the system of the inter-personal relationships between a physician and his patient.

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