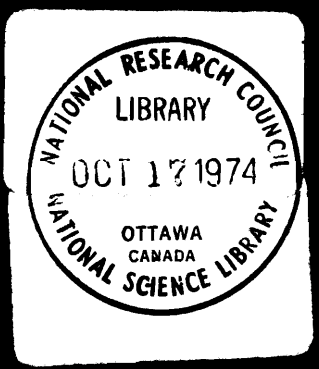
Science Council of Canada Report No. 22

Science for Health Services

October 1974



Science for Health Services

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October 1974

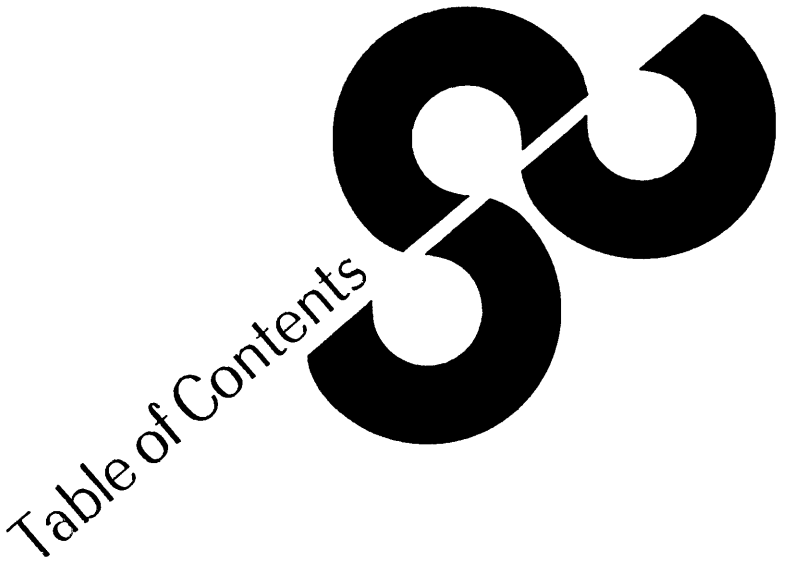
The Honourable Charles M. Drury, PC, MP,
Minister of State for Science and Technology,
House of Commons,
Ottawa, Ontario.

Dear Minister:
In accordance with sections eleven and thirteen of the Science Council of Canada Act, I take pleasure in forwarding to you the Council's Report No. 22, *Science for Health Services.*

The Report is concerned with the topical problem of finding and implementing improved solutions for the delivery of health care in Canada. The application of science and technology in health care services and the organization and funding of research and development in this field received special attention. This latter topic is controversial. The draft report for consideration by the Council was developed by our Health Sciences Committee. One member of that Committee felt strongly enough about a change in the final text of the recommendations on the organization for the federal support of R & D on health care delivery (as approved by the Council, page 86), to place on record his dissent. His position is stated in Appendix A.

Yours sincerely,

Roger Gaudry,
Chairman,
Science Council of Canada.



List of Tables

List of Figures

Acknowledgements

This report is based on a draft submitted to the Science Council of Canada by its Committee on Health Sciences chaired by Roger Larose, OC, Vice-Rector of the University of Montreal. In order to provide the needed breadth of expertise in the complex problems of health services, this Committee was unusually large* and consisted mainly of non-members of the Council, who contributed very greatly to the success of this report. Much of the basic information for the report was compiled during the first phase of the study by a Background Study Group led by Dr. H. Rocke Robertson, CC, former Principal and Vice-Chancellor of McGill University. The study of this Background Group has already been published (Robertson 1973a). The various contributions to that publication have been acknowledged therein. Throughout this report, the Council received invaluable assistance from the federal and provincial authorities in the field of health care, as well as from many experts in the universities, to such an extent that it is impractical to list here all the agencies and individuals who have contributed.

In the staff work, the Council was fortunate to obtain the contributions of several months' time of Dr. John Milsum† and Clinton L.R. Unwin‡. The final integration of the report was the responsibility of the Project Officer, Jorge Miedzinski, assisted by Dr. Joyce Feinberg§.

*The list of Members is given on page 133.

†Dr. Milsum is now Director, Division of Health Systems, in the Health Sciences Centre at the University of British Columbia.

‡Mr. Unwin was seconded to the project from the Defence Research Analysis Establishment of the Defence Research Board.

§Dr. Feinberg is now in the Policy Development Branch of the Communications Division, Ontario Ministry of Transportation and Communications, Toronto.

Highlights

The progress of medicine and of related sciences, which offers increasing opportunities for curing disease and improving health, creates a natural demand for the new health care services made possible. Canadians have chosen the objective that a large and increasing part of these services be provided as a public service, available to all with minimum discrimination due to financial means. Progress in this direction is being made, but the objective has not yet been met to a satisfactory degree. Meanwhile, a heavy strain has been placed on both the available services and the public treasury, with the costs of health care increasing at a rate which cannot be maintained. Politicians are the first to know that the same taxpayers who demand increased services will not be prepared to foot the growing bill unless they are convinced that, collectively, they obtain an appropriately increasing amount of useful service.

"Everyone – governments at all levels, physicians, organized medicine, hospital authorities, the Economic Council of Canada – all agree that something must be done. We cannot afford the inefficiencies, the escalating cost increases, the inequities of access to and quality of health care services in Canada. The current financing programme for the "non-system" not only allows these, but in some cases, actually promotes them."*

The press is well aware of this situation and devotes an unprecedented amount of space to the public debate on health care. There is thus no doubt that legislators at both levels, local authorities and trustees of health care facilities will all be deeply involved in a major reform of the present health care structure under the watchful eye of the much concerned public. Social ideologies will certainly play a role in the search for solutions, however objective information available to the decision makers is insufficient and should be increased. A greatly expanded effort is needed to define the ways in which the social and physical system for the delivery of health care can be improved. There are basically three problem areas: improvement of services, rendering accessibility more equitable, and keeping the costs in proper proportion. Scientists, engineers and technologists can provide much of the needed information. *The purpose of this report is, therefore, to consider how science and technology can help in the search for solutions to the problem of improving the delivery of health care as a socially supported service.*

The terms "health care" and "health care delivery" mean different things to different people. We wish to stress that we shall use these terms in their broadest meaning, extending far beyond the treatment of sickness and even medical care in general. For example, we regard the protection of a healthy environment and the provision of health education and facilities for healthy recreational activities as parts of the overall problem of health

*Dr. Maurice LeClair, federal Deputy Minister of Health, in an interview with Dr. D.A. Geekie, as reported in the *Canadian Medical Association Journal*, 8 January 1972, p. 93.

care, even though they might not be parts of a single administrative structure.*

The scope of the field thus defined makes it impractical to consider all aspects of it in this report. Our selection of a few specific topics for discussion and recommendations is based on the belief that they are the keys for unlocking the door to progress in many areas. In particular, placing the problem of the health care *system* foremost, with a major accent on the promotion of health, we do not belittle the importance of continuing research in the *medical sciences*. There is still much need for substantial progress in the biomedical and allied sciences that may bring about effective and economic, curative and preventive techniques which the improved health care system could then deliver (see p. 19 and 82)†.

Health care reform has already been the subject of many exhaustive studies (see Appendix C), with an additional recent overview by Dr. H. Rocke Robertson published as a background study for the Council. A high degree of consensus has been found in these studies. The following elements of the consensus may be identified:

1. The reform of the health care system has to be guided by a *comprehensive definition of health*, encompassing not only its physical, but also its social and emotional aspects. This broad concept of health has led to a recognition of the need to integrate health care and social welfare to a degree as yet not well determined.
2. The means devoted to the promotion and maintenance of health must be greatly increased without detriment to the continuing support of the treatment of disease.
3. The most effective short-term measures can be found in *improved organization and management* of health care services, i.e., in a greater use of the management sciences. These will range from a better distribution of duties among the various types of personnel, through improved coordination of existing facilities, to the setting up of now relatively unfamiliar types of facilities (notably community health centres) in numbers permitting the necessary large-scale evaluation.
4. *There should be a greater involvement of local communities* in the definition of their requirements and the planning and management of their local facilities.
5. There is a need *to expand the extent of publicly financed health care* (e.g., to include nursing homes, home care, dental care, etc.) and *to improve* its actual, rather than nominal, *accessibility*.

It is well understood that structural optimization is at present largely hampered by existing legislation – partially through limitations included in

*The term "health field concept" is sometimes used to convey the above broad meaning, while retaining a more restricted concept of health care. The "health field concept" has recently been presented in an address to the "Pan American Conference on Health Manpower Planning" by the Minister of Health and Welfare Canada (Lalonde 1973a). It is known that the above concept is being developed by his Department and the release of a "green paper" on new approaches to health care is expected before this report is published.

†A thorough review of the biomedical research in Canada was prepared for the Medical Research Council (1968a). The President of MRC, Dr. G. Malcolm Brown, subsequently suggested that the Science Council of Canada might review the corresponding field of health care services, which led to this report.

federal-provincial cost-sharing agreements and partially through professional restrictions on the right to provide various services. The federal-provincial agreements are already being renegotiated to provide more flexibility and greater inducement to cost-effectiveness. The professional restrictions are also being looked at in varying degrees, but the development of solutions to this complex set of problems is likely to take much time. As regards the promotion of health, the effective means for achieving the desired end are not clear. Also, while it is widely believed that promotion of health should be cost-effective in the long run, as well as bring the obvious advantages of better health, it can rarely show significant short-term benefits.

The existence of areas of consensus does not mean that major reforms will be implemented. The fact is that the general consensus seldom extends to detailed solutions. This is due mainly to a lack of well disseminated knowledge that would permit a clear choice among the infinite variety of possible new arrangements and thus help to overcome inertia or resistance.

The need for reform indicated by this consensus again calls more for the design of a system for the delivery of health care than for specific improvements in medical facilities and techniques. Hence, it is necessary to embark on a course which will lead to the development of a system making the best possible use of science and technology. For example:

1. There is a clear need for experimentation with new approaches to health care delivery on a scale large enough to provide convincing guidance for mass implementation and with a diversity of approach broad enough to cover the spectrum of ideological differences (see page 78)*.

2. This increase of experimental trials must go hand in hand with a truly scientific evaluation, assimilation and dissemination of results. Such concepts as community health centres (including provisions for dental care), nurse practitioners, combined medical treatment, social consulting and recreation centres should receive a major concentration of evaluative effort. Needless to say, the above approach will involve public expenditures which legislators should be ready to approve. The federal government has already made an offer of a "Thrust Fund" of $640 million which could in part be used for this purpose (see pages 114 and 115).

3. The indispensable elements for large scale evaluation are:

- development of sensitive and specific health indicators, which will permit the monitoring of the change of health of individuals, groups, communities and the nation and which are relevant to the proposed changes in the delivery of health care (see pages 32 and 71).
- full use of the technology of information systems (see pages 33 and 72).

Both of the above requirements represent major undertakings. Fortunately, they are needed not only for the evaluation of experimental facilities, but even more for the continuing operation and improvement of the complete system of health care delivery.

4. A corresponding increase in the funding of health care research is also indispensable. The very fact that the best models for the reformed

*This and the subsequent references to page numbers indicate the part of the report in which the relevant recommendations have been developed.

health care system have not yet been established is an indication of the inadequacy of research in this field (which should not be confused with biomedical research). A suitable mechanism will be needed for the funding and management of the expanded health care research and development (see pages 82 and 85).

5. A major research and development effort is needed in the area of the promotion and maintenance of health*. Promotion of health has remained an abstract objective for so long mainly because of the lack of knowledge of how to develop it. The main problem here is that the promotion and maintenance of health relies largely on self-administered activities. Human experience in the area of self-control is certainly not encouraging. Thus, new and better approaches to health education and motivation must be developed. Health care will continue to be very costly in relation to its effectiveness unless and until its recipients place sufficient value on their own and their fellows' health to develop it and to protect it before it is lost (see pages 54 and 69).

*This includes prevention of disease and accidents, but should go much farther than purely preventive measures.

Guide to Recommendations

Chapters I, II and III are of an explanatory nature. All the formal recommendations are developed and stated in Chapter IV, and are concerned with four main principles. The following guide is to help the reader who wishes to examine the interrelations among the individual recommendations, or who wishes to locate quickly those of specific interest.

Principle One: Reform of health care should be based on the "systems approach" (page 64). This principle, stated in general terms on page 64, gives rise to all the other recommendations in this report. In addition to those grouped under the other three related principles, it is developed in several subsidiary recommendations dealing with:

- financing: pages 64 and 65
- organization: pages 65 to 67
- personnel: pages 67 to 69.

Principle Two: Much more emphasis should be given to the protection of health relative to the care of the sick (page 69). Following a general statement, three subsidiary recommendations are on pages 69 and 70.

Principle Three: Specific areas of research and development need particular emphasis to make the systems approach and the improved protection of health possible (page 70). This principle is embodied in recommendations on

- health indicators: pages 71 and 72
- health information systems: pages 72 and 73
- effectiveness of health protection: pages 74 and 75
- use of emergency transportation and telecommunications: page 76.

Principle Four: The organization and funding of R & D has to be modified to meet clearly identified needs which are not covered adequately (page 76). The required modifications are stated in recommendations on:

- multi-level research, development, evaluation and planning capability (RDEP): page 78
- large-scale trials: page 78
- Community Health Centres: page 78
- level of funding for research, development and evaluation: page 83
- development of personnel for RDEP: page 84
- sources of federal funding: page 86.

The readers of this guide should bear in mind that formal recommendations have to be written as tersely as possible. The qualifying statements and supporting recommendations are often contained in the accompanying text. The full intention of some recommendations might thus be open to misinterpretation when read out of context. For this reason, the texts of the formal recommendations have not been quoted in a separate summary and it is hoped that even the busy users of this report will read the text of Chapter IV in full.

I. The Case for Reform

Problems and Progress

Health care in Canada has been in a state of major transition for over a quarter of a century. The transition is from a mainly private responsibility for health care, supported by charity in cases of hardship, to an increasingly comprehensive public responsibility. We can be proud that our society has adopted the objective of making good health care available to all those who are in need, when they are in need, and to the extent of their need, regardless of their financial means. Furthermore, there has been a growing determination to make this objective a reality. The means used toward achieving it have been, so far, primarily concentrated on reducing the financial impediments to universal access through public investment in facilities and the establishment of publicly-operated prepaid insurance plans involving extensive (in some provinces complete) support from provincial and federal taxes. Much good has been achieved. None the less, the current results fall far short of expectations (for a discussion, see Robertson 1973a, Chapters I and III).

The national costs of health care in Canada, measured as a percentage of the GNP, are among the highest in the world*. One would expect this to have resulted in better health care than that which we have achieved. While there are no fully adequate methods of measuring the results, there are several indications that our health care structures are not performing as well as those of several nations which devote a smaller percentage of their resources to health care (LeClair 1972; Great Britain 1967, p. 26; Fraser 1973; Appendix C, "Canada", item 5, slide 2).† We do not know the optimum percentage of GNP that should be devoted to health care and there is no reason to assume that it should not be rising over a long period of time. However, many people are alarmed by the fact that the rate of escalation of costs is considerably faster than the rate of increase of GNP and has been rising (LeClair 1972)‡. An increase in costs was to be expected since the purpose of universal health insurance was to make more extensive health care available to the population. Nevertheless, this objective can not be achieved if the escalation of costs is largely due to increasing prices or to the provision of unnecessary services. The reasons for this situation are many and complex and have been extensively analysed by past Commissions and Task Forces§. A very large number of sound

*The calculation of that percentage depends on the definition of health care and the data on the Gross National Product (GNP). Hence there is some uncertainty about the actual ranking of various countries (see the discussion in Ruderman 1972 and Mennie 1973), but there is little doubt that our costs are one of the highest. A comparison with the U.S. is now available (Health and Welfare Canada 1973a).

†An earlier introduction of public medical care plans among some of these nations may be the reason for their better performance.

‡The latest data indicate that the crest of acceleration for hospital insurance occurred in 1968 (communication from Health Insurance Division, Health and Welfare Canada).

§See list of studies in Appendix C and the reviews in Appendix B. A short summary of the recommendations in several major studies is given in H.R. Robertson (1973b) and in the "White Paper on Health Policy" (Appendix C, "Manitoba", item 2). A brief general review of health care was included in "Patterns of Growth", the Seventh Annual Review of the Economic Council of Canada (1970) with a follow-up paper for the National Economic Conference in 1973 (Economic Council of Canada 1974).

recommendations for improvement have been made to responsible authorities at all levels of jurisdiction. We have not attempted to improve on these recommendations. Instead, we have tried to put them in perspective and thus bring out more clearly certain major impediments to progress, with particular accent on the roles of science and technology in helping to overcome these impediments.

Science of Health Care

One of the three major categories of present deficiencies is in the science of health care. Despite the impressive progress of the health sciences during this century, our knowledge of the nature of health and illness is still very limited. In particular:

– We do not know the most effective cure for many kinds of illness. This sometimes leads to the provision of therapy or other measures which might be unnecessary or even harmful. Such measures consume resources which could be applied in a more effective way if we knew how (Sackett 1972a, Cochrane 1972).

– Curative, as opposed to palliative, treatments have not yet been developed for many important chronic illnesses and some acute illnesses.

– The potentially adverse effects of many chemicals in food, drugs, cosmetics, air and water have not been adequately studied.

– We have not found effective means of promoting healthy ways of life and of discouraging personal habits which contribute to illness, or of inducing high levels of compliance with treatment programs known to be efficacious.

The situation is complicated by the fact that in many cases we do not know the primary cause of a particular instance of illness. For example, the *direct cause* may be an identifiable infestation by a rapidly multiplying bacterium or virus. However, these are often ever present and the *primary cause* of the body defences suddenly succumbing to their onslaught is not known.

Organization and Management of Health Care Delivery

Another deficiency is in our knowledge of how to organize and manage the delivery of effective health care in the most efficient way. In recent decades, rising demands have increased the size of the health care establishments. The concentration of financial support in provincial governments (or their Commissions) has imposed complex, centralized decision-making processes on previously independent units. At the same time the retention of self-government by the thousands of health care facilities has impeded coordination or integration of services by the central authorities. Thus the present transitory stage combines many negative aspects of both the centralized and decentralized approaches. Furthermore, by the terms of the British North America Act, we have an agglomerate of fourteen intertwined health care structures (ten provincial, two territorial, one federal for direct federal jurisdiction and one federal for financial interaction with the remaining twelve). Each of these structures is different and complex. They have evolved from a combination of random growth, local initiative, central planning and political compromises. It is no wonder that even well known principles of management and planning can seldom be successfully

applied in a situation of such complexity, particularly in view of the additional complications described below.

Social Behaviour

The third category of deficiencies is in our understanding of social behaviour. The present agglomeration of health care structures is subject to many influences militating against the introduction of even the most patently needed reforms. Many of these influences are of a psychological, socio-economic or political nature. They exist among both the providers and the recipients of health care. Fear of the unknown, fear of loss of privilege and some political ideologies, all play inhibiting roles. In addition, restrictions on improvements are imposed by the rigidities of the federal-provincial agreements on cost-sharing (of hospital care and, to a lesser extent, medical care)*, for example, limitations on the type of health care eligible for federal financial support; complexities of administrative arrangements; minimal return to provinces from cost-saving achievements. These agreements in turn involve some broader principles of federal-provincial relations and are, therefore, very difficult to re-negotiate.†

Progress

Having pointed out some major deficiencies of the present health care structure, we would be remiss if we did not point out the progress which has been achieved. Public prepaid hospital and medical insurance plans now cover over 99.8 per cent of the eligible population‡ (Health and Welfare Canada 1973b, 1973c). The types of treatment covered by insurance are slowly being expanded. Although the distribution is very uneven, Canada is, on the average, well supplied with hospital facilities and physicians for its population, as indicated by Table I.1.§ Furthermore, Canada has the ability to incorporate quickly into the delivery of health care the results of world biological, medical and pharmacological research, as well as make her own contributions in these fields. In addition, some of the important recommendations from the previously mentioned studies†† are being incorporated into reforms introduced, or actively being planned, in most provinces and into the federal support of research, development, evaluation and planning. There has been a considerable shift, at the policy level, in the direction of increased emphasis on prevention of accidents and improvement of fitness (see Appendix B and

*See, for example, *Task Force Reports on the Costs of Health Services in Canada, Vol. I, Summary*, Appendix C, "Canada", item 2.

†See Appendix B, pp. 113-115.

‡The "eligible population" excludes only those whose health care is already provided by other forms of publicly supported care, mainly the members of the Canadian Forces, the RCMP and inmates of penitentiaries.

§It has to be pointed out that the data in Table I.1 is six years old and that the compatibility of data for the various countries is questionable in spite of the great efforts by the World Health Organization (WHO) to provide comparable information. Progress since 1968 is not likely to have been uniform. The latest available information for Canada (Hacon 1973) shows a population per physician ratio of 633 to 1, which represents a probable improvement in Canada's standing among the developed countries. See also Health and Welfare Canada 1973d, for recent details on health manpower in Canada.

††See Appendices B and C.

Table I.1–Health Personnel and Facilities in Some Developed Countries (1968)

Country	Population per Physician	Relative Standing	Population per Dentist	Relative Standing	Population per Nursing Personnel[a]	Relative Standing	All Hospitals[b]		General Hospitals[c]	
							Population per Bed	Relative Standing	Population per bed	Relative Standing
Australia	850[d]	19	3 350[d]	15	150[d]	1	90	8	162	–
Austria	560	2	3 680	16	520[i]	18	90	8	–	–
Belgium	640	5	4 320	21	590[i]	19	130	20	216	14
Canada	740	9	3 050[g]	13	170	3	100	13	173	9
Denmark	690	8	1 480	3	190	4	110	17	170[e]	8
Finland	1 120	24	1 920	4	150	1	70	1	228	17
France	780	15	2 550	10	380[g]	15	200[j]	25	227[j]	16
Germany: Fed. Rep.	600	4	1 920	4	360	14	90	8	154	5
Greece	670	7	2 340	8	1 260	22	170	21	351	22
Iceland	740	9	2 310	7	350	13	80	4	142	3
Ireland	960[d]	22	4 810[d, g]	22			70[d]	1	264[d]	19
Italy	560	2					100	13	141	2
Japan	910	21	2 820	11	400	16	80	4	99	1
Luxembourg	990	23	3 170	14	480[g]	17	80	4	173	9
Netherlands	840	18	3 930	19	270[g]	9	190	24	211	13
Norway	740	9	1 240	1	300	11	110	17	199	11
Portugal	1 120	24	129 660	26	1 170	21	170	21	293	21
Spain	770[f]	14	10 110[f]	24	1 760	23	220	26	800	23
Sweden	800	17	1 260	2	236	6	70	1	151[j]	4
Switzerland	740	9	2 500	9			90	8	158	6
Turkey	2 710	27	14 090	25	2 410	24	510	27	870	24
U.K.: England and Wales	860[e, g]	20	3 870[h]	18	330[e, h]	12	100[j]	13	244[j]	18
U.K.: Northern Ireland	790[h]	16	3 760[h]	17	280[h]	10	90[j]	8		
U.K.: Scotland	760	13	4 160	20	250	7	80[j]	4	207[j]	12
U.S.A.	650[e]	6	2 020[e]	6	200[e]	5	120	19	217	15
U.S.S.R.	450	1	2 850	12	250	7	100	13		
Yugoslavia	1 120	24	4 960	23	960	20	180	23	289	20
Median	*770*		*3 110*		*340*		*100*		*209*	

[a]Ratios are calculated on the basis of the combined total of fully qualified nurses and intermediate-level auxiliary nurses.
[b]All establishments permanently staffed by at least one physician, which can offer in-patient accommodation and provide active medical and nursing care.
[c]Hospitals – other than local or rural hospitals – providing medical and nursing care for more than one category of medical discipline.
[d]Data from 1966.
[e]Data from 1967.
[f]Registered personnel. Not all working in the country.
[g]Preliminary, approximate or estimated data.
[h]Personnel in government services.
[i]Hospital Personnel.
[j]Government hospital establishments.
Source: Based on statistics from the *World Health Statistics Annual*, 1968, Volume III, Health Personnel and Hospital Establishments, World Health Organization, Geneva, 1971.

Lalonde 1973a). Some provinces (Ontario in particular) have programs for attracting physicians to locate in under-serviced, rural areas. The increased availability of physicians, combined with reduction of financial impediments in the poorer regions, is also having an effect on improving the distribution of physicians. Nevertheless, the situation gives no cause for complacency for the reasons stated at the beginning of this chapter. Some further insight into the required characteristics of the necessary reform may be obtained by considering the principal factors affecting health and the perceived requirements for health care. The requirements, when compared with the current level of achievement, identify the perceived shortcomings of the present structure.

Principal Influences on Health

Good health care must depend on an understanding of the nature of health itself. We will not attempt a strict definition but we approach the thinking of the World Health Organization (WHO)* in stressing that health is more than the absence of disease and that it is strongly affected by emotional and social influences. Thus health care must be much broader than medical care alone.

Among the principal factors affecting individual health, one can identify:†

1. Endowment at conception.
2. Physical environment (natural and man-influenced).
3. Social and economic environment.
4. Personal life style.
5. State of science and technology in the health field.
6. Organization of health care.

The purpose of a health care system should be to influence all such factors so as to obtain a satisfactory improvement or maintenance of health for the largest possible percentage of the population. This should include the provision of guidance and help for individuals to exercise their own influence or selection, within their means of control.

Obviously, most of the above factors are outside the strictly medical field or even outside the accepted administrative boundaries of the present health care structures. Many measures needed to promote good health and protection from disease depend on the actions of social institutions which have specific objectives, policies and budgets completely independent of those of the organizations responsible for the care of sickness. It is self-evident that the institutions which affect or determine our living and working environment – education, transportation, and the economy in general – have a strong influence on health. Yet, there is at present no mechanism which would check if, in the assignment of resources among

*See "The Constitution of the World Health Organization" (United Nations 1947, p. 793), which defines health as "*A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*".

†The following classification is very similar to that developed by H.L. Laframboise (1973).

these institutions and health care structures, society is not making major errors in terms of health care*.

Perceived Requirements for Health Care

The objective of health care defined on page 18 requires a delivery system which must have a certain set of characteristics for satisfactory performance†. It is usual to describe our perception of the most important characteristics by a series of adjectives:‡

universal	humane
comprehensive	effective
accessible	efficient

These adjectives represent a "shorthand" notation for the following characteristics:

Universal: After much deliberation, Canada opted in favour of public responsibility for health care, through publicly supported services and insurance schemes covering together virtually all of the population.

Comprehensive: The demand is for a single system which embraces prevention, diagnosis, a broad spectrum of treatment, and rehabilitation. Such a system should provide the maximum attainable degree of coordination with other social structures affecting health.

Accessible: There should be easy physical accessibility, with fast response to emergencies and without impediments arising from complexity, lack of information and guidance, red tape, deterrent charges, etc.

Humane: Another commonly used adjective is "personalized". It represents a demand by patients to be treated with sympathy and understanding, as individual human beings, rather than in a brusque and impersonal manner.

Effective: This represents the demand for preventive measures that are truly protective, for diagnostic methods that are valid and reliable, and for treatments that cure the disease or substantially alleviate the symptoms.

Efficient: Efficiency reflects the desire to achieve the above characteristics without waste of funds, facilities, and effort.

The attainment of these characteristics is perceived as the objective in the development of a modern health care system. However, such requirements are open to quite a range of interpretations. To the extent to which uncertainty exists, it presents a serious impediment to the reform of health care in Canada.

Perceived Shortcomings of the Present Structure

One of the most important impediments to the improvement of the present structure is the one which receives the least popular attention: *the lack of a*

*The recommendation regarding a possible role for the "Institute for Research on Public Policy" (page 66) is relevant to the above problem.

†An early statement of such characteristics has been expressed in the "Health Charter for Canadians" (Appendix C, "Canada", item 1, vol. 1, pp. 11–12).

‡There is also a requirement of "portability" which expresses the need for a continuity of coverage for people moving from one province to another.

means for accurate and sensitive comparisons between the objectives and the results. In the absence of such information, public attention is often attracted to the most obvious, but not necessarily the most important, ways in which present health care falls short of the accepted objectives. Many more shortcomings are, of course, apparent to those involved in the actual operation of health care. Some of the most important ones are listed below:*

1. Accessibility is poor in many areas, and these are not always the remote areas. Hospital out-patient and emergency services are overloaded. House calls by physicians are becoming rare and the rural family physicians are a vanishing breed. These services have not been satisfactorily replaced everywhere, hence some localities are worse off now than they were a generation ago. Although this trend is beginning to be checked as noted on page 22, the difficulty of providing local medical care in rural areas is the sign of the times in very many countries. In some metropolitan areas the waiting period for an appointment or admission is lengthening, particularly with certain specialists, (Enterline et al. 1973†).
2. Emergency transportation and treatment are often inadequate.
3. Integration of the various facilities for treatment, (acute care hospitals, convalescent homes, home care, etc.,) is poor or non-existent and the insurance coverage is incomplete.
4. Proven preventive measures are not universally applied (e.g., immunization of children is not complete in all parts of Canada).
5. The exclusion of dental services (and the exclusion or arbitrary limitation of some other services) from the public insurance system is not logically supportable. The high cost and poor availability of dental services requires some form of social intervention.
6. The interaction between the health care delivery system and the other social functions which have a strong effect on the health of the population is not adequate.
7. Individual provinces differ widely in the degree to which health care is paid for by taxation as opposed to direct premiums and in the range of services covered, as shown in Table I.2.
8. Cost and quality control are improving but are not adequate. Better methods of control need to be introduced, with great care exercised not to sacrifice quality to cost.
9. There is a tendency to optimize the performance of the system from the point of view of those delivering the care. This is not to be decried but it is not necessarily sufficient for those receiving the care.
10. Scarce resources are used inefficiently, (through lack of coordination, through performance of tasks of a routine nature by over-qualified personnel who are needed for more complex duties, through misuse of laboratory facilities, etc.).

*It is not intended to imply here that these are uniquely Canadian problems.

†The period of time covered by the second phase of this comparative study (1 August 1971 to 31 July 1972) was quite close to the introduction of the provincial medical insurance plan in Quebec (1 November 1970). Some of the increased waiting time shown in the report may have been due to transient effects associated with the introduction of medicare, i.e., the rise of demand being faster than the rise of supply of services.

11. There is a lack of information regarding both aggregate statistical levels of health and individual health histories. This is a major impediment to the improvement of health care.
12. There is a general orientation toward the treatment of manifest illness while relatively less attention is paid to the expansion of resources for the promotion of health. The effectiveness of health promotion is very low and needs major improvements.

The reduction of the financial barriers to health care through public hospital and medical plans has emphasized the existence of these shortcomings. A more fundamental reform of the structure of health care thus becomes even more urgent than before. The principal trends toward possible reforms are discussed in the subsequent chapters.

Table I.2–Federal Medical Care Program and Provincial Medical Care Insurance Plans

Province Date of Entry	Extra Benefits[b]	Regular Premiums Payable by those who do not Qualify for a Subsidy, Per Month, and Other Charges ($)				
			Medical Care Insurance	Hospital Insurance		Combined Premiums
		Category	Regular Premium	Regular Premium	Other Charges	
British Columbia 1 July 1968	Optometry, chiropractic, naturopathy, physiotherapy, podiatry, orthoptic treatment and services of Red Cross nurses, special nurses and V.O.N. Orthodontic services for cleft palate and/or hare lip. (Free prescription drug program for residents over 65 and a drug subsidy program for those receiving 90 percent medicare premium subsidy.)	Single Couple Family	$ 5.00 10.00 12.50	Nil Nil Nil	$1.00/day in-patient except newborns. $1.00/day out-patient cancer therapy. $1.00/day for psychiatric day care or night care services or psychiatric out-patient services and day care rehabilitation services. $1.00/day diabetic day care services. $1.00/visit out-patient physiotherapy. $2.00/day for day care surgical services, emergency services or minor surgery.	$ 5.00 10.00 12.50
Alberta 1 July 1969	Dental services rendered by dental surgeons as specified in regulations, optometric, chiropractic, podiatric and osteopathic services and appliances provided by podiatrists. An optional health services contract is available through the Commission at subsidized rates to residents who are not members of a group. Provincial government assumes costs of eyeglasses, hearing aids, dentures and dental care, and medical and surgical appliances for residents over 65 if not provided under basic and optional coverage.	Single Couple Family	$ 5.75[e] 11.50[e] 11.50[e]	Eligibility for hospital insurance depends on medical care insurance status. No separate premiums.	$5.00 registration fee for first day of hospital care for persons admitted to general hospitals. No charge for newborns. $3.00/day charge in auxiliary hospitals from 121st day of hospitalization.	$ 5.75[e] 11.50[e] 11.50[e]
Saskatchewan 1 July 1969	Optometry, chiropractic, referred orthodontic service by dentist for care of cleft palate (subsidized hearing aid program).	All eligible residents	Nil	Nil		Nil
Manitoba 1 April 1969	Optometry, chiropractic, prosthetic devices and certain limb and spinal orthotic devices and services when prescribed by an MD. Contact lens following congenital cataract surgery. (Pharmacare program for residents over 65).	All eligible residents	Nil	Nil	An extended care benefit provided (if insured in province 12 months in preceding 36 months) at $4.50 per day for this service.	Nil

Ontario 1 October 1969	Optometry, chiropractic, podiatry, osteopathy (also out-of-hospital benefit towards cost of physiotherapy and for ambulance services).	Single Couple Family	See combined premiums	See combined premiums	An extended care benefit provided (if insured resident in province for one year) – co-payment $4.50/day for this service.	$11.00[d] 22.00[d] 22.00[d]
Quebec 1 November 1970	Optometry Oral Surgery in a university institution. Drug benefit (social assistance recipients).	All eligible residents				0.8% of earnings with ceiling of $200.00/year[e]
New Brunswick 1 January 1971		All eligible residents	Nil	Nil		Nil
Nova Scotia 1 April 1969	Optometry	All eligible residents	Nil	Nil		Nil
Prince Edward Island 1 December 1970		All eligible residents	Nil	Nil		Nil
Newfoundland 1 April 1969		All eligible residents	Nil	Nil		Nil
Yukon Territory 1 April, 1972[a]			$ 6.50 12.50 14.50	Nil		$ 6.50 12.50 14.50
Northwest Territories 1 April 1971		All eligible residents	Nil	Nil	$1.50/day for in-patient insured services	Nil

Notes: All plans provide insured services of federal program, i.e., medically required services of practitioner and certain surgical-dental procedures undertaken by dental surgeons in hospital.

The premiums given in the table are those for persons who do not qualify for premium assistance on account of limited income. The provisions for assistance vary from province to province.

[a]Coverage depends on residency rather than on payment of premiums.

[b]These benefits are provided generally on a limited basis. For specific details, information may be obtained from provincial authority. The federal government is not contributing toward the costs of these extra benefits.

[c]Premium exemption for basic (and for optional) coverage if member of a premium unit is 65 years or more.

[d]Premium exemption for combined coverage if member of premium unit of 65 years or more and resided for at least the previous 12 months in the province.

[e]Single persons with net incomes under $2 600.00 and families under $5 000.00 are exempted.

Source: Health and Welfare Canada, Health Insurance Directorate.

II. Health Care as a System

Systems Approach

It has been shown that there is an acknowledged need to reform the present structure of health care. The high cost of health care (nearly $6.6 billion or 7 per cent of our GNP in 1971 as shown in Table II.1) adds to the urgency of this need. Many authorities responsible for health care at provincial and federal levels have recognized for a long time the potential advantages of restructuring health care in accordance with the principles of the "systems approach". This approach is described below.

The name system is often applied to an organization, a structure or a method irrespective of its characteristics. It has also acquired, however, a more restricted scientific meaning, in conjunction with the development of systems theory which has found many important applications (first in engineering and later in the life and social sciences). In terms of that theory, a true system is "an integrated assembly of specialized parts acting together for a common purpose. The components of a system may be physical particles in an atom or electronic components in a computer; they may be biological cells in a plant or animal; they may be people in an organization or a society; they may also be specialized ideas and knowledge in a philosophical system."* A functional grouping of components may be a subsystem – the beds, walls, personnel, organization, etc., of a hospital ward form a subsystem of a hospital. Simple systems may be integrated into a more complex, higher order system – a hospital may be part of a comprehensive health care system comprising also health education, ambulatory services, emergency units, ambulance transportation, convalescent homes, home care, public health facilities, etc. – all adjusted in size, position and interaction to optimize the performance of their common objective. *Thus the existence of a common purpose, mutually optimizing relationships, and specialization are the main attributes of a "healthy" system.* An approach to the design of physical and organizational structures which intends to ensure the above attributes is known as the "systems approach".

If one part of a system grows, at the expense of others, more than is necessary for improving the overall performance toward the common objective or if some parts act in discord, the structure becomes "degenerate" from the systems point of view. An example is the trend toward improving the efficiency of hospital units. Combined with the development of treatments requiring complex facilities, this trend has led to the rapid growth of large hospitals as the pre-eminent places where major health care services are dispensed. These large and excellent hospitals have begun to attract, for many reasons, patients not requiring such costly facilities. This is defeating the objective of overall economy, while also introducing other disadvantages by impeding a balanced development of facilities and services.

In complex systems comprising human beings it is not only possible but very probable that individual decisions taken on the small scale by sensible, well-intentioned people coping with a particular problem,

*J.A. Morton, *Organizing for Innovation, A Systems Approach to Technical Management*, McGraw-Hill, New York, 1971.

decisions that are rational from their point of view, may bring about consequences on a larger scale which are definitely undesirable (Schelling 1971).

In order to overcome the above problems, the systems approach has to include continuous monitoring of performance with respect to objectives, leading to reallocation of resources or structural readjustments in response to the observed needs. This crucial activity is known as feedback. It can only take place if means exist for comparing the results and the objectives. The systems approach also involves a periodic reassessment of partial or short-term objectives, in accordance with changes in external influences and/or internal capabilities. An optimized relationship with its environment is therefore another attribute of a system. This is another way of saying that each system should play its proper role as a part of a larger system. In this context the health care system is a part of our social system.

The fundamental feature of a total systems approach is that it must take into account all major influences on health, (i.e. those listed on page 22). It is of course obvious that our present structures of health care do not form a proper system nor are they an optimized part of the social system. The need for a more systems-like approach to health care, both for economy and to improve performance, has been recognized (explicity or implicity) in most Canadian studies.* However, a complete implementation of the systems approach calls for such major social reorganization (within the boundaries imposed by the BNA Act) that, even as a trend, it is only in its initial conceptual stage. One of the most significant aspects of this trend lies in various moves toward providing a suitable correlation between health and welfare services.†

The principal requirements for a systems approach to health care may be summarized as follows:

1. A clear definition of current working objectives, as well as of ultimate goals.
2. Existence of means of comparing performance with objectives.
3. Continuous evaluation of performance and implementation of routine corrective action.
4. Periodic review of performance and identification of needs for major adaptive changes.
5. Carrying out of research, development and trials to discover and implement the ways of overcoming deficiencies.
6. Planning the changes in the system, as indicated by the results of the activities under (4) and (5) above.
7. Capability to bring about implementation of the results of planning.
8. Comprehensiveness of the above activities to cover the needs of the recipients of health care, the deficiencies of knowledge and technology, the problems of organization and management, and the deficiencies in interaction with the relevant functions outside the jurisdiction of the system.

As discussed in Chapter I, the definition of current working objectives

*Summaries of the principal recommendations in those studies may be found in Appendix 10 of H.R. Robertson (1973b). See also Appendix B in the present report.

†This approach has been developed most extensively in the Castonguay-Nepveu report (Appendix C, "Quebec", item 1).

refers to the provision of *effective* protective measures or curative treatments. Thus the evaluation of performance with respect to objectives should not mean just checking whether certain measures or treatments were performed as planned, but should include an examination of their *effects* on the improvement of health.

A well-conceived system contains built-in incentives for the individuals and the organizational elements to operate in a way consistent with both the system's objectives and individual or organizational benefits. Where such synergism exists, the system tends to be self-optimizing. In the absence of synergism, a major effort in vigilance, reorganization and enforcement becomes necessary, but may often not be attainable in practice. Herein lies one of the major problems of the current health care structure.

The existence of synergism may reduce the need for the monitoring of performance of the health care system with respect to its objectives, but cannot eliminate it. Indicators of the state of health of the population are indispensable to monitoring the performance. Such indicators must be sufficiently fast and sensitive to show the effects of external influences or the results of any modifications in health care on a real-time basis. A health information system is needed to provide data from which the desired indicators can be derived. Thus health indicators and a health information system are indispensable elements of the systems approach. They must be backed by good management and include provisions for cost and quality control, for which the system will provide the necessary tools.

Health Indicators

The classic health indicators have been life expectancy and maternal, neo-natal and infant mortality rates.* The mortality figures are often subgrouped by age, sex, disease, and region. Morbidity figures are also used to provide some information on the population's requirements for medical attention. However, morbidity statistics are practically never complete, since those who currently demand medical attention represent only some unknown proportion of the total sick population†. Surveys to estimate the total extent of morbidity are very expensive. Also, since morbidity data relating to one person can come from a variety of sources (doctor, hospital, etc.,) morbidity statistics are plagued by the problem of multiple counting.

Several kinds of indicators are required, depending on their application. There is a need for a set of indicators representing various health problems amenable to health care, which can be used for monitoring the effectiveness of the health care system in greater detail. A "total" indicator that embraces all aspects of health would also be very useful.

The health indicators which have been used in the past fail almost totally to measure the state of a nation's health in terms of the emotional and social effects of illness or death. For example, even a relatively advanced indicator, based on the loss of life expectancy, shows the death of an

*Certain international and interprovincial statistics in this regard are presented by H.R. Robertson (1973a).

†This is known as the "iceberg" phenomenon.

infant (life expectancy 70 years) as equivalent to the death of two people aged 35, who are likely to be carrying major responsibilities for their families and to be subjects of very different emotional attachments. There is now much effort to define better indicators, but immense difficulties arise because there are so many subjective factors.

A key element in developing health indicators is the description of the individual's state of health, with its physical, emotional and social components. Some attempts have been made to define a health state indicator in terms which include both mortality and morbidity (Sullivan 1971a, 1971b; Patrick, Bush and Chen 1972). Morbidity can be defined to include in-patient days and out-patient visits (Miller 1970). These initial attempts have now led to the concept of a continuous spectrum of health states (including prognosis) (Fanshel and Bush 1970; Torrance, Thomas and Sackett 1972). The state of health can, of course, be determined on the basis of either external evaluation by experts, or by the subject's own internal perception of his condition. These may well be different. There may also be a difference in the definition of health state used in an indicator, depending on the purpose of the indicator. One purpose may be the development of health indices to characterize, in a positive fashion and with instruments capable of measurement and scoring by non-clinicians, the health status of individual patients at one point in time (Spitzer et al. 1973). In another case the objective may be not the measurement of health status per se, but the determination of its social utility (e.g., Patrick, Bush and Chen 1972; Torrance, Thomas and Sackett 1972). Both types of approach are important.

A quantitative measure of disability or health deficiency for any health state can then, in principle, be computed by multiplying the reduction of the health state from the perfect condition by the period during which the reduction has been endured and is likely to persist. When added for a year over the entire community, a community health deficiency indicator is obtained (Meyer 1971). We should comment here that quantitative assessment in particular cases tends to show that relatively mild chronic diseases, which are prevalent in much of the population, exceed in their social health deficiency the effect of rarer but more life-threatening acute diseases.

A general problem with most health indicators is that they represent an integrated effect, over many previous years, of the various factors affecting health. This makes them difficult to use as a tool in policy determination. Infant mortality is believed to be relatively more sensitive in time to some aspects of health care. A recent analysis (Fraser 1973) suggests a good inverse correlation between infant mortality and the extent to which health care resources in a country are devoted to the provision of non-personal, public goods and services.

Health Information Systems

Imperative Need

The health care structure is large and complex, hence it requires a large and complex information handling system. As in any large organization, computers (i.e., electronic data processing) were first used mainly for

administrative functions, beginning with the standard commercially proven accounting and payroll applications. The massive accounting involved in the present system of medicare payments could hardly have been undertaken without electronic data processing. However, there are a large number of functions basic to the health care system that also need computerized information storage, processing and retrieval. In order to use their time more efficiently, health care personnel should be relieved of much of the drudgery of record tending. Further, the records should be structured and maintained in a way that would:
- facilitate learning about illness;
- make personal medical records more complete, accurate, and rapidly accessible to authorized personnel;
- assist in diagnosis and education;
- provide better information with which to manage the health care system.
The last requirement, in particular, will eventually bring about a massive system or systems of computer storage and retrieval. The requirement is apparent and the technical means are available, but there are still many questions: What kind of system shall we have – an integrated one, a group of compatible provincial or regional systems, or an agglomeration of incompatible parts? How fast should it grow? How expensive and cost-effective will it be? Who will make the relevant decisions and when will they be made?

Development of such a system will not be easy. Many early attempts failed because the technology was available without the methodology for using it for this new application. The sensible course of action is to encourage and then to guide an orderly development. The alternative of spontaneous, disorderly development usually brings about much smaller advantages at a much higher cost. The requirements for the various functions in the information system, and the present means or trends for meeting them are outlined below.*

Medical Record

The medical record† of an individual is generated chiefly by the physician(s) and nurses attending the person in a hospital, or by the family physician during the course of various visits, and includes the results of all tests. This medical record can grow very fast; for example, after two weeks the record for a cardiac-emergency patient may be quite voluminous, including laboriously hand-compiled information such as:
- handwritten notes by many examining physicians;
- many data on temperature, pulse rate, blood pressures, etc., gathered by nurses;

*A general review of the problem of information handling in health care in Britain may be found in a special issue of *The Statistician* on "Medical Information Systems" (Statistician 1972).

†The expression "Medical Record" is used here with reference to all types of information pertinent to a patient's health and treatment, be it medical, dental, psychological, pharmaceutical. Such a record when comprehensive enough might more properly be termed the "Health Record".

– ECGs* together with the specialists' "reading" of them;
– blood and other biochemical analyses.

At the present there is no standard universally accepted method of recording the plethora of information which can accumulate in this way; also, some of the data are typically either illegible or disorganized and are gathered in a repetitive way. Thus a prerequisite to the development of a computerized medical record is a reassessment of the actual data gathering procedures. Such an exercise would involve, for instance,
– reduction in the amount of data collected, by a critical evaluation according to need;
– consolidation of information at the source;
– identification of meaningful data for storage in computer memory.
In other words, it is impractical to computerize the medical record in its present form. Standardized format and procedures must be devised.† The requirement for standardization of data and for entering it into a computer defines only the minimum data. It does not imply that no other information can be recorded or that all records must be entered into a computer. There can be no question of the right of health personnel to keep additional personal notes, in particular notes containing highly subjective impressions or thoughts too tentative to be entered into a formal record.

To sum up, a computerized record system should be:
– *standardized* to make it readily decipherable to all authorized members of health personnel (including remote users);
– *easy to produce;*
– *linkable* with other records relating to the same illness or person;
– *quickly accessible* from the computer for either emergency or statistical work, and legible for quick reference;
– *confidential*, with access only by authorized individuals;
– *functional*, in that it would embody and help to meet the whole range of requirements of clinical medicine;
– *multifunctional*, to meet also (as far as possible) the needs of the management for scheduling, financial and other information and to satisfy provincial and federal requirements for statistical data.

It is evident that the detailed nature and degree of usefulness of the optimal record will depend on the type of approach to health care. For example, the many benefits of a suitably designed record would be manifest in connection with the type of approach known as "problem oriented" medical care. This approach describes a patient's condition in terms of a set of problem areas and allocates each test, prescription, etc., to a particular problem. The problem list is always kept at the front of the record so that all problems are considered before the patient is released (Bjorn and Cross 1970; Hurst and Walker 1972). The superiority of this approach awaits objective verification. If, as appears intuitively reasonable, the problem-oriented care is an improvement over some present approaches,

*Electrocardiograms; electroencephalograms (EEG) would be another example, note also page 40.
†For further discussion see, for example, Cousineau et al. 1973 and Côté et al. 1973 (project SNOMED).

it will require a problem-oriented medical record, which is more manageable in a computerized system.

Hospital Information Systems

Each time the physician writes an order for measurement or therapy for a patient, a dozen or more unit actions by the staff may be generated, all controlled by separate written records. Then, as noted, each patient generates a medical record which grows rapidly in time, becoming increasingly difficult to handle and access. Vast storage spaces are utilized for holding many old records for possible future reference. However, information in these is not readily accessible. Thus they have not been useful for the development of much needed data banks.

Almost all patient orders involve a cost, hence the accounting section must arrange to receive enough information. This is one area which is now rapidly being computerized, often by voluntary cooperation of hospitals within a region so as to benefit from the efficiency of larger systems. Such conversion to computers was often begun on the basis of payroll, since this item accounts for about 70 per cent of a hospital's budget, and since the problem of payroll accounting had already been solved in large organizations. It is estimated that between 20 and 30 per cent of the total staff time in hospitals is spent on clerical work (this would imply about $750 million yearly in Canada). There is a clear need for total hospital information systems serving administration, medicine and research, either directly or through the larger regional Health Information Systems (HIS), of which they should be a part.

Medical Audit

In a financial audit, one accountant checks the work of another. In a medical audit, the work of a health professional or a health unit in a hospital or clinic is checked for quality by a group of peers. Quality of care must be related to the end results of care. A record of the process of care is needed before we can arrive at indicators of quality. Thus, at present, the audit is a description of prevailing care and not yet a final indicator of quality. The particulars of each patient must be recorded, often on a computer, and compiled to permit periodic comparison with other patients and other professionals' work. The trend has been for this storage and retrieval to be done by service agencies such as the Hospital Medical Records Institute (HMRI) in Ontario with 70 hospitals subscribing, 7 of them outside the province. The HMRI has in operation a widely expanded number of programs including Special Audit Reports (Hospital Medical Records Institute 1973) and its membership is now expanding rapidly. Canada is also served by the Commission on Professional and Hospital Activities in Ann Arbor, Michigan. The two major services of the latter commission are the Professional Activity Study (PAS) and the Medical Audit Program (MAP) (Commission on Professional and Hospital Activities 1973a, b). These two services are being used by 1 836 and 1 268 hospitals respectively, with 244 of the former and 70 of the latter services being provided to Canadian hospitals in August of 1973. Some larger hospitals have set up their own recording for audit, claiming more detailed and intimate

knowledge and recording capability.

The computerized medical audit service is not in the same category as a true medical audit by a group of peers. It provides only a coarse monitoring service which is useful, however, in that it points out instances of deviant performance where true medical audit by peers may be necessary.

The medical audit, if it focusses on health care processes which are known to influence end results, can be a valuable procedure that should be encouraged, but is critically dependent upon the quality of medical records assembled at each hospital. The development of a sophisticated system for encoding diagnostic information (Project SNOMED at Université de Sherbrooke) may have a significant impact on the situation.

Record Linkage

The difference between ordinary records and linked records is that the former treats each event as a discrete entity, whereas the latter permits events which happen to the same person to be correlated and thus creates a capability for recognizing cause-and-effect relationships (Medical Research Council 1968b).

Record linkage, although simple in concept and very useful, is not widely employed because of the physical difficulty of relating the record of one type of event to another. Such events have not typically been recorded in a way conducive to their rapid analysis by computer. Other obstacles involve changes of family name by marriage and the movement of population from one part of the country to another. These obstacles would be overcome with a more general "social record" information system. Resolution of the problem of identification would require universal use of some accepted system, such as that now potentially provided by the personal social insurance number.* The system used must cover, individually, all who reside in Canada, native (from the date of birth) or immigrant (from the date of becoming insured).

It will be noted that the mere keeping of records, as difficult as this may be, is not sufficient for record linkage to take place. The records must be compatible, accessible and in a form that enables the analysis to proceed in an economical way. Thus the value here of a computer-based regional record system should be self-evident.

Regional Record Systems

The term "regional" is used here pragmatically, referring variously to an area embracing a province, less than a province or more than a province, depending upon technical, economic and political considerations.

Among those aspects of the health care structure which would benefit from a regional record system are:

- private physician services;
- emergency room service;
- diagnostic service;
- record linkage to test hypotheses of cause-and-effect relationships;

*At the present time, the social insurance number is not assigned at birth except in P.E.I. However, it has the advantage of being an identification system used across Canada.

- management of national, provincial or regional structures including predictions of future requirements based on trends;
- simulation of major systems to assist management;
- statistical service on health and health care by Statistics Canada.

The advantages of such a regional system have long been apparent and several systems are now in various stages of development in a number of countries, for example:
- The Kaiser-Permanente Medical Insurance Group in Oakland, California, with 1.3 million records.
- The Danderhyd Hospital System for Stockholm, Sweden, covering a population of 1.4 million.
- The Sherbrooke, Quebec, system which is planned for a 600 000 population base (Cousineau et al. 1973).

Experience with the first two systems shows that such projects require substantial funding over a considerable period of time.

The long time lag involved in the development of health care facilities and personnel makes planning in this field very difficult. Dynamic simulation on a computer is being developed as an important planning tool (Milsum et al. 1971a), for example, project MEDICS (Bélanger et al. 1972) and "Vancouver Regional Health Planning Model" (Milsum et al. 1971b). Both the development and the full utilization of modelling is affected by the availability of information. This could most readily be provided by the regional health information systems.

Protection of Privacy

The development of large scale data banks and information systems raised a potentially major social issue, namely, the problem of protection of individual privacy, and protection of individuals against the consequences of erroneous information about them that could become stored in such systems. In the case of health information systems, the potential dangers are particularly acute and so is public apprehension, among doctors and patients alike. A carelessly designed and/or managed HIS could indeed cause much harm to some individuals in spite of its general benefits. We are confident, however, that the problem can be overcome without undue difficulty, provided that it is handled in the design stage of a system. The necessary programming and encoding techniques already exist (Feistel 1973); the decisions on who should have access to what information (including information about oneself) and who should be the custodian of the information are social decisions which are not dependent on the use of computerised information systems. The use of such systems makes some problems easier, since it is relatively simple to make a required category of information available for research or planning purposes without allowing access to individual records containing names of individuals or other information that should be protected. However, several social decisions have yet to be made. For example, the Ontario Council of Health (Appendix C, "Ontario", item 1, supplement 9) has studied the creation of a Privacy Committee to deal with access to, and disclosure of, personal information. The Quebec legislation (Appendix C, "Quebec", item 2) makes provisions for the use of information for research purposes and for

accessibility to the patients. While the social attitudes are being defined, there is no need to retard the much needed development, providing sensible safeguards are maintained.

Computer Assisted Diagnosis and Learning

Diagnosis is rarely a precise procedure. More often it is an iterative investigation in which the physician takes a history, makes certain readily obtainable observations, and, drawing on knowledge and experience, comes to some tentative hypotheses regarding a number of diseases which might be present to account for the observed conditions. The physician then makes an estimate of the tests required to resolve the problems together with a weighing of the costs to the patient in dollars and discomfort. As more information is gathered, and the process continues, one diagnosis begins to emerge as the most probable and, finally, reaches virtual certainty. Of course, when the case seems simple, the mind may skip some of the steps and arrive at a rapid decision.

Can such a mental task be assisted by a computer? The answer from a growing body of workers (for example, Taylor 1970) is that computers can be programmed for special cases, but for broader application, only after we know more about diseases. For some diseases which have been studied specifically for the application of computer assisted diagnosis, the computer is able to match or perform better than experienced diagnosticians; for example, in the diagnosis of acute abdominal pain, a determination that is fraught with uncertainty (de Dombral et al. 1972).

A suitably programmed computer, supplied with an adequate data base, can provide:

- a guide toward the most efficient way of arriving at a diagnosis;
- an objective check of the diagnostic methodology used by the physician;
- a means of preventing the physician's thinking from falling into familiar ruts, and thus overlooking unusual ailments;
- access to the most recent advances in a specialty;
- a means of keeping remote physicians in touch with their colleagues who contribute new experiences and ideas to the system;
- a means of giving a remote physician a rapid consultation in an emergency, such as a poison case*;
- an untiring 24-hour a day service.

However, as noted above, the knowledge of various diseases and their probable symptoms is not well enough developed to enable such a system to be expanded to embrace the total field of medicine. More statistics need to be gathered regarding the conditional probabilities of symptoms. Such a gathering process is dependent upon the accurate collection of a great many medical records and much statistical research. The role of the computer will become more important as diagnosis increasingly becomes a matter of objective decisions, but the computer can not replace intuition and judgement based on the factually indescribable processes of human thought. While the required basis of knowledge is

*A "Computer Based Poison Information System" has been organized by the Faculty of Pharmaceutical Sciences, University of British Columbia, in cooperation with the Government of British Columbia.

slowly accumulated, the methodology of computer-assisted diagnosis is being developed and even put into limited service (Levine 1973).

In the above discussion, attention was centered on the higher levels of the diagnostic process. At the opposite end of the scale is the analysis of individual test results. Here computer assistance comes in the form of automated analysis. Automated analysis of laboratory specimens is now commonplace and has led to a great reduction in the cost of such testing. Another important application is the analysis of electrocardiogram (ECG) (Marriott et al, 1973; Manfreda and Classen 1973) and electroencephalogram (EEG) records (Cox, Nolle and Arthur 1972). These require great skill and are time-consuming in direct analysis by human experts, but have the advantage of starting in the form of an electric signal which can easily be transmitted, even over a long distance, to a computer programmed for pattern recognition. Several Canadian universities (notably Dalhousie University in Halifax) are engaged in research in this field, where much more work is needed before computer analysis will become a reliable medical tool.

More recently, there has been a considerable development in the application of computers in radiology, particularly in the processing of chest radiograms, which presents a great enhancement of abnormalities that only a very careful examination by an expert could detect and diagnose on a conventional image.

If a computer can assist in diagnosis, it can also assist in learning. The simplest use is that of providing a specific reference service or short lectures on given subjects, available by telephone. Such a Dial Access Service was developed in 1970 by the Division of Continuing Medical Education, University of Saskatchewan, in cooperation with the Saskatchewan Medical Association. A library of some 500 topics is available (Laxdal, Krause and Souster 1972). A similar service is now being offered by the Sunnybrook Hospital in Toronto. These services are utilized to the extent of several hundred calls a week.

A more sophisticated and very promising use of computers employs interactive mode of communications between a computer and individual (or groups of) students, i.e., where student response has an influence on further presentation by the computer. Such computer aided learning (CAL)* is being developed for applications in many fields (National Science Foundation 1972). Most of these developments are applicable to the teaching of health subjects and the training and testing of health personnel (Wismar and Christopher 1970; Harless et al. 1969). In Canada there are several medical CAL systems in operation, for example, at the University of Alberta in Edmonton and at McMaster University in Hamilton. The National Research Council in Ottawa is developing a CAL research centre which is intended for remote access by any university in Canada. Remote access CAL systems will require low cost computer communications, which have been recommended by the Science Council,† by the Canadian Computer Communications Task Force (Department of

*Also known as computer assisted instruction (CAI) and computer managed instruction (CMI).
†Report No. 13, see List on end pages.

Communications 1972, vol. I and II),* and by a position paper of the Government of Canada (Canada 1973, pp. 9 and 14).† Inter-university cooperation can greatly enhance the development and use of CAL. A proposal for a Canadian University Computer Network (CANUNET) has been put forward by the University of Quebec and is being developed by the federal Department of Communications.

Improved Management

Since the last war, health care in Canada not only has become a multi-billion dollar industry, but it also has undergone a transformation toward a much greater degree of centralization and complexity, from the financial centralization of payments to independent practitioners through medicare, to the growing size and complexity of hospitals with increasing governmental funding. The new situation has required new methods of management. The management inevitably has also grown in size and complexity, but this has not ensured optimal adjustment to the new requirements – largely because the systems approach was lacking. When direct observation has to be replaced by distant accounting control, numerical criteria of efficiency can interfere with patients' needs. Also, the type of voluntary board of directors and executive structure that can manage a 50-bed unit very well is quite different from that needed for a 500-bed hospital with specialized wings. It is often said that the simplest way to improve the apparent efficiency of a hospital, as commonly measured in cost per patient day, is to keep patients hospitalized a few days longer than necessary. The cost per patient-day for convalescents is much lower than the cost of the initial days of intensive treatment, hence the average cost goes down and the *apparent* efficiency goes up – but so does the *total* cost. Many other examples could be quoted of waste due to unsuitable methods of accounting, or restrictions on free availability, without hospitalization, of certain services which could be performed on an ambulatory basis at a lower cost.

The above problems are easier to perceive than to rectify. The following projects have been tested with apparent success in some cases:
- bulk buying for health care centres (laundry, drugs and other supplies);
- increased use of cafeterias for ambulatory patients and of centrally-packaged precooked meals, as in airlines;
- emergency agencies for poisonings, drugs, suicides, etc.;
- hotel-motel type facilities (for patients receiving various levels of ambulatory care and for their relatives).

Some of the major trends toward improvement in management for the purpose of improving the service are described below.

*Volume II of this reference contains an overview of the applications of computers in health care (Chapter B3): "Computers, Communications and Canada's Health Care Delivery System," pp. 131–173) and in education (Chapter B2: "Applications in Education", pp. 101–130).

†A drastic reduction of rates for digital communications on routes linking principal cities in Canada has been announced by the Trans-Canada Telephone System on 21 February 1973.

Decentralization/Point of Delivery Concept

The trend in modern planning is to recognize the need for subdividing the impersonal, large urban societies into self-identifiable, closely-knit communities. This viewpoint is reflected in the "point of delivery" concept which emphasizes the physical and psychological convenience of the consumer who receives the desired services. In health care this means easily accessible community clinics, group practice centres or sub-hospitals, open at times convenient for the local population. The term "community clinic" implies two-way integration, i.e., the community is not only receiving services, but is involved in providing them and influencing their nature. In fact even more is aimed at, since such clinics should be integral parts of a much broader "Community Center" offering a wide spectrum of health, welfare, recreational, and social facilities, all within a convenient distance, as in the old "village square" situation (Pearse and Crocker 1947). Many variants of community clinics have been tried in the past* with varying degrees of success (one in Manitoba is 46 years old, two in Saskatchewan are 10 years old) and many more will be tried in the future. The economic advantages of this concept are still under discussion, but many provinces are embracing the idea.† One motivation arises from the fact that 80 to 90 per cent of demand involves only the primary care level for which no complex facilities are necessary (Appendix C, "Quebec", item 1, Vol. 4, Tome 2, p. 32).

Centralization

The idea of decentralization can only be viable when supported by more sophisticated centralized facilities, with suitable communication and transportation links. There is a trend toward establishing a network of local facilities (including a computer-based information system) closely linked to a hierarchy of increasingly expert health centres (see Appendix B). An example of this was the Castonguay-Nepveu report (Appendix C, "Quebec", item 1, Vol. 4, Tome 2, pp. 28–47) which proposed three levels of health care facilities: the local health centre, the community health centre (this could be based in the present conventional hospital, but not necessarily so) and the university hospital centre. However, proposals for administrative unification of various health care establishments to facilitate better specialization and coordination of functions in accordance with the principles of a systems approach have, in general, been effectively resisted by the independent establishments. Some provinces intend to introduce a measure of local centralization of planning and budgeting by setting up district (or local) health councils, but the proposed role of such councils is purely advisory.

*See H.R. Robertson (1973b), Appendix 2, research projects No. 282 to 291, and Appendix 10, "Summary of Recommendations from Major Studies", part 3b: Community Health Centres.

†A major study of the concept of Community Health Centres was commissioned by the Conference of Health Ministers. The report on the study was presented for their consideration in 1972 (Appendix C, "Canada", item 4) and is summarized here in Appendix B, "Community Health Centre Project", pp. 115–118.

Reorganization of Facilities

The above trends may be summarized as follows:

1. There is a tendency to organize interrelations among the health care facilities in a more systematic way than at present, through a better combination of centralization and decentralization.
2. It has been recognized that there is an excessive tendency to place patients in intensive care hospitals. This has resulted in an oversupply of the very expensive intensive care beds. At the same time, there is a shortage of satisfactory convalescent beds, observation units, ambulatory services, rehabilitation centres, day or night care centres, and domicile service, all of which are much less costly. An expansion of the range of facilities covered by health insurance is necessary to correct this imbalance and reduce the cost of health care per patient.*
3. The principle of community involvement in the definition of its needs and in the observation of their fulfillment through cooperating, specialized facilities (inherent in the systems approach) is being broached through community participation in advisory health councils or in community health centres.
4. Physicians will increasingly be drawn to work in teams, either as a private enterprise (group practice) or as participants in public enterprise (community clinics or health centres). Contractual agreements between the former and the latter organizations are also likely in the future.
5. Practice in the above facilities permits teamwork between the various types of health care personnel in ambulatory practice similar to that developed in hospital work.
6. Community health centres, as public institutions, might facilitate the integration of personal medical care, health protection by public health personnel, and social work.

Reallocation of Functions Among Personnel

It has been realized for some time that one of the major reasons (or even the major reason) for the present shortage of some kinds of health personnel and the high cost of service lies in the fact that a large percentage of services are provided by personnel who are more highly trained than is necessary.†

The details of the various possible ways of overcoming this problem are still being discussed, but there is no doubt that the concept of expanding the role of the lower echelons in the health profession is gaining support. The physicians and dentists involved will more often become leaders of a multilevel health team, in which they themselves perform only the most sophisticated tasks (Smith, Miller and Golladay 1972). There will also be independently operating "nurse practitioners", "feldscher" midwives, possibly dental auxiliaries, etc., for whom successful precedents exist in many countries and in the Canadian North. Suitably oriented training of the necessary personnel (which previously had to be imported from abroad) is expanding (Appendix C, "Canada", item 9).

*See Appendix B and H.R. Robertson (1973b), Appendix 10, Part 3e "Continuing Care".
†See H.R. Robertson (1973a) pp. 69–80 and (1973b), Appendix 10, Part 4c, "Physicians' Assistant".

The team concept has to provide due recognition to the role of all types of personnel involved in health care. The rapidly growing use of complex technical equipment demands a well-established Health Care Engineering Service (HCES) as its human counterpart. When we speak of ambulatory facilities, efficient patient handling, or the flow of health information, we take for granted the efficient utilization of equipment, the logical operation of the systems, and the use of basic computer applications. This is rarely so, since health care institutions are still basically non-technical in nature.

If technology is to contribute to improve efficiency, to stabilize costs and to benefit the health care system, it must be utilized by competent professionals and subjected to continuous updating and evaluation. In this respect, an HCES is a natural complement to medical and paramedical services, and an indispensable asset to management. Furthermore, it must be emphasized that the introduction of modern management methods and the introduction of proper technology can effectively be realized only by people continuously in contact with health care problems. Otherwise, it may fail to be relevant and therefore miss the goal. Consequently, an HCES can fully play its role only if it is integrated with health care operations.

Emerging concepts of health education aim at maximizing the number of common courses for various types of personnel. Lower levels of training should no longer place incumbents in dead-end positions but, with the aid of experience gained at a lower level of work, would one day facilitate a return to school for upgrading. An increasingly flexible system might thus be developed.

Transportation and Telemedicine

The optimum distribution of facilities and personnel necessarily depends on the ease and speed of transportation and on the availability of good communications. During the past quarter century, improved transportation has exerted a major influence on the development of health care, mainly by promoting greater centralization of services. This increased the importance of emergency transportation. Remote areas continue to benefit from improved technology, but in the cities the result of "technical progress" is frequently a traffic jam. Recent cross-country reviews* as well as several provincial studies,† have shown a very uneven distribution of the quality and cost (to the patients) of ambulance service among the provinces and often within the provinces. This situation is partially due to geographic and demographic influences, but is much affected by the different approaches of the various authorities. The available technology is not everywhere utilized as much as it could be and there are large differences in administration, supervision and integration with emergency departments in the hospitals.‡ Ontario has the only provincially-operated,

*e.g., the federal/provincial "Working Party on Ambulance Services" in April 1972 and the federal/provincial "Emergency Health Services Director's Conference" in October 1972.

†e.g., in Manitoba, Saskatchewan, Alberta, and Nova Scotia.

‡The latest study in this field has been undertaken by the Traffic Injury Research Foundation of Canada (116 Lisgar St., Suite 100, Ottawa, Ont.) *Study of Emergency Care of Injured People in the Ottawa Area.*

radio-controlled, full-time ground ambulance service in Canada. Quebec is planning to set one up. Newfoundland is relying largely on air services. These are also extensively used in the northern parts of other provinces, under various arrangements. The Canadian Forces operate search and rescue missions and mercy (i.e., "a matter of life and death") flights. The use of helicopters to overcome traffic problems in large cities is very rare. The experience at the Hospital for Sick Children in Toronto showed that a landing pad on the hospital roof is not sufficient, since a helicopter can seldom be made available quickly enough and land near the site of an emergency for patient pick-up. Computer simulation can be used for finding optimum location of ambulances (Swoveland et al. 1973).

An efficient utilisation of ambulance services clearly depends on the availability of mobile radio communications. The medical effectiveness of that service can also be drastically affected by communications with the hospital base.* The decision, whether emergency transportation is required at all, can also be made more accurately on the basis of a consultation and examination over communication links. The same links can be used for consultation about treatment at a remote location. Provisions for such distant services, and the methodology of their use, are being developed under the name of "telemedicine".

Telemedicine, in its simplest form as a conversation, is as old as telephone and radio. More recently it has been given a new impetus by the development of biomedical monitoring for astronauts on space travel.† Availability of one- or two-way television communications extends the capability of telemedicine, but is not required for a vast number of extremely important applications – whenever a telephone link is used to extend the presence of a more highly trained person to a location served by a less trained (or less specialized) person. Simple interface equipment can permit transmission, for distant recording and analysis, of pulmonary or cardiac auscultation (Murphy et al. 1973), electroencephalogram or electrocardiogram signals (Baxter 1973), etc. X-ray photographs can be transmitted by facsimile equipment over the same link (Gunby 1973).

A recent development for patients recovering from a heart attack might permit them to live at home and move about, while being coupled by a miniature transmitter to a local unit which can detect an anomaly in the heart's signals, alert a doctor or ambulance, and transmit the last minute of the electrocardiogram for an immediate analysis if a dangerous situation exists.

The more powerful forms of telemedicine, using the two-way interactive television (IATV), have been pioneered by the Massachussets General Hospital since 1968 when the first remote unit was placed at the Logan International Airport.‡ Several major projects in this field are currently in

*See Arnold (1974) regarding plans for a medical emergency radio network in the U.S.A.
†A particular re-development for ambulance applicants has recently been described in a press release by the National Aeronautics and Space Administration (1973).
‡See Bird (1973a) for a general discussion, or Murphy and Bird (1974) for a detailed analysis.

operation* or are being installed.† In Canada, in addition to some "conventional" experiments, several universities have proposed (to the Federal Department of Communications) experiments in telemedicine using satellite transmissions via the experimental Communications Technology Satellite (CTS) due to be launched in October 1975 (Communications Canada 1973).

Quality, Cost and Effectiveness

Cost and Quality

Canadian society expects an increasing amount of health care of high quality, but the total resources available will always be limited at some level. It is therefore very important to investigate the relationship between cost and quality and to develop ways of obtaining maximum results from a given investment and effort. In an ideal system of health care, such an optimal relation would be assured by the properties of the system. The practical health care structure is very far from this ideal, partially because of avoidable waste (e.g., bad organization and management, human frailties) but largely due to limitations in our knowledge of what represents high quality health care and how to provide it (cf. the limitations discussed on pages 19–20).

The popularly required characteristics of health care are listed on page 23. Accessibility is the most noticeable aspect of the quality of a health care system and receives much attention. Expanded financial accessibility does not always match the *de facto* physical accessibility, either through lack of local service combined with a lack of suitable transportation facilities, or because the rising demand overloads the capacity of the facilities and personnel, resulting in longer waiting lines for consultation or elective hospitalization. Thus, much development is needed to provide universally good accessibility, without letting the costs run away. However, many problems remain even after access to the system has been gained. Some of the shortcomings listed on pages 23 to 25 were discussed earlier in this chapter in connection with organization and management. Many other aspects of quality should be considered – in particular, the quality of prevention, care, treatment and rehabilitation provided by the health care structure; but one should first look at the magnitude of the costs.

During the years of expanding social insurance, the total health expenditures have risen from $3.2 billion in 1965 to $6.6 billion in 1971. The composition of these costs is analysed in Tables II.1, II.2 and II.3. It is seen in Table II.2 that the principal element of the total cost lies in hospital services (nearly one-half) with physicians' services second in importance (nearly one-fifth).‡ The increase of costs for the total and for these two services in particular is analysed in Tables II.1 & II.2. A portion of the

*See Telemedicine (1973) for an example of a well-documented project.

†An extensive review of the potential of cable television in health services delivery, public health education and continuing professional education has been given by Kalba (1973).

‡The proportion of these two services in the total cost has been rising over the past decade, the hospital costs more so than any other service.

Table II.1–Estimated National Health Expenditures, Canada: Total Health Expenditures

Calendar Year	1965	1966	1967	1968	1969	1970	1971
$ Millions	3 225	3 637	4 083	4 636	5 146	5 786	6 611
Percentage Increase[a]	11.8	12.8	12.2	13.5	11.0	12.4	14.3
Percentage of GNP	5.8	5.9	6.1	6.4	6.4	6.8	7.1
$ Per Capita	164	181	200	224	245	271	306
Percentage Increase[a]	9.2	11.1	10.8	11.6	9.5	10.5	12.3

Notes: Total Health Expenditures include the total expenditures on personal health care, expenses for prepayment and administration, government public health activities, voluntary health organizations, research, and medical facility construction. (See percentage composition in Table II.2).

[a]Calculated in relation to the previous year.

Source: Health and Welfare Canada, Health Programs Branch, Health Economics and Statistics Division, "*National Health Expenditures in Canada 1960-1970*".

Table II.2–Estimated National Health Expenditures, Canada: Distribution by Category of Expenditure (Percentage of Total)

Categories	1965	1966	1967	1968	1969	1970	1971
Hospital Care[a]	45.3	45.9	46.9	47.9	48.6	48.8	47.7
Nursing-home Care	2.5	2.5	2.6	2.6	2.7	2.8	2.8
Total Institutional Care	*47.9*	*48.4*	*49.6*	*49.5*	*51.3*	*51.7*	*50.5*
Physicians' Services	16.9	16.6	16.8	17.0	17.5	17.8	18.7
Dentists' Services	5.0	4.8	4.6	4.6	4.7	4.5	4.5
Other Professional Services[b]	2.3	2.0	2.0	2.0	2.0	2.0	1.8
Total Professional Services[c]	*24.1*	*23.5*	*23.4*	*23.6*	*24.2*	*24.3*	*25.0*
Drugs and Appliances[d]	14.2	13.8	13.7	13.4	12.9	13.0	13.2
Total Personal Health Care	**86.2**	**85.7**	**86.7**	**87.5**	**88.4**	**89.0**	**88.8**
Cost of Prepayment & Administration	2.2	2.0	1.5	1.7	1.3	1.5	1.8
Government Public Health Activities	3.6	3.9	3.6	3.1	3.3	3.2	3.1
Voluntary Health Organizations	0.4	0.3	0.3	0.3	0.3	0.3	0.3
Research	0.8	0.9	1.0	1.0	1.1	1.0	1.0
Medical Facility Construction	6.8	7.2	6.9	6.4	5.5	5.0	5.1
Total Other Health Expenditures	**13.8**	**14.3**	**13.3**	**12.5**	**11.6**	**11.0**	**11.2**
Total National Health Expenditures[e]	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

[a]Includes general and allied special hospitals, mental hospitals, tuberculosis sanatoria, and federal hospitals.
[b]Includes chiropractors, naturopaths, osteopaths, podiatrists, physiotherapists, and private duty and Victorian Order nurses.
[c]Expenditures relating to professionals employed in various institutions are included in institutional care.
[d]Includes prescribed and non-prescribed drugs, eyeglasses from optometrists and from opticians, hearing aids and parts, and other prostheses.
[e]The dollar values of total expenditures are shown in Table II.1.
Source: Health and Welfare Canada, Health Programs Branch, Health Economics and Statistics Division, "*National Health Expenditures in Canada 1960-1970*".

Table II.3–Estimated National Health Expenditures, Canada: Expenditures on Personal Health Care (Hospitals, Physicians, Dentists, and Prescriptions), by Province

$ Per Capita (upper entry) Percentage above the average for all the other provinces (lower entry italics)								Percentage of Personal Income	
Province	1965	1966	1967	1968	1969	1970	1971	1965	1971
Newfoundland	71.85	79.18	94.52	113.14	**125.55**	**138.30**	**153.54**	5.80	6.96
	–41.2	*–41.4*	*–37.4*	*–33.9*	*–33.9*	*–34.7*	*–35.7*		
Prince Edward Island	82.24	91.01	103.87	111.76	124.30	137.95	**155.55**	6.54	7.11
	–32.1	*–32.1*	*–30.7*	*–34.3*	*–34.1*	*–34.4*	*–34.4*		
Nova Scotia	103.99	115.43	131.46	145.13	**163.69**	**185.99**	**205.07**	6.66	7.86
	–14.4	*–14.2*	*–12.6*	*–14.9*	*–13.5*	*–11.8*	*–13.8*		
New Brunswick	105.05	111.55	125.96	141.83	152.61	163.27	**196.31**	7.34	7.95
	–13.5	*–17.1*	*–16.3*	*–16.8*	*–19.5*	*–22.7*	*–17.5*		
Quebec	114.45	132.52	143.76	160.64	177.69	198.08	**234.42**	6.10	7.75
	– 7.32	*– 1.33*	*– 5.46*	*– 7.32*	*– 7.75*	*– 7.7*	*– 1.27*		
Ontario	133.01	143.15	163.29	188.18	209.15	**234.07**	**259.05**	5.47	6.54
	16.2	*11.1*	*14.7*	*17.9*	*18.1*	*19.00*	*15.6*		
Manitoba	118.73	129.48	141.77	160.27	**182.96**	**206.54**	**232.06**	6.06	7.25
	– 1.86	*– 3.38*	*– 5.53*	*– 5.81*	*– 3.01*	*– 1.7*	*– 2.01*		
Saskatchewan	122.80	131.75	141.50	**153.24**	**168.17**	**183.86**	**197.89**	6.53	7.13
	1.67	*– 1.61*	*– 5.72*	*–10.1*	*–11.2*	*–12.9*	*–17.0*		
Alberta	122.33	138.93	159.20	183.81	**200.00**	**222.38**	**242.62**	6.04	7.13
	1.3	*4.15*	*6.9*	*9.04*	*6.71*	*6.44*	*2.76*		
British Columbia	122.88	134.31	150.31	**167.07**	**188.48**	**206.80**	**226.38**	5.19	6.10
	1.83	*0.43*	*0.47*	*– 1.71*	*0.07*	*– 1.66*	*– 4.79*		
Yukon & Northwest Territories[a]	100.81	108.93	117.45	118.48	134.19	142.58	160.91	6.14	6.18
	–16.6	*–18.6*	*–21.6*	*–30.2*	*–28.8*	*–32.1*	*–32.0*		
Canada	120.87	133.80	149.67	169.69	188.36	209.94	236.61	5.80	6.96

Notes: Expenditures on Personal Health Care amount to about ¾ of the "Total Personal Health Care" as defined in Table II.2, by excluding non-prescription drugs, appliances, other professional services and nursing home care.

Entries in bold type show per capita expenditures for years during which the provinces participated in the federal medical care program for six months or more.

[a]The Northwest Territories joined the federal medical care program in April 1971, but the Yukon did not do so until April 1972.

Source: Health and Welfare Canada, Health Programs Branch, Health Economics and Statistics Division, "*Expenditure and Personal Health Care in Canada 1960-1971*".

total rise in costs is attributable to the increased amount of services performed and their increasing sophistication due to general medical progress. (The effects of inflation can be taken out by using GNP or personal income as the basis of comparison.)

The rates of increase would not be too alarming, but for two facts. One, the costs for Canada as a whole continue to rise faster than the GNP; and two, the main increase is due to the rise in the per unit cost rather than the amount of the services rendered. For example, the number of hospital beds and their occupancy has been nearly static, hence the increase of hospital care costs amounted to a similar increase in the cost per bed-day. (In view of its magnitude, this problem has been thoroughly analysed (Appendix C, "Canada", item 2) and detailed information on the composition of the rising costs is available (Statistics Canada 1974a* and Health and Welfare Canada 1973a, 1973e).)

It has to be noted that the extent of the annual increase in the cost of health care for Canada as a whole, calculated on the basis of budgetary annual expenditures, might give an overly pessimistic impression since individual provinces were gradually joining the federal medicare program during the period shown in the tables. The added costs of starting a program thus disguised the natural trend in the total costs. Detailed information regarding the cost performance on a province by province basis is available for the last eleven years (Health and Welfare Canada 1973e). When corrections are made for joining the federal program in the middle of a year, it appears that the average annual increase in the cost of physician services (on a province by province basis) was lower in the post-medicare years than before (communication from Health Insurance Division, Health and Welfare Canada). An indication of the absolute and relative costs of personal health care in the individual provinces and the territories is shown in Table II.3. For added perspective, the per capita costs are shown as a percentage of personal income. Due to high personal income, this percentage is relatively low for Ontario in spite of the province having the highest per capita costs in the country.

Nevertheless, the inescapable conclusion is that the overall rate of increase of costs must be slowed, even if our society decides to devote a still higher percentage of its resources to health care.† This is even more necessary if funds are to become available for the further extension of services. Thus much thought has been given recently to the possibilities of reforms in the methods of health care delivery, including cost and quality control, that would break the rising spiral without detriment to quality. Some drastic departures from the conventional delivery of care have been tried, but it is difficult to make choices without improved methods of assessment.

*The cost of personnel is shown to be the principal expense.

†The influence of close interaction with the U.S.A., where the costs are still higher, adds to the difficulty of cost control in Canada. A detailed comparison of the costs of health care in Canada and the United States has just become available (Health and Welfare Canada 1973a).

Experimental Tools

The knowledge of what represents high quality care is a prerequisite of any optimization of quality with respect to cost. On the clinical side, properly conducted trials are necessary on groups of patients numerous enough to reduce the effects of the different susceptibilities of individuals to a particular treatment, the somewhat different circumstances in each case, and the effect of being given special attention. A "properly conducted" trial deals with outcomes of a treatment (i.e., the overall effects, as far as assessable), rather than with the more easily measured specific outputs, like a reduction in the length of hospitalization. A particularly powerful experimental method of evaluation of treatment is provided by the Randomized Clinical Trial (RCT) in which the results of two treatments (or an actual and simulated treatment) are compared, using a group of volunteers who are sufficiently differentiated in their characteristics to provide an unbiased sample of the "at risk" population. The results of such trials have often indicated that a more costly and supposedly "better" treatment is not more, and may be even less, effective than the more economical alternative (Sackett 1972a; Cochrane 1972). The reasons may be diverse – from a mistaken initial belief in the value of the treatment (e.g., keeping a patient in bed longer than necessary may do more harm than good, at a high cost); through lack of effectiveness because patients tend not to comply with the treatment (which would help them if they complied); to lack of efficiency because equal or better results could be achieved at a lower cost. Unfortunately, RCTs are difficult and often costly to conduct. Nevertheless, they represent an extremely important element of the R & D spectrum in health care, without which costly, but unnecessary or harmful, treatment may often be provided to patients. In fact, research that results in improving the efficiency of an apparently effective treatment may even lead to "increasing the efficiency with which we provide harm to the consumers of health services".* Such danger would be minimized if the principles of the systems approach were vigorously applied in health care.

Analytical Tools

Cost-benefit and cost-effectiveness analyses are becoming important methodologies which can help us to estimate the relative merits of various possible health care programs. Cost-benefit analysis (Prest and Turvey 1965) is more complete analytically. Its aim is to show which one among a set of possible programs maximizes the ratio of the present value of all benefits, compared to all costs (subject to specified constraints). The analysis includes a long-term view, in that future effects are considered (with an appropriate discount to their equivalent present values). It also includes a broad view, in that all predictable side effects are accounted for. Unfortunately, the evaluation of benefits involves the artifice of converting to dollar values such almost intangible effects as increased patient satisfaction with a new nursing schedule, or decreased pain brought about by a treatment.

Cost-effectiveness analysis sidesteps this problem by measuring output

*Extract from a personal communication from Dr. D.L. Sackett.

effectiveness in terms of some appropriate but arbitrary unit. However, the corresponding disadvantage is that programs which are measured in different effectiveness units cannot easily be compared. For example, the life-years gained by kidney transplantation programs cannot be compared with the disability-days saved by a program which fits artificial limbs on amputees and costs the same amount. Even when two programs can be measured by the same unit, e.g., the gain of life-years, the difference in the quality of life gained by two different procedures should be taken into account. This presents a major problem in evaluation – for example, in comparing the effectiveness of kidney transplantation with external dialysis units.

The above analytical tools may give the impression of being rather abstract, but there are many examples of their successful application, i.e., applications in which the choice or continuation of a treatment was affected by a calculation of its cost-benefits. We can mention the decision to add vitamin D to milk to prevent the onset of rickets in young children during the low-sunshine winter months in Canada, the expansion of immunization against measles and rubella, and a reconsideration of the value of mass screening for tuberculosis by chest X-rays.

III. Protection of Health

The previous discussion of costs versus benefits in health care naturally leads to a consideration of the *protection* of health, which traditionally has been supposed to be very cost-effective ("an ounce of prevention is worth a pound of cure"). In any case, the non-monetary value of good health is so high that no health care system can be regarded as complete if it does not give proper attention to protection of health. The purpose of this chapter is to stress those features of health care which, given the traditional emphasis on curing sickness, have stood on the periphery. We will take up a number of topics which we consider important in this broader field and review trends in the attention that is currently paid to each.

There could be a semantic problem in our use of the term "Protection of Health" since this term is sometimes used in a restricted sense of protecting the public, through legislation and regulations, *to prevent* exposure to certain hazardous influences (e.g., radiation, noise, chemical and infectious pollution, dangerous devices) by removing them from the environment and the market place. For lack of a more general expression, we have used this term to embrace all the activities which are aimed at *enhancing health by means other than treatment of disease*. Protection from exposure to danger represents only one aspect of the broad range of needs and possibilities in this field. Protection of health through promotion of physical and mental fitness represents its necessary positive counterpart. There is also a broad field of influences which are not hazardous enough to be restricted by regulation, but are not conducive to promotion of health. These influences might be externally imposed (e.g., some aspects of urban development, house design, working conditions) or self imposed (e.g., smoking, overeating, lack of exercise). Thus protection of health embraces two main approaches:

1. *Promotion* of physical and mental fitness
2. *Prevention* of accidents and contagious or otherwise exogenously induced diseases.

Both approaches have their medical and non-medical aspects, although medical intervention is most pronounced in the prevention of disease through immunization against infectious diseases. Screening programs aimed at the early detection of diseases which can more easily be cured or arrested in their initial stages, are also often regarded as an element of preventive medicine. In general, protection of health had spectacular successes in the 19th and early 20th centuries, when vaccination against smallpox and environmental reforms (pure milk and water supplies, sewage disposal and malarial mosquito control) were major influences on the reduction of mortality (which led to the problem of "population explosion"*). Since that period, attention has been moving increasingly to the treatment of illness, partly because the most easily instituted pre-

*It is also believed that the development of transportation, with the resulting great increase in the variety of diet for large groups of population, had a major contributory effect (Health and Welfare Canada, Nutrition Bureau).

ventive programs had already been implemented and partly because of rapid progress in clinical medicine. There is no readily available inventory of protective activities and their costs, but the *following trends* may be observed.

Public Health Programs

In Canada in 1971, only about 3 per cent of our health dollar went into the government public health programs (see Table II.2) although they were the main source of support for the protection of health. These programs have to compete with the population and technology explosions. Previously satisfactory methods of environmental control are in danger due to saturation of water, air and soil by pollution, while new and economically feasible methods have not yet been developed. The flood of new chemicals for drugs, food additives and industrial processes overtaxes the long-range testing capabilities of laboratories. It is often impossible to ascertain before the fact whether more harm will be done by approving a product or by withholding the proven benefits of its use, since some harmful side effects may become apparent only after years of mass usage. This typifies a basic difficulty – long-term effects are very much harder to determine than short-term ones, particularly in the absence of a mechanism for linking data on effects to remote data on causes. A rising public awareness of the long-term problems may help to redress the balance, if the public will become sufficiently concerned to accept the cost of greater prudence.

A particularly successful (and cost effective) part of the public health program lies in the well-developed area of immunization, which has virtually eliminated five dreaded diseases: diphtheria, poliomyelitis, tetanus, smallpox and, through postexposure vaccination, death from rabies. The fact that some 27 000 cases of diseases for which a vaccine was available were reported in 1971 (Statistics Canada 1972b, p. 2) is mainly due to gaps in the coverage of pre-school children, because of the lack of a suitable monitoring system.

Environment and Life Style

The gradual deterioration of the working and living environment in many cities is now beginning to receive more notice from the public by reason of the influence of long-range forecasters and personal discomfort. The establishment of Environment Canada and its various provincial counterparts is an overt expression of public concern and governmental reaction. These departments have a major role to play in the protection of health since many environmental effects are felt only after years of exposure and are by then irreversible. Developers and short-range planners seldom show the necessary degree of concern or understanding, while health authorities often have little direct influence on the situation. The increasing installation of pollution monitors and controls is an indication of a new trend, but the rate of progress in environmental control is slow, or at some places even negative – which is not surprising in view of the amazing amount of public tolerance.

Nutrition

Proper nutrition is one of the most obvious protective activities which depends on both the environment and personal life style. Some underprivileged groups in our society still suffer from plain lack of food, i.e., under-nutrition. Correction of this problem is mainly a matter of providing employment opportunities and welfare coverage. However, a large percentage of our more affluent population suffers from malnutrition in spite of an abundance of food. This is due to habits of eating food that satisfies hunger without providing a balanced diet, or that may even provide harmful quantities of some substances. Excessive intake of carbohydrates (contributing to dental decay, obesity) or certain fats (suspected of causing cardiovascular problems) are typical examples of such destructive nutrition. The considerable progress in the related knowledge of the enrichment of common foods by vitamins, proteins and other needed elements is in continuous competition with nutritionally harmful processing for various popular (often induced) "appeal" reasons and with a general lack of dietary education.

A number of surveys show how bad the situation is. Surveys in Ontario have rated 69.5 per cent of adolescent girls and 39 per cent of boys as "poor" or "very poor" in nutrition (Trenholme and Milne 1963). In the case of the elderly, one survey revealed an inadequate diet in 50 per cent of cases (Campbell 1970). In the U.S.A. a survey of the poor in several states revealed some shocking statistics (Schaefer and Johnson 1969). Recent information from California indicates that the total social costs for that state that can be attributed to various nutritional problems might be as high as $3 billion (Briggs 1971). The present situation in Canada will be known when Nutrition Canada completes its survey in 1973.*

In recent years the progress in the development of new or improved sources for the necessary nutrients has been spectacular and shows even greater promise.† However, the progress we have been making in nutritional education and in the restriction of unhealthy commercial practices has been dismal. Also, arguments still taking place among experts regarding the positive or negative value of some foods are not encouraging the population to take dietary recommendations too seriously.

*The first publication resulting from the above survey (Nutrition Canada 1973) was released just at the completion of this report. It is too late to give full justice to its findings, but we can note that the pessimistic anticipations have been confirmed. Nutritional problems were found to be independent of the amount of money spent on food (extreme cases excluded). Overweight plagues a large proportion of adults, apparently from a combination of too many calories and too little physical activity. It is a typical self-inflicted problem, though there are many external influences encouraging unhealthy choices.

Iron deficiency (contributing to anemia) was found to be more common than generally expected, affecting men as well as women and children. Protein deficiency, probably associated with the unsatisfactory eating practices of young women, was found to be sufficient to affect the health of their new-born children.

There are many other findings. The conversion of suspicion to evidence should promote action. A number of recommendations for action are included in the document. The general approach is in line with the philosophy of this report.

†For example, improved enrichment practices for cereal-based products.

Recreation and Relaxation

The value of recreation and exercise to health and well being is widely acknowledged. Canadians spend $110 million per year on recreation equipment and have unparalleled natural recreation areas – yet carefully conducted tests have shown that, on the average, we tend to be flabby and effectively older than some Europeans, at least as measured by the capacity to absorb oxygen, which is an indication of the capacity to work (Sheppard 1966).* The difference is staggering: a 30-year-old Canadian is likely to have the same oxygen absorbing capacity as a 55-year-old Swede. This indicates that there is something wrong with the way we spend our time and money (including $138 million from municipal funds) on recreation. The prevalence of spectator sports over participatory activities and, for example, motor boats over canoes, might have much to do with it. The high degree of urbanization is another factor.

There are many indirect indications that one of the prime objectives of recreation, the relief of tension, is also not being achieved. This applies even to some of those who actively participate in sports, possibly because of a tendency to introduce an excessive amount of competition. As tension is currently being linked to heart problems (Mai 1968), as well as the traditional gastric ulcers, and a host of psychosomatic effects, the whole subject of relaxation and the relief gained from it, merits much serious research effort. Meanwhile, quite a lot could be achieved by recreation on the basis of our current knowledge. Some new trends toward healthy exercise have become visible, for example, the increasing popularity of cross-country skiing, cycling, jogging – but the time and money directed to snowmobiling are not quite in the right category. The awareness of the need for, and the nature of, healthy exercise is aided by the Fitness and Amateur Sport Branch, Health and Welfare Canada, which received a major financial boost recently, and by a new private non-profit corporation "Sport Participation Canada".

Personal Abuse

Personal abuse is an aspect of life style strongly associated with external influences. It ranges from overwork, through overeating, to all kinds of drug taking. When it results in psychological and physical damage to the individuals (and often to their families) it becomes a social problem and no longer a private matter. After being virtually ignored for generations (with the notable exception of legal penalties for some abuses), this group of problems is now receiving much deserved attention. The establishment of a statistical correlation between smoking and lung cancer was a breakthrough point. It is significant that this occurred only after several generations in which cigarette smoking was a well-rooted and commercially profitable social habit, and that encouragement of the public to smoke (through persuasive advertising) is only slowly being curtailed.

*This might become one of the more useful health indicators (cf. Health Indicators, pages 32–33).

Some of the social consequences of personal abuse are illustrated by the following figures:

Smoking

The cost of certain identifiable consequences of cigarette smoking in Canada in 1966 was estimated at $388 million (Health and Welfare Canada 1969). Included in the cost was the loss of future income for the 13 800 people whose deaths that year were attributed to smoking. For males between the ages of 45 and 65, 80 per cent of the deaths from lung cancer, 41 per cent of the deaths from coronary disease, and 76 per cent of the deaths from chronic bronchitis and emphysema could be attributed to smoking.* The costs also include the care of the sick, the loss of income by the sick, and property lost or damaged by fires which were due to smoking.

The campaign against smoking has been gaining impetus of late, but for each $1 000 spent on cigarettes, only one dollar is spent on prevention. From 1965 to 1971 the percentage of smokers among men declined from 58 to 51 per cent and leveled off among women at about 34 per cent. However, the prevalence of the habit among teenagers, which is of particular importance, is on the increase. During the same period, the percentage of teenage women smoking rose substantially from 19 to 25 per cent while that of teenage men increased from 34 to 36 per cent (Health and Welfare Canada 1971).

Alcohol

Some 617 000 Canadians are consuming "hazardous" amounts of alcohol; 905 deaths in Canada in 1969 were due to alcoholism (Appendix C, "Canada", item 3c, p. 42). In 1970, 54 per cent of the drug deaths in Ontario which were reported to coroners had alcohol as their prime cause (Cotnam 1972). Many deaths in which alcohol plays a prominent role are not reported to coroners; for example, those caused by cirrhosis of the liver, peptic ulcers and gastro-intestinal hemorrhage. The Addiction Research Foundation of Toronto (Appendix C, "Canada", item 3a, p. 132) reports that the incidence of alcoholism in Canada has increased 60 per cent from 1.5 per cent in 1951 to 2.4 per cent in 1965. Approximately 70 per cent of drivers killed in single vehicle accidents and 50 per cent of drivers killed in multivehicle accidents had been drinking. Similar statistics apply to deaths of pedestrians due to traffic accidents (Campbell 1969).

Other Drugs

The use of other drugs, both "hard" and "soft", particularly among teenagers, has reached such proportions that a major effort is clearly needed to understand and cope with the problem. A serious start has been made through the Commission of Inquiry into the Non-Medical Use of Drugs (the Le Dain Commission), whose findings have recently been made public (Appendix C, "Canada", item 3).

*A communication from Health and Welfare Canada.

Mental Health

The incidence of mental illness, much of it associated with the influence of the environment and life-style, has long been increasing. It has reached the stage where more than one-third of the total patient days of hospital care are provided by mental hospitals and psychiatric units in general hospitals (Appendix C, "Canada", item 2, vol. 3, p. 374), in spite of drastic improvements in the treatment of the more serious, previously chronic, hospital cases. The social costs are staggering. Among children alone some 10 to 15 per cent are afflicted (CELDIC 1970).

In Canada there were over 51 000 first admissions for psychiatric treatment in 1970 (Statistics Canada 1972c). The total operating expenditure for mental institutions in 1970 was over $400 million dollars (Statistics Canada 1972d). Many of the cases are of genetic or accident-caused origin, but a large proportion are possibly attributable to the influence of social environment, inside and outside the family, although rigorous proof of this is difficult to obtain.

Accident Prevention

Accidents are the largest single cause of death between the ages of one and forty-four years (Canada Safety Council 1972a, pp. 22–23). Road accidents form the largest group in this classification and in 1970 accounted for 5 080 deaths*, 178 501 injured, 1 785 000 working days lost and over one million hospital bed days, the hospitalization alone costing some $50 million. The prominent role of alcohol in these casualties has been mentioned above.

Among the causes of death at all ages, accidents rank third, trailing far behind cardiovascular disease and cancer (Statistics Canada 1972a). However, due to the age distribution of accidents, they are the leading cause of the loss of life years (calculated by multiplying each death by residual life expectancy). If one counts only the loss of productive life years (defined as the years between the ages of 20 and 65), the average loss per fatality due to traffic fatalities alone was over three times larger than the combined average losses per fatality due to cardiovascular disease and cancer in 1968 (Ministry of Transport 1971, p. 92). This ratio would have been very much larger if the calculation had accounted (as it should) for the loss in productivity due to accident-disability cases. Yet it has had little apparent effect on research. It has been estimated that in 1967 the amount spent in Canada on all traffic accident research was only one nineteenth of the combined cost of research on heart disease and cancer (Canada Safety Council 1970). Since then the Road and Motor Vehicle Traffic Safety Branch of the Ministry of Transport has been organized (Ministry of Transport 1973) and it has been esimated (Campbell 1972) that $2 000 000 a year is currently spent on research and development. The total annual direct expenditure on road safety, which includes engineering, education and enforcement, as well as research, has been estimated at $227 000 000. This is only 1.9 per cent of the total annual cost of road

*6 237 in 1972.

transportation in Canada. The reasons for the low level of spending on road safety are presumably linked to the amazing public tolerance of carnage on the roads, an attitude which is logically incompatible with the intense reaction of the same public to any news of deaths resulting from, say, political strife.

The campaign of a few devoted people started the development and gradual compulsory introduction of safety features in the design of automobiles, but it is characteristic that automobile users still have to be warned by a buzzer to wear a safety belt. However absurd it might appear to be, one has to accept the fact that in some instances people may have to be compelled to take safety measures in order to protect their own health – at least until better approaches to health education and motivation are developed. For example, the experience in Australia with compulsory wearing of safety belts in automobiles in the state of Victoria resulted in a statistically significant drop in the death rate of the occupants and a drastic reduction of eye injuries, in comparison to the other states of Australia – even though the prevalence of belt wearing was still only 50 per cent (a communication from the Australian Road Research Board to Health and Welfare Canada). In Canada, a group of research workers at Memorial, Dalhousie and McMaster Universities demonstrated a small but real decline in automobile accident fatalities as a result of the introduction of the breathalyser.

Motor vehicles account for nearly one half of all accident fatalities (49.2 per cent), followed by falls (14.1), drowning (8.4), industrial accidents (6.4), poisoning (6.1), fire (5.8), and suffocation (4.0 per cent). Together these account for 93.9 per cent of all accident fatalities. The second largest group of accidents after transportation, fatal accidents in the home, accounts for one-sixth of the total deaths, with falls, fire and poisoning as the leading causes of home accidents (Canada Safety Council 1972, pp. 2, 3).

Despite their statistical significance, accidents at home receive little attention from the authorities, inventors, and designers. The fact that such simple measures as compulsory labelling of the contents of prescription containers, compulsory dispensing of prescription pills in safety containers that are too complex and tough to be opened by a small child, or regulations on flammability of night clothes have been introduced long after the development of space satellites, and are not yet universal, is a poignant indication of our social sense of priorities and of our understanding – or rather our lack of understanding – of the importance of prevention.

The field in which most is being done for accident prevention is in industry, where any humanitarian tendencies are strengthened by certain legal and financial obligations placed on employers and common carriers (Department of Labour 1969). There is also a further incentive from the losses of investment in equipment, personnel and efficiency which often result from accidents or unhealthy working conditions. Even so, no drastic improvements are indicated by the recent statistics.

Screening

Mass Screening

The use of mass screening as a preventive measure has been the subject of considerable controversy, partially on the grounds of cost effectiveness and partially because of the minor, but permanent, risks involved in certain types of screening (e.g., exposure to radiation in X-ray testing for tuberculosis). As with immunization, screening, combined with some treatment and changes in life style, has been so effective in the past, that the incidence of certain diseases dropped below the value at which continued mass screening was worth while. In other instances, screening was dropped because medical intervention in the early detected cases was no more effective than that following the appearance of symptoms. Mass screening may attempt to cover the whole population or all members of a special group (characterised by age, sex, occupation, etc.) known to be particularly susceptible to certain risks to their health (the "at risk" population). There is, at present, an increasing interest in the highly selective screening of certain "at risk" groups. A good example may be presented by screening for mother-foetus incompatibility (Rh immunization in pregnancy; Zipursky 1971). Experiments are being carried out with the screening of adults for potentially dangerous high blood pressure (Wilber and Barrow 1972).

A drastic example of screening of proven value, which, with few exceptions, is not incorporated in our social health care, is the case of dental screening (and treatment) for caries among children, although this is a case where prevention (fluoridation, proper cleaning, suitable diet) is just as important. The effectiveness of dental screening and treatment among children is now being vigorously examined in Ontario and Saskatchewan. Several provinces are planning to include it in their health care plans.

The proponents of screening believe that its cost can be made very low by the use of nurse practitioners and specialized paramedical personnel. Some expect that interaction between health care and social welfare can effectively take place at the screening stage, thus reducing the load on the health care system through better "streaming" at the time of the initial contact.

Multiphasic Screening

The converse of selective mass screening is the approach based on the initial and periodic subjection of every member of a health care plan to a battery of questioning and tests, covering a broad spectrum of possible weaknesses and latent or overt diseases (Collen 1966; Brown 1972). This is sometimes called "multiphasic screening". Here the cost can be much reduced by the use of a carefully designed and highly automated system, operated largely by paramedical personnel. Pioneered by the Kaiser-Permanente system (Garfield 1970), the use of this approach in a less systematic way spread among many private practitioners and hospitals when medicare eliminated the direct financial burden of tests on patients.

Multiphasic screening conceived as a means of early diagnosis for

curative purposes is gradually losing popularity as more information on its effectiveness becomes available (Sackett 1972b; Ramcharan et al. 1971). It is still being advocated by Kaiser-Permanente and others as an efficient way of establishing a data base on the state of health of a person (multiphasic health testing). This may be needed as an element in a health care program, but can also serve the purpose of screening out "bad risks" for potential accidents at work, or for life insurance purposes.

Genetic Counselling

Preventive activities can begin before conception or birth. Healthy parents, particularly with regard to inheritable disease, are an asset. In early genetic counselling, the accent was on recommending against having children when a genetic disease was identified in a family. With the rapid development of genetic knowledge, including prenatal screening,* it is now possible for many people, who previously have been afraid to do so, to decide to conceive progeny. Unfortunately, this has potentially dangerous side effects; many children thus born are free from a manifest genetic disease, but they add to the number of carriers of genetic defects, thus reducing the overall quality of the genetic pool of mankind. This could in the future be corrected by some processes of genetic manipulation, but the mere possibility raises grave ethical problems and justifiable fears.

*Prenatal screening could lead to the virtual eradication of some genetic afflictions, including those originating in multifactorial causes rather than in single-gene mutations in one or both parents. This possibility has been studied recently for the particular case of the Down's Syndrone, i.e., mongolism (Stein, Susser and Guterman 1973).

IV. Recommendations

Implementation of Systems Approach in General

Having examined the extensive analyses of health care problems already published,* including recent governmental activities, we were impressed by the high degree of consensus regarding the objectives for, and the desired nature of, health care in Canada. One fundamental feature of this consensus is an acceptance of the systems approach to health care (see description in Chapter II), based on a broad concept of health which recognizes the importance of emotional and social influences. A formulation of the systems approach has been stated most recently in the "Hastings Report" (Appendix C, "Canada", item 4); also Appendix B, pp. 115–118). The main recommendations of that report were supported in principle by several major Canadian associations of health personnel.† This degree of agreement, supplementing the earlier support of the systems concept by many provincial authorities, is most encouraging, but is not yet reflected in the present structure of health care.

Health care in Canada must be reorganized into an integrated system with the utmost practical speed, within the prerogatives of the respective jurisdictions. The philosophy of the systems approach requires that such reorganization proceed through a number of incremental steps, each step being carefully evaluated before widespread application.

A number of different approaches to each step should be tried in parallel to permit a comparison of results and to develop a plurality of solutions suited to the wide range of the Canadian social and geographic environment.

The possible speed of progress is impeded by many factors, including lack of agreement on many detailed aspects of a future system, lack of knowledge which would provide a solid basis for such agreement and, often, the fear of change. Some of these problems and possible solutions are discussed below, but a general pre-condition for progress can be stated to begin with: Governments have to come forward with clear statements of policies related to health for the coming years. The endless arguments about generalities, promoted by the present feeling of uncertainty, can then be replaced by constructive work to devise means to achieve progress in the defined direction.

Financing

The fact that existing federal legislation regarding the support of hospital and medical care, however well intended, presents a deterrent to the optimization of the provincial health care delivery structures is acknowledged by federal and provincial jurisdictions. The nature of the new federal proposals that have been under negotiation with the provinces for over two years are described in Appendix B. These proposals would remove some impediments to optimization by permitting much greater flexibility in the provincial selection of avenues to providing health care. From this point of view, they represent a step in the right direction. The negotiations

*These reports are summarized in Appendix B.

†Canadian Medical Association, Canadian Nurses Association and Canadian Hospital Association (Liaison Committee 1972); Canadian Public Health Association (CPHA 1973); Association of Canadian Medical Colleges (ACMC 1973).

of the details of the division of financial responsibility between the two levels of government are part of a political process in which the Science Council has no role. We can only point out that the services affected by the legislation in question cost over $4 billion per year. If their cost effectiveness could be improved by only 10 per cent as a result of a better agreement, additional services valued at over $1 million per day could be provided without an increase in total cost. The urgency for reaching a new agreement is, therefore, paramount.

The two levels of government should explore every possible means for reaching an improved agreement on the financing of health care at the earliest possible time in order to remove one of the principal impediments to the development of an integrated health care system.

One of the objectives of the proposed reform in the financing of health care is a reduction in the rate of cost escalation. The intention is the encouragment of a more efficient delivery not only by removing some obstacles, but also by eventually limiting the rate of growth of federal support to that of the GNP. The latter provision raises widespread fears. We have already stated that there is no reason to select the present proportion of the GNP devoted to health care as representing the optimum level. Nevertheless, we agree that the rapid and relatively free escalation of spending in the recent past was conducive to inefficiency. A close control of the rate of growth of the operating costs is required to add the necessary impetus to the hoped-for emergence of a more efficient health care system. However, the reorganization of the system will itself necessitate capital and training expenditures for new or modified facilities and different personnel. It should result in a more functional allocation of tasks between the professional and non-professional staff – a reallocation which is long overdue. (The provision of a $640 million "Thrust Fund" to meet this need is included in the federal proposal: see Appendix B, pp. 114–115). Furthermore, when improved efficiency is realized, it will amount to the provision of more service per dollar, but the total operating costs may be higher. *So long as waste is eliminated,* increased operating costs should not be regarded with alarm: the objective of publicly supported health services has been to make good health care available to those who were deprived of it. Additional costs required to meet this objective are obviously justified, where necessary.

A periodic evaluation of the percentage of the GNP which our society is prepared to devote to an efficient health care system will be necessary in view of changes in social attitudes, in social structure (e.g., average age, economic level) and in the environment.

The limits on financial resources mean that some new and justifiable programs may not be implemented unless other, less effective, programs are discontinued. It follows that any effort to curb the growth of the costs of health care adds to the importance of establishing, through research, development and evaluation, a proper scientific basis for selection among the programs.

Organization

One of the impediments to policy decisions on the reform of health care

may, paradoxically, stem from the amount of study this problem has received. The complexity of the problem has led to a vast number of recommendations (well over a thousand) being placed before the governments. A study of these recommendations alone presents a significant task to legislators. Meanwhile, the situation tends to change faster than the recommended improvements can be implemented. Clearly a continuous filtering and synthesizing effort is needed. The National Health Manpower Conference (NHMC) in 1969 which had broad representation from the government, the profession and the public, recommended that a special council be set up to perform this role (NHMC 1969). Such a council would be independent of any one department or government and would report to the Conference of Health Ministers. This recommendation was not implemented, but a Conference of Deputy Ministers of Health has been established and the formation of a Canada Health Council is being considered (see Appendix B, p. 112 for details).

The Conference of Health Ministers and the Conference of Deputy Ministers of Health, with its secretariat and Federal-Provincial Advisory Committees are very necessary for establishing agreements, but might not always be the best instruments for action.

The creation of ad hoc "Health Care Development Boards", comprised of only the high level officials of the governments participating in particular cooperative programs, could speed up progress in special cases. One such Board should be set up whenever the Conference of Health Ministers arrives at an "in principle" agreement on a particular aspect of a health care development program, with the Conference delegating to the Board its authority for the operational development of that program.

Such Boards could in fact form the executive arms of the Conference of Deputy Ministers of Health, unless the secretariat and the committees of the Conference develop as instruments which will render these Boards unnecessary.

The filtering and synthesizing effect needed to promote action should take account of the major influences on health of the policies over which the departments of health have no jurisdiction (compare page 22, page 31 item 8 and most of Chapter III). Thus a broadly-based study is needed, conducted by a team based in no one department or even government, to provide a link between the outcomes of R & D and policy planning.

The Institute for Research on Public Policy is a body which could undertake, on a continuing basis, the task of synthesizing the principal studies and recommendations into a strategic program for the implementation of reforms in health care. Its recommendations should be reported to the Conference of Health Ministers and should be published at the same time.

The work of the Institute* should include consideration of properly evaluated field experiments and selection of those approaches which merit wide application or testing on an expanded scale. In this particular task the Institute would act as a study commission for the Conference of Ministers, in accordance with the precedents set up on previous occasions (e.g., Hastings Committee). The study effort should be supported by contract funding.

*See Ritchie (1971); Institute for Research on Public Policy (1973).

The independence of the provincial jurisdictions over health care introduces a useful amount of plurality in its development. However, interprovincial differences in administration, coverage, coding, monitoring, and other procedures should arise only from deliberately assessed needs for a difference, rather than through accidentally different development. Much of the very important statistical material for research on improvement of health care can be rendered useless because of such accidental, unnecessary differences. The need for standardization represents a typical task that could be assigned to an ad hoc Health Care Development Board.

The proposals for the reorganization of health care delivery through the setting up of Community Health Centres, group practices and various levels of Health Councils are described in Chapter II (pages 42–43) and in Appendix B. For proper operation, Local Health Councils need a secretariat plus expert support from the Provinces. They should have a measure of budgetary power, but a learning period in an advisory role may be necessary.

The arguments in favour of Community Health Centres or group practice often extol the economy of size. Ruderman's analysis (Appendix C, "Canada", item 4, vol. 2) has cast doubts on this advantage. We are concerned that an excessive trend toward large facilities can lead to a concentration of health care in a small number of widely separated centres – one of the disadvantages of the present hospital-based structure. We believe that the delivery of primary health care should be as evenly accessible as possible. This could be achieved through extensions of large facilities, etc. For example, in addition to home care, ambulatory facilities normally attended by a nurse practitioner should be available in residential communities and at major employment centres.* The advantages of co-locating health care and recreational or educational facilities should be seriously considered in community planning.

Those specialized facilities which must serve a number of areas to achieve the necessary economy of size (e.g., acute care facilities for low-density areas, special-care units, and specialized consulting services) have to be planned and provided on a broader regional basis. However, the general organization of health care should involve as few administrative layers as possible. A Regional Health Council should be involved with regional services in the same way as a Local Council is involved in local services, but we see no reason for the regional level to be interposed administratively between the province and those local facilities which do not require regional coordination (cf. Chapter II, pages 42–43).

Personnel

Inherent in the problem of improving an organization is the availability of personnel who suit the new organization. The presence of rigid barriers between the various groups of professionals and technicians makes difficult the proper reallocation of tasks when this is required by the necessity of reducing costs or by the need to provide a broad service with limited personnel. The whole structure of Canada's pool of health per-

*This may be facilitated by the use of "telemedicine", see the sections "Transportation and Telemedicine" and "Overcoming Distance".

sonnel is therefore being placed under scrutiny by the government and the professions with the idea of developing a greater amount of integration and team work, as well as establishing and meeting the requirements for personnel (see "Reallocation of Functions Among Personnel" pages 43–44).*

A redefinition of the roles of health personnel is required which would reduce the formal restrictions on the services that can be performed by the various personnel. More emphasis should be placed on the knowledge and skills gained as a result of continuing education and in-service training.

The mode of remuneration of health professionals is one of the most frequently discussed topics in health care. It is one of the important parameters affecting the cost of service, both directly and indirectly through its effect on the performance of individuals. The latter influence may be more important. There is a considerable degree of polarization on the subject of fee-for-service versus straight salary or capitation-based income. We feel that in this area flexibility is better than adherence to a fixed principle. The mode of remuneration for an individual should be that which provides the most incentive to the conscientious performance of duties and does not place an undue burden on the public treasury. The best mode thus depends on the task and the environment. In a highly competitive environment, like a teaching hospital, the salaried system appears to work very well. The same mode can lead to slack performance in an isolated situation. The fee-for-service, on a scheduled basis, tends to discount experience and judgement. It promotes high effort in terms of quantity of services rendered, without rewarding quality. In many circumstances, a mode intermediate between the two extremes might serve best. It should be possible to devise a mode of remuneration for health professionals that would provide a basic salary dependent on such objective factors as initial education, length of experience, amount of continuing education and special proficiencies, with adjustments dependent on, for example, the hours of work per week, number of cases treated, or a combination of both.

It might be a portent of things to come that some such intermediate solutions are in fact being tried internally, within group practice units, although their external income is on the fee-for-service basis.

Another problem is that of frequent conflict between medical and administrative personnel in a health care establishment caused by their different backgrounds and different attitudes toward organization (Hall 1969; Pickering 1972; Roemer and Friedman 1971). To eliminate the inefficiency currently resulting from the divided authority and differing objectives of physicians and administrators, each health institution must have a compatible and understood set of objectives for the whole of its personnel.

One of the needs for change in personnel policies results from the interface problem between man and technology. Modern health care establishments are full of electromechanical equipment; there is a continuing need for the establishment and improvement of integrated

*A statement of the goals and methods for the Health Manpower Development Program, for the fiscal year 1974/75, was approved by the Federal/Provincial Health Manpower Committee and the Conference of Deputy Ministers of Health, in December 1973.

subsystems comprising personnel, materials and equipment. The equipment has to be properly selected, used and maintained in an environment populated by health personnel rather than engineering specialists. The costs involved can run from tens of thousands to millions of dollars.

A Health Care Engineering Service should be formed in all large establishments, while assistance under contract should be provided to smaller establishments.

Typically, a Health Care Engineering Service (HCES) would group biomedical engineers, operational research specialists, systems analysts, and technicians. The team could comprise up to five or six professionals in the case of a large regional centre and be as small as a single biomedical engineer with an electronic technician in the case of a community health centre.

Enhanced Protection of Health

The reorganization of health care into a coordinated system requires a proper balance between protection of the healthy and care, cure and rehabilitation of the sick. The needs of the sick must be taken care of, but the review in Chapter III, in conjunction with the distribution of health care expenditure shown in Table II.2, presents a convincing argument that the present situation must be far from the proper balance. While this has been recognized by the health care authorities, implementation programs are lacking. Since this is largely due to public preoccupation with the curative side of health care, further urging is necessary.

It is becoming increasingly urgent that the protection of health, in all its aspects, receive much more attention than at present. Long-range planning and determined policy making are required to change the status quo.

Development of physical fitness is a badly needed health promotion activity for much of our population. This has been confirmed by the results of a recent study carried out in Saskatchewan.* The abrupt discontinuation of organized physical education at school-leaving age has yet to be replaced to a sufficient degree by community activities, particularly for young women. The effectiveness of public expenditures on recreation programs and facilities (e.g., in terms of reduced social costs of health care and crime) is not visible. This adds to the difficulty of mobilizing action. Furthermore, one can expect the existence of a threshold effect in many health promotion programs – i.e., a program can bring tangible benefits only when carried out above a certain level of intensity that causes it to overcome other influences. Hence:

A part of health promotion funds should be set aside for intensive programs that could have a demonstrable impact on the health of selected groups or communities.

A fair selection of recipient groups could be made on the basis of a challenging competition. Such a competition might bring additional benefits by itself.

*"Study Confirms Low Canadian Fitness Level" Health and Welfare Canada press release No. 1973-115 dated 11 October 1973. The full results of the study will shortly be published.

In increasing the emphasis on the protection of health, priority should be given to the protection of children. Thus all proven preventive and related treatment programs should be extended to all children in Canada, wherever this has not yet been done.

As far as the medical aspects of protection are concerned, this can be partially accomplished by the expansion and better implementation of coverage under the existing health care plans; in some instances (e.g., dental care) there is the opportunity for setting up a separate plan based on the systems approach. Several provincial proposals aimed in this direction merit urgent consideration.

Expansion of health protection should provide an opportunity for greater integration of all aspects of health care.

The work of the public health personnel is devoted to the protection of the health of others. Their roles and responsibilities should be greatly expanded in scope, with better means for fulfilling that duty. Improved integration of their work with other health personnel and with the health-influencing activities of other services is also needed, at both the field and the planning level.

The objective of improving the protection of health will not be achieved in practice until an organizational structure is developed in which adequate protection of health will benefit the personnel operating the system as well as the recipients of care and the society in general (cf. page 67 and page 78).

Priorities for Research and Development

The previous chapters could not fail to indicate the existence of great gaps in our knowledge of how to organize and operate an efficient health care system. A much expanded effort in R & D on health care delivery is an urgent need.

Health research and development in general is a continuum of activities that stretches from biomedical work (research on the biological functions and factors relevant to human health), through clinical investigation, to work on health care delivery systems (including health protection). All of this work includes basic, applied and developmental aspects. Basic research is most common in biomedicine, while development and evaluation predominate at the health care system end of the continuum.

We would not attempt to form an overall set of priorities for R & D in the broad field of health care. The intention of this section is to specify the areas in which an intensified effort is required as a logical consequence of the approach taken in this report. The background information for these recommendations may be found in Chapters II and III. A good example of the very important work that is outside the scope of this report is the development of medical reference standards for admission, treatment and discharge in typical cases of more common diseases (see Payne 1968), which we leave for other bodies to comment upon. Even the R & D on highly technical aspects of health care, if contained within the biomedical area alone rather than raising system organization problems, is taken as being outside the scope of this report. Thus we will make no recommenda-

tions on the development of electrocardiography per se, but will consider the subject of using technology and organization to make expert analysis of electrocardiograms available to patients at a remote location. We will also make recommendations on R & D needed to improve protection of health (including health education), even though this subject is regarded as being outside the field of health care delivery by those who associate delivery solely with the curative aspects of health care.

Indicators

Satisfactory health indicators, i.e., conceptually appropriate and practically useful measures of health, are essential for the proper application of the systems concept that would lead to the optimum development of health care. The brief review of the shortcomings of conventional indicators ("Health Indicators", pp. 32–33) and of the slow progress being made in this field (due to inherent difficulties) leads to the conclusion that:

The present work on health indicators should be intensified in order to identify and begin to utilize improved indicators.

One aggregated group of health indicators might ultimately be agreed upon, but at the present stage it would be better to experiment with several approaches. The approaches might vary in the relative weightings accorded to the physical, emotional and social components; the external versus the perceived internal methods of assessment; and the regional differences (cultural, economical and occupational). Quantitative assessment of these indicators would represent a continuing and expensive task requiring the usual organization for sampling, plus much more than usual effort on the nature of the questionnaire. This work should be coordinated with that on social indicators. In order to utilize such indicators it will be necessary to generate adequate conceptual and computer simulation models of the various levels of health care structures and their social environment – from a relatively disaggregated level of evaluation of health in small groups or areas and the effect of local health care,* to a highly aggregated level of planning and management studies on the provincial and national planes.

The difficulties in developing health indicators are exceptionally large. It is not possible to foresee how long it will take to obtain truly satisfactory results. Meanwhile, a start should be made in using the best indicators available in addition to the conventional indicators already in use.

A study group should be convened by Health and Welfare Canada to assess the applicability of the recently proposed health indicators and select those most suitable for interim use in Canada.

Naturally, the choice of workable indicators must be determined in conjunction with Statistics Canada, which can best estimate the practicability and the cost of gathering and processing the necessary information. We understand that the two departments already have a joint working group that would ensure the necessary coordination. The full cooperation of all the provinces is a requirement in this project since it might necessitate some unusual types of surveys. A suitable relation of the project to one

*The importance of disaggregated information, caused by the rapid variation of prevailing characteristics with location in urban and suburban districts, has been demonstrated in a recent report on "Composite Social Indicators for Small Areas" (Bixhorn and Mindlin 1972).

of the established organs for federal-provincial cooperation in the health field ("Organization", page 65) would be an advantage.

On the basis of the above selection of health indicators, Statistics Canada should assume the responsibility for gathering the appropriate data from as many communities as possible, working out the values of the new health indicators, and publishing the results on a regular basis.

Information Systems

Most types of technology can find applications in health care, but we have shown ("Health Information Systems", pp. 33–41) that the computer has, potentially, a particularly crucial role to play, permeating virtually all aspects of day-to-day health care delivery as well as future-oriented research. We regard the general use of computer-based information processing in health care systems as inevitable. The development of health information systems (HIS) is an essential component of the application of computers to help solve the operational and research problems of health care in Canada.

The satisfactory evolution of the health care system that we envisage will require the development of computer-based health information systems (HIS). This work must be funded on a long term basis or the effort will be wasted.

An important aspect of the HIS is the need to use records of standardized format and terminology. The necessary properties of such a record are defined on page 35. While we favour a plurality of approaches, continuous cooperation among the groups working in this field will have to be ensured in order to avoid developing a number of incompatible systems. For many purposes interprovincial compatibility of records is of as much importance as that within a province.*

The development of standardized health (including health care) records is a prerequisite of a computer-based HIS. It has to receive first priority in the HIS program.

The most common objections to HIS are based on two misconceptions. One is the fear of invasion of privacy, ("Protection of Privacy", pp. 38–39). This fear is shared by both the providers and the recipients of health care. It is based on the assumption that electronic records are accessible to more people than paper files. No record is safe in badly guarded storage of any kind. However, computer tapes need more equipment than a pair of eyes to be read and can be protected from unauthorised readers by suitable programming techniques. The question of who should have access to what information is not a technical one. At present, more people suffer from lack of information about their health problems and their treatment (e.g., drug reactions) than from improper disclosures.

The second problem is the fear of the amount of work and cost involved in placing *all* health care records in electronic storage. Such detailed transfer is neither needed nor desirable. The information that is

*The Canadian Medical Association and Canadian Hospital Association have just established a joint project (supported by Health and Welfare Canada) to develop a Canadian Health Computer Bureau and Abstract Service, which is intended to assist in the coordination of various efforts and the diffusion of information about progress.

already routinely stored on computer tapes for accounting purposes would be sufficient for a very useful HIS, if it were more accurate medically than is needed for accounting, and if better provisions were made for linking records from different sources pertaining to one person, or related records pertaining to different persons (e.g., relation by common disease, occupation, neighbourhood or by family relation). The capability for such linkage can be of great benefit even without electronic handling of records, although the speed of electronic processing would greatly increase the benefits.

Immediate steps should be taken on a national level to put into linkable form all records of birth, ambulatory care, hospitalization and death in Canada.

We envisage that the provincial HIS systems will be linked to form a national grid built up of a number of regional nodes whose location would be selected by the provincial jurisdictions as a function of geography, demography and computer economics. Much federal-provincial cooperation will be needed to evolve such systems. The federal government could promote compatible development by providing special assistance to provincial members of a nation-wide network and by taking steps to reduce the cost of communications. Some other applications of HIS described in Chapter II ("Computer-Assisted Diagnosis and Learning," pp. 39–41) would also be much more effective and economical on a large regional or nation-wide system. In the case of medical audit or comparative analyses of cost-effectiveness, compatible tapes can be mailed for processing. Linking is also possible without a communications network, by mailing computer tapes to a central processing unit. This is most economical when immediacy of access is not important. It is already taking place to some extent through a service provided to the provinces by Health and Welfare Canada.

Compatibility of records, in both the hard copy and electronic format, is important not only to obtain the maximum benefits from record interchange and analysis, but also in order to reduce the costs. A well-balanced computer-based hospital information system, including statistical analysis, administrative and scientific applications, costs in the neighbourhood of $1 million annually (including computer rentals). Costs per hospital may be reduced by sharing computer services. There is a strong trend throughout this continent toward such cooperative efforts, particularly for administrative applications. Service organizations, like HMRI or CPHA (see "Medical Audit," p. 36) offer another alternative.

With all the support expressed above for the development of increasingly comprehensive health information systems, it is necessary to add a note of caution. The number of possible useful applications for various kinds and aspects of health information systems is endless. These opportunities are matched by the equally endless possibilities for expending funds on such systems. Priorities must therefore be given to those applications which will provide benefits more important than equal expenditures on expansion of personnel or other facilities. Reliable cost-benefit calculations are hardly ever possible, even after the fact. Nevertheless, some rough judgements have to be made. The benefits in question must lead,

directly or indirectly, to improved health of the affected population, or at least to more satisfactory health services. Proposals which do not offer the prospect of such benefits (in the above relative way) should not be implemented, no matter how elegant the technical aspects might be.

Effectiveness of Health Protection

The development of effective health protection techniques is retarded by the inadequate amount of research in that field (see Chapter III).

A major effort should be directed toward research on the effectiveness of the whole range of present and potential approaches to the protection of health, including development of physical and mental fitness, protection from disease and prevention of accidents.

This effort will be greatly facilitated by the health information systems. Record linkage is particularly relevant to work on occupational hazards.*

Many of the protective activities in which the individual concerned has to take action (or refrain from it), are a failure, because of human attitudes. The way to overcome this problem is through education and motivation,† including the development of both understanding and willpower. Provision of opportunities for healthy activities is, of course, also necessary. The approach to the health education of the public in Canada has been mainly ineffective so far.‡

A concentrated research effort is needed to discover effective ways of health education, i.e., education on how to protect one's own health. This effort should include a study of the availability and development of human resources for such education.

The required research should cover a broad field of lifestyles and include such aspects as hygiene, eating and driving habits. It should place special emphasis on the problem of patients' non-compliance with simple therapeutic regimens that are known to be of critical importance to prolongation of their healthy life (e.g., in cases of mild hypertension among middle-aged men). The research problem is finding the determinants of unhealthy behaviour and discovering methods of inducing modifications – on a mass-scale, not by clinical therapy. One of the first steps in such a program might be to look for ways in which all-round physical and mental agility could become a strongly desirable goal for the majority of people. At present there is a clear conflict between such a goal and many strong social and commercial influences which are incompatible with it.

*For example, a provincial health authority wishing to compare the rate of lung cancer among uranium miners in the province, with that of the population as a whole, has at present no practical way of including in their study those who had worked in mines in that province, but subsequently moved to another province and might have died of lung cancer there.

†The importance of mass television in influencing public attitudes and ways of life has been well recognized and effectively used for a long time. More use of it could be made in attempting to stimulate health-promoting life styles which increasingly are becoming the key to individual and social health.

‡The situation in Canadian schools was reviewed at a national conference in Ottawa in October 1972 (see National Conference on School Health 1972). The Conference was concerned with the complete school health program, i.e., health education, health environment and provision of health services in schools. A number of specific recommendations were developed.

A review of the quality and availability of information for self-education on health care is also required and action may have to be taken to fill in the gaps and to ensure that the necessary literature is well publicized and is generally available at a low cost (e.g., in the form of pocket-books or inexpensive encyclopædias).

Accidents and Road Safety

Accidents are the main cause of death between the ages of 1 and 44 and the principal cause of loss of life years.

The knowledge required for more effective accident prevention must be developed. There are two main avenues for research in this field – one is the improvement of the physical safety of artifacts*, the other is safety education.

The recent development of road-side crash barriers at the National Research Council (Basso, Pinkney and McCaffrey 1970) is a typical example of R & D potential in the neglected field of physical safety. The funding of road safety research in Canada ("Accident Prevention", pp. 59–60) in relation to the social cost of accidents is certainly below the optimum cost-effectiveness level. However, it is strongly suspected that the beneficial effect of improved safety devices on roads and in automobiles is greatly reduced by the habit of many drivers to drive less carefully in safer conditions. This tendency to risk-taking brings us back to the area of education and providing alternative opportunities for challenging activities. The human urge for risk-taking cannot (and perhaps should not) be eliminated, but there is hope that at least a good part of it could be transferred to activities in which the risk-taking individual exposes only himself to danger. Also, social initiatives are needed in promoting activities which do not involve major physical risks, but still offer stimulating challenges and the satisfaction of difficult achievements. Fortunately, some trends in this direction are beginning to show. The recent major increase in the budget of Recreation Canada, which includes funding of research on recreation, is a step in the right direction (Lalonde 1973b).

Overcoming Distance

Emergency transportation is inherently an important element of a health care system, but is left outside the integrated structure in large parts of Canada both financially and administratively ("Transportation and Telemedicine" pp. 44–46). This should be corrected as soon as possible. As regards accessibility, ambulance service should be at least as good as radio-controlled taxi service. The use of full-time personnel should be attempted. Where a volunteer station-wagon service must be resorted to, the cars should still be equipped by the province with mobile radio links. A greater involvement of the Canadian Forces (which are already providing a major service), through increased incorporation of emergency services as a part of their training program, should be considered.

Proper training of ambulance personnel (or their equivalents) is not equally well organized across Canada and presents major problems.

*e.g., Safety of roads, automobiles and other transportation systems; construction and factory equipment; instrumentation (medical and other); domestic appliances; safety aspects of building design, etc.

Acceptance of a higher cost or a solid enlistment of volunteers appear to be the only solutions where help from the Services is not available. There is no reason why service in the Ambulance Corps should not be regarded as being at least as important as that in the militia.

The overall picture is of uneven use of transportation technology and training programs, mainly because of organizational problems. With appropriate leadership, the best results attained anywhere could be used as a model, wherever applicable, thus leading to a general "levelling upwards". Provision of radio control will open the door to the use of telemedicine in ambulance service. The great potential of telemedicine, not restricted to ambulance services, has been described in the section "Transportation and Telemedicine": as a means of extending higher grade or specialized medical services to distant locations, it can be of very great value in many Canadian situations. It is particularly applicable in conjunction with the present tendencies toward integrated, multi-level health care systems.

Much attention in telemedicine has been centred on the use of interactive two-way television, but we are more concerned with the provision of assistance at a very low cost to small health care outposts. There is a need for marketing a simple microphone that could efficiently transmit the sound of a heart beat or breathing over a telephone (or radiotelephone) to a remote physician or specialist consultant. Such transmission of sound, plus a description of symptoms by a local observer – aided by skillful questions – could at times mean the difference between life and death. This type of service could be introduced by visiting nurses. There is little doubt that telemedicine will play a significant role in making consulting services available to small local ambulatory facilities, but the time may not be too far away when individual homes (serviced by telephone) will be equipped with suitable transducers as well as with thermometers (Irwin 1973).

The use of an appropriate combination of communication facilities and emergency transportation should be expanded. The latter is more a problem of organization than techniques. The effective use of communications in health care (telemedicine) also calls mainly for the development of our ability to make use of the technology that is already in existence.

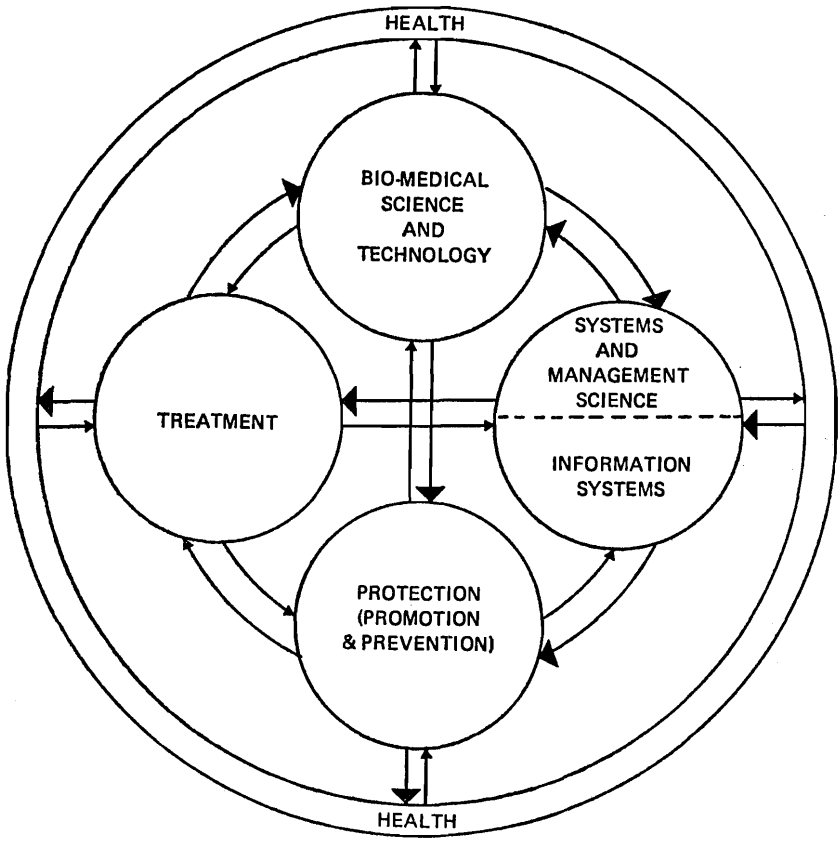
Organization and Funding of R & D*

Required Capability

The delivery of health care can be discussed with reference to Figure IV.1 which shows, in four small circles, some principal elements of a health care system, represented by the large inner circle. The health of the population, represented by the outer ring, is affected by interactions with the various elements of health care. For the best possible result and a continuous improvement, these elements should be appropriately balanced and should strongly interact with one another. The actual situation is far from this ideal. The rapid progress in biomedical science and clinical treatment has not been matched by appropriate developments in information systems

*We use the well known abbreviation R & D for convenience, but with the understanding that evaluation and even some aspects of planning are included in the process covered by this term.

Figure IV.1–Health Care Elements and Interactions



and management science as applied to health care delivery, or in the more difficult aspects of prevention and promotion activities.* Fortunately, this imbalance was perceived some time ago and many corrective measures have been taken, but society is still suffering from the usual time lag between training of new personnel, accumulation of research knowledge, development of methods and systems, and the practical application of results in the field (see Lalonde 1973c and LeClair 1973).

The success of health care research and development depends upon many factors. The more important among them are:

– development of rigorous experimental methodology for studying alternative approaches to health care (Randomized clinical or field trials are representative examples of such methodology);

– availability of personnel trained in the use of rigorous methodology and in multidisciplinary cooperation (which is usually necessary);

– good communications with those working on new approaches to protection, care, cure and rehabilitation, which could change the optimum method of delivery;

*The need for socio-medical research is implied here.

– availability of suitable tools for R & D work (information systems, indicators, etc.);
– availability of funds for mounting investigations on a sufficient scale, extent, and duration to produce reliable results;
– availability of an information dissemination system which would promote application of useful results. This includes dissemination of knowledge to possibly reluctant users, for example, through demonstration projects.

A proper sequence of research should investigate the outcomes of a process and prove that it is effective (i.e., it does more good than harm on a statistically significant scale) before developing its wide availability and efficient delivery, or responding to supply or demand pressures (Sackett 1972a; Draper 1972). The economic significance of this approach is apparently not as obvious as it should be, since it is not practiced often enough ("Experimental Tools", p. 51).

The social tendencies to satisfy the demand for treatment increase the need for rigorous research and development that would demonstrate the circumstances under which a treatment might not be useful. In many instances the value of a treatment is affected by the local situation. The need for considering local conditions in evaluation combines with other demands for a measure of decentralization in R & D (e.g., those resulting from the trends to establish a multi-level health care system).

A well established research, development, planning, and evaluation capability is required at several levels of the health care system, from the national through provincial to the regional and some larger area coordinating centres. The universities will have a major role to play, at various levels.

In the extremely complex field of health care delivery much of the evaluation must be of a statistical nature, on large samples. Also, many variants have to be tested. Thus the scale of the R & D has to be large, or no significant conclusions will be reached.

In phase with the development of the above capability, the two levels of government should cooperate without delay in making available the necessary means of support for carefully structured large-scale trials. A gradual expansion of successful trials is seen as a crucial element in evolving better solutions and overcoming a resistance to change.

The expansion of trials is of particular importance in connection with the further development and evaluation of Community Health Centres.* A plurality of models to test conceptual variants and to suit different requirements in various locations is needed. It would be particularly interesting to see how some of the models, working under a global budget (i.e., a pre-paid budget for providing a broad range of health care for all members), would divide their resources between the protective and curative aspects of health care. Further information is also needed for comparative studies of Community Health Centres and Group Practice, and of possible interrelations between these two methods of health care.

We support the selection of Community Health Centres as a major vehicle for the operational testing of various new approaches to health care

*See Appendix B, "Community Health Centre Project", pp. 115–118. We refer to the functional concept of such centres, not necessarily requiring a new physical entity in every case.

practice and administration. Such testing should now be carried out on a much enlarged scale if significant progress is to be achieved.

Past and Present Funding

An approximate tabulation of the recent funding of R & D in health sciences in Canada, shown in Table IV.1, indicates the gross features of the situation. The totals shown exclude several smaller sources of support (including many provincial contributions) and the indirect cost of research in universities and teaching hospitals.* Industrial R & D is shown separately since it is represented mainly by the highly specialized activity in the pharmaceutical and scientific equipment industry and its magnitude has no bearing on the policy considerations in this report. The principal sources of non-industrial funding are seen to be the Medical Research Council (MRC) and Health and Welfare Canada (HWC). These two sources together represent nearly 98 per cent of the federal funding. Also, their contributions give a fairly good indication of the distribution of federal funding between biomedical and health care delivery fields of work. The MRC funding covers the biomedical field while the HWC funding is predominantly oriented toward the health care delivery field (in the broad meaning of the term, including health protection). The ratio of the entries for those two sources of funding thus gives a good indication of the ratio of biomedical to health care delivery R & D. (The total non-federal funding is likely to be divided in a similar way, although an analysis of it is more difficult, because of the multitude of sources).

Taking the values of the MRC and HWC funding as an indicator of the levels of biomedical and health care delivery R & D in Canada, we have examined its history over the past eleven years, as shown in Table IV.2. The comparative rate of growth is strikingly different, to the disadvantage of health care delivery. The difference in the accumulated total funding over 11 years is even more significant.

In view of the importance of the HWC funding in health sciences to health care delivery, some recent budgets of that department are shown in greater detail in Table IV.3.

The HWC Public Health Research Grant was reserved for applied and developmental projects conducted by universities, hospitals, provincial health departments and various non-profit health organizations. The National Health Grant had the purpose of stimulating research studies, service demonstrations and training activities of national importance for the improvement of health services. (These two funds have now been merged into one fund under the name of National Health Grant.†) In addition to these, a separate source of funding is available for capital

*A much more detailed analysis of the funding of R & D in health sciences has recently been compiled by R.D. Fraser for the Ontario Council of Health (Appendix C, "Ontario", item 1 viii). However, some of his results are not directly comparable with Table IV.1 because of differences in the definitions.

†The above information on funding gives little insight into the distribution of effort among the various types of R & D projects. More detailed information can be found in Robertson (1973b) which contains a list of all R & D projects in Health Care that were in operation at any time between 1 September 1971 and 1 September 1973. The most recent information can be found in an annual publication of the MRC (Medical Research Council 1973; see note on limited availability in the list of references).

Table IV.1–Expenditures for Support of Health Sciences R & D in Canada: Principal Intramural and Extramural Expenditures, by Source of Funding

Source	1971-72 $ Millions	
Federal Government		
Medical Research Council[1, a, c]	35.6	
Health and Welfare Canada[2, 3, a, b, g]	16.2	
Other Agencies[a, g]	2.5	
Total Federal		54.3
Provincial Government		
Ontario[d, e, g]	8.2	
Quebec[e, g]	0.9	
Other Provinces[d, g]	1.2	
Total Provincial		10.3
Total Governmental		*64.6*
Private Sources[4]		
Voluntary, Non-Profit Research Agencies and Foundations[d, g]	11.5	
University Endowment Funds & Misc. Private Donations[d, g]	4.4	
Total Private		*15.9*
U.S. Sources[d]		0.9
Total Non-Industrial		*81.4*
Industry[d]		27.2
Grand Total		**108.6**

Notes: Direct current expenditures only, for the natural and human sciences combined. See explanatory notes below.
[1]Intramural administrative costs are excluded. All extramural expenditures are included.
[2]The R & D portion of the Health Resources Fund is excluded. Although a part of the current budget, these expenditures represent federal contributions to the provincial capital budgets for the construction and equipment of research facilities for biomedical, clinical and public health research. These contributions may amount up to 50% of the costs incurred by the provinces. The latter costs are also excluded from the principal figures.
[3]See Table IV.3 for details.
[4]Excluding industrial funding related to its business.

Explanatory Notes:
Direct administrative costs are included, unless otherwise noted.
Indirect costs and general overheads are excluded for all performers. Thus university costs complementary to the external grants are not included.
The portion of the basic research in life sciences, relevant to biomedical knowledge and clinical application, but not performed as a part of a specific program in public health or biomedical research, is not included.
Most of the figures given in the tables represent approximate information, but should be complete and accurate enough for policy purposes.
The values obtained for individual entries are often significantly dependent on the interpretation of the terms "Health Sciences" and "R & D" by the different sources of information.

Sources:
[a]Statistics Canada, Science Statistics Section. Computer readouts and special communications.
[b]Health and Welfare Canada, communications from Health Economics and Statistics Division and from Research Programs Directorate.
[c]Medical Research Council, Annual Reviews and Special communications.
[d]Ontario Council of Health, *Report of Committee on Health Research*, "The Economics of Health Research" by R.D. Fraser. (The interpretation of the term "Health Research" and of its components by Dr. Fraser is often different from that used in the compilation of this Table, hence several of his figures had to be adjusted before being used.)
[e]Communications from Provincial Agencies.
[f]Health and Welfare Canada, *Annual Report Respecting Operations under the Health Resources Fund Act for the Fiscal Year ended March 31, 1973*, p. 14.
[g]Estimates in Science Council of Canada on basis of the above sources and direct enquiries.

expenditures on construction of research and training facilities by the provinces (The Health Resources Program). These capital funds, amounting to $500 million, are to be used over the period of 1966 to1980; $37 million were used from this source in 1972/73, with $10.2 million specifically allocated for research facilities (Health and Welfare Canada 1973f, p. 14).

Table IV.2–Expenditures for Support of Health Sciences R & D in Canada: Growth of MRC and Health and Welfare Canada (HWC) Expenditures ($ millions)

Fiscal Year	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	Accumulated Total	Accumulated Difference HWC — MRC
MRC[1, a, c]	5.1	6.9	12.3	12.3	20.4	26.9	30.9	34.0	35.6	37.5	40.4	263.3	
HWC Grants Program[1, 2, b]	4.0	4.2	4.2	4.2	4.1	4.2	5.0	5.5	7.8	8.4	9.8	61.4	—200.5
HWC Total R & D[3, a, b, g]	6.8	7.0	7.3	7.8	10.7	9.9	10.8	11.2	16.2	18.3	20.5	126.5	—135.8

Notes: Direct current expenditures only, for the natural and human sciences combined. See explanatory notes in Table IV.1.
[1]Intramural administrative costs are excluded. All extramural expenditures are included.
[2]Includes Public Health Research Grants up to 1972–73, National Health Grants from 1969–70 and some miscellaneous grants in the early years. Scholarships for the training of research personnel and some other expenditures not normally qualified as R & D are included for consistency of comparison with MRC.
[3]Excludes Health Resources Fund, see Table IV.1, note 2. The components included in this total are shown in Table IV.3.
Sources: See Table IV.1.

Table IV.3–Expenditures for Support of Health Sciences R & D in Canada: Distribution of Expenditures by Health and Welfare Canada ($ millions)

Program	1971-72			1972-73			1973-74		
	Intramural	Extramural	Total	Intramural	Extramural	Total	Intramural	Extramural	Total
HWC Grants Program, Health Programs Branch[1, b]	–	7.8	7.8	–	8.4	8.4	–	9.8	9.8
Non-Medical Use of Drugs[a, b]	<0.1	0.2	0.3	0.2	0.5	0.7	0.1	1.1	1.2
Fitness and Amateur Sports[a]	–	0.1	0.1	–	< 0.1	< 0.1	<0.1[b]	0.4[b]	0.4[b]
Health Protection[a]	6.8	<0.1	6.8	8.1	0.1	8.2	7.5	0.2	7.7
Other[g]	1.2	–	1.2	1.0	–	1.0	2.4	–	2.4
Total[2, g]	*8.0*	*8.2*	*16.2*	*9.3*	*9.0*	*18.3*	*9.0*	*11.5*	*20.5*
Health Resources Fund: Research Facilities[2, 4, f]		7.4	7.4		10.2	10.2		12.6	12.6
Other Scientific Activities and Capital Expenditures[4, g]			3.5			8.4			9.1

Notes: Direct current expenditures only for the natural and human sciences combined. See explanatory notes in Table IV.1.
[1]See Table IV.2, note 2.
[2]Excludes Health Resources Fund, see Table IV.1, note 2.
[3]Shown only for the purpose of comparison with the current expenditures on R & D.
Sources: See Table IV.1.

Adequacy of Funding

It is shown in Table IV.2 that Canada spends 1 per cent of the costs of health care on R & D in health sciences.* The R & D on health care delivery (i.e., excluding biomedical research) is less than half the above amount. Such a low level is inconsistent with sound industrial practice. An increase in the small outlay on health care R & D is obviously needed to improve the value obtained from the much larger outlay (over 200 times) on health care itself.

There are other ways of assessing the relative adequacy of health care R & D funding. For example, in 1972/73 the federal government spent $640.863 million on R & D in natural sciences. The Health and Welfare Canada share of this amount was $26.785 million (Ministry of State for Science and Technology 1972, p. 27). This represented 4.2 per cent of total natural science R & D . At the same time, the total HWC expenditures were over 18 per cent of total federal spending (Canada 1972, Table 3, pages 1-24 to 1-31). Looking at the absolute figures (Ministry of State for Science and Technology 1972), we find the following comparison of R & D funding by departments and agencies (in millions of dollars) for 1972/73:

National Research Council	$115.6	National Defence	$ 52.9
Industry, Trade & Commerce	100.2	Medical Research Council	36.1
Environment	96.9	Energy, Mines and Resources	31.9
Agriculture	67.0	Health & Welfare Canada	26.8
Atomic Energy of Canada Ltd.	65.5	Communications	23.5
		Others	24.5

It is not an impressive illustration of the relative importance currently being attached to health care R & D.† This would be of little significance if the needs for new knowledge in this field were reasonably well satisfied. However, the preceding pages should have shown that the extent of the outstanding need for knowledge is such that it will have little chance of being met without a major increase in funding.

Future Needs for Funding

What is needed for the science and technology of health care is the equivalent of the leadership and drive provided by the MRC in the biomedical field. The latter research should continue to grow in order to attack more and more difficult problems of health, but R & D on health care must grow much faster to restore the balance between them and to meet the pressing need for more knowledge on health care delivery.

We know of no principle that would permit an objective assessment of the magnitude of optimum funding in any field of research, although some major industries have developed guidelines for R & D as a percentage of income, based on long experience.‡ In addition to such gross boundaries, comparative assessments can be made on the basis of experience in the

*This is compatible with the data in Table IV.1 for non-industrial expenditures.

†Later figures (Ministry of State for Science and Technology 1973) do not show any change in the above pattern.

‡There is no universal figure for all industries. It depends on the complexity of the processes involved, the rate of growth, the degree of competition. In most relevant cases, the optimum is judged to fall within the range of 2 to 6 per cent in industrialized countries.

related fields of science. For example, we can see the benefits resulting from the granting activity of the MRC. With the present underdevelopment of the science of health care delivery, we have no doubt that at least an equally strong federal granting activity should be developed for this field. The MRC budget will be about $40 million in the present fiscal year, i.e., in 1973/74 (Canada 1972), and is likely to reach the order $50 million in five years.* The HWC intramural R & D budget for health care delivery might reach $10 million in five years. Thus a target figure for the total federal health care delivery budget of $60 million, $50 million intramural plus $10 million extramural, in five years would bring the federal extramural R & D activities on biomedical and health care delivery to about the same level (counting current expenditures only), with each component still well below 1 per cent of the national expenditures on health care.

We must emphasize what should be obvious: there is a need for expansion of knowledge in this field that could easily consume resources at the above rate. Nevertheless, the figure of $60 million in five years is nothing but a target, to be reached only if fully justified by good ideas and high quality proposals emanating from competent groups and individuals. Otherwise it might take seven or ten years instead of five, but it should be known that the potential funding is available. The speed of progress will necessarily be affected by the organization behind the available funding.

It is also necessary to stress that the above target figure for rapid growth (to be followed by normal growth) is intended to apply to the whole of the R & D activities on health care delivery, rather than just to the areas put forward as priorities from the point of view of this report. Thus the majority of expenditures would occur on projects of socio-medical, educational and organizational natures rather than in the technical field.

The federal funding of health care R & D should be increased to the order of $60 million per year as fast as it can be justified by the availability of good teams and proposals. This will necessitate a commitment of long term block grants to existing or prospective R & D centres in order to permit the development of the necessary teams. The above new funding should not in any way affect the continuing requirement for growth of research in the biomedical field.

Manpower for R & D

The growth of health care research in the past has been limited by the shortage of suitable personnel and the lack of sufficient interest in that area of research. This is demonstrated by the fact that, on occasion, after all the proposals to the National Health Grant that were deemed to be of merit received support, some funding remained unallocated.† However, this is a "vicious circle" situation, since special funding is needed to

*The budgetary estimates for 1974/75 of $41.1 million (Canada 1974) are not in line with this prediction, but it is hoped that they represent only a temporary set-back.

†Some of the rejections could have been affected by the differences of opinion on what is relevant, useful and valid research in a field in which there are few peers.

develop personnel.* Also, the knowledge of major potential funding is needed to stimulate interest. For example, when the National Grant has only a few millions dollars to dispense across the country, researchers are not likely to submit proposals requiring a million dollars each, even though this might be the proper order of magnitude for some projects. Furthermore, the potential for a career in this field of work must be clearly visible.

Urgent action is needed to increase the number of personnel qualified for, and interested in, health care research. Steps now being taken to remedy the situation by the faculties of health sciences must be intensified. In particular, involvement of many non-medical investigators, required by the multidisciplinary nature of health care research, should be expanded. This action will require a considerable increase in career awards and other stimulating funding with a long-term policy commitment.

The danger that funds could be wasted if awarded to poorly designed projects run by ill-trained people can be overcome by retaining a high selectivity in granting awards while making large resources potentially available. The present qualified workers in the field could provide the core of the much larger multidisciplinary teams that are necessary. In order to tap the available human resources from all the relevant disciplines, it may be necessary to make it more evident that members of non-medical disciplines (e.g., social sciences, economics, management sciences, systems science, operational research, applied mathematics, computer science, engineering, physics, chemistry) can fully participate in, or even lead, health care projects and that such leadership will not necessarily be vested in the medical schools or departments. The need for the corresponding multidisciplinary breadth among the members of the peer review committees assessing the R & D proposals and the outcome is taken for granted.

The removal of some of the present impediments to expansion will be needed at the same time. One of the difficulties arises from the fact that proposals for grants normally have to include the names of suitable personnel for carrying out the work. This requirement is one reason for the poor quality of some proposals: a new member of the staff has to rush in an attempt to obtain funding for his retention, or senior personnel, who carry heavy workloads, have to rush in order to permit confirmation of a commitment. This is a self-defeating procedure at a time when rapid expansion should be stimulated. It would be more effective to fund promising people first and give them time to develop a good proposal afterwards. Even this may not be sufficient to develop multidisciplinary teams. For the latter purpose, a block-grant decision regarding the development of a centre of R & D in health care delivery is needed, where only the general area of work and the leadership would initially be defined.† On the basis of such a decision, involving a commitment for some five to ten years, a team and a detailed program could be developed. The increase in

*It is tentatively estimated that just over $1 million per year is currently being used from the National Health Grant to assist in the development of new personnel for research on health care. This may be compared with an estimated figure of $10 million per year used by the MRC to assist in the development of new personnel for biomedical research.

†This procedure is used sometimes now, but not to a sufficient extent.

the funding explicitly aimed at the development of R & D personnel will have to be very large. Even at the level of $10 million per year, the training of new R & D personnel for the health care field would barely keep pace with growth in the biomedical field, without much opportunity to make up for time lost in the past. A sudden tenfold increase in the rate of training is, of course, impossible. Much initiative will be needed to set up a fast-growing training program.

Sources of Federal Support

In most areas of R & D, federal funding is divided between direct departmental support of projects specifically associated with their developmental missions and support of more general research in the field which is vested in autonomous Crown corporations like the Medical Research Council (MRC), the National Research Council (NRC) and the Canada Council. The research on health care delivery has been an exception. The MRC is charged by its act with supporting "basic, applied and clinical research in Canada in the health sciences, other than public health research" (Canada 1970, vol. 5, chapter M9, p. 5033). The last phrase has been interpreted as excluding all research on health care delivery. The latter was left in the direct care of Health and Welfare Canada as a part of its mission. We believe that this policy is too extreme. The disparity in the level of the two fields of research might be due in part to the greater degree of administrative freedom enjoyed by Crown corporations. Also, it is necessary to ensure that R & D work on concepts in health care can be supported on the basis of their general merit without embarrassing the responsible minister, even when they might not have a high departmental priority or might be contrary to the current departmental policy.

The management of the support of health care within HWC has been considerably improved recently and has been moving in the direction indicated above (Lalonde 1973c); for example, through the unification, with the concurrence of the provinces, of the National Health Grant and the Public Health Research Grant; the establishment of the National Health Grant Review Committee with its extensive sub-committee structure; and the elevation of the responsibility for the management of these activities to the level of a Director General, Research Programs. An effort is being made to establish better contacts with the current or prospective grantees through on-site visits, but the available personnel resources still do not provide sufficient means for these activities.* In particular, it still is not possible to expend sufficient effort toward the important functions of explaining the nature of the shortcoming in rejected applications and helping younger scientists (who do not have the skills of "grantsmanship") to improve applications which appear to contain ideas of merit but are not properly presented.

There is no doubt that HWC has to retain direct control over much of its extramural R & D activities, but several steps could be taken to remedy the shortcomings of the present situation and to provide more impetus to the research on health care.

*It is understood that appropriate positions are available, but that it has not been possible to fill the vacancies.

The present restrictions on the support of research on health care delivery by the MRC should be removed,* with the accompanying provision of additional funding for this field of research.

This would remove the present anomaly and bring an independent group to support health care research, particularly that of a more long-term and fundamental nature. The above provision would thus increase the plurality of the funding sources for health care R & D. Such plurality is healthy and should be encouraged (for example, by greater involvement of independent foundations) but chaos and waste can be avoided only if suitable provisions are also made for the dissemination of up-to-date information regarding all R & D projects proposed, active and completed. So far this need is not properly met. An expansion of the Information Exchange Centre for Federally-Supported University Research in the National Science Library could provide the nucleus for this important service (National Research Council of Canada 1973, pp. 102–103).

Furthermore, the present R & D granting and coordinating activity of Health and Welfare Canada should become a Statutory Agency (preferably a departmental Crown corporation), operating within the department with a considerably expanded budget. The transfer of some other departmental R & D activities to the new Agency should also be considered.†

The above change would provide permanence and visibility to the emerging high degree of internal independence of the Directorate of Research Programs and would promote operational flexibility. The general concept is to ensure that the department would retain the means to satisfy its needs for major extramural R & D programs of high quality, closely related to its policy, without being administratively involved in the details of the allocation of grants. A balance of independence and responsiveness in the control of R & D could thus be achieved. A transfer of some intramural activities to the new Agency would facilitate discharge of the presently intended coordinating function of the Directorate.

It is taken for granted that proper safeguards need to be maintained for provincial input to the establishment of priorities and to avoid setting up, without provincial consent, field evaluation projects which, if successful would impose a continuing burden on provincial treasuries. It is also taken for granted that the membership of the new Board or Council would have the appropriate representation of non-medical members and that the review committees would use a broad set of criteria for acceptance, with potential contribution to the internal advancement of science receiving a relatively lower weighting for certain types of projects in promising areas. A scientifically correct approach is, of course, always necessary, but the main value of, say, a field evaluation project may lie in the data produced, rather than in the improvement of the methodology of scientific evaluation per se.

*It appears that, in the short term, this might be done without necessarily changing the MRC Act (Canada 1970) either by reinterpretation of section 4 (1a) or under the permissive prerogatives of the Minister as defined in section 4 (1b). We assume that MRC would quickly establish a separate peer review system, appropriate for the new field of R & D.

†There was much discussion on this recommendation in the Science Council Committee stage of the work. The arguments of a member of the Committee against the final text of this recommendation as approved by the Council are placed on record in Appendix A.

Ideally, the new Agency should operate on a five-year budget, annually updated for another year. A ten-year commitment authority for a fraction of its budget would be needed. Such budgetary provisions are particularly important for major field evaluation projects, but a similar need for long-term budgeting is felt by all granting councils.

We do not propose a specific division of funding between the MRC and the new Departmental Agency. The high budgetary target offers plenty of scope for each agency to do its best in developing the potential for health care delivery research in Canada. The final ratio after the period of fast expansion should depend on the relative performances in stimulating high quality work. The Department does of course have a further option of meeting some of its most urgent needs through directly placed research contracts if none of the two agencies could fulfill the demand within their programs. The Departmental Agency should be in a particularly good position to assist in such problems.

We are confident that in the environment thus provided, it will be possible to expand the research and development on health care to the extent demanded by the problems in the field.

V. Conclusion

Canadian society has opted in favour of social responsibility for health care, with clear indications that more and more comprehensive coverage will be required in the future. Although progress has been made, the goal has not yet been reached. The political decision will be meaningless unless we develop our health care delivery system until it becomes equal to the task. It will take major reform, including many changes of basic attitudes, to provide acceptable care for more people at a tolerable cost. Fortunately, the cloud of increasing costs has a silver lining: it generates a powerful pressure for reform as a direct effect of the financial crisis. The urgency of the situation has therefore been recognized.

Just as there is more to a person than a body, so there is more to health care than medicine. Thus any comprehensive health care system has to be complex, integrating many diverse activities from medicine to sociology. We have not yet mastered the skills of organizing such complex structures. In fact there is room for considerable improvement in the management of the medical care aspect alone. Progress in the development of management sciences, as applied to health care (with carefully used computers, supported by communications, as one of the major tools), emerges therefore as the area of first priority if the full benefits of progress in the biomedical field are to become generally available.

In restructuring the health care system, the objective should be to match the system to the needs of the individual, rather than force the individual to match the system. Fortunately, the new trends in health care research and development are already pointing in this direction. Properly used technology can help to make this possible. Several recommendations related to this problem area are put forward in the report.

Our recommendations are centered around the concept of developing health care as a dynamic, self-improving system, diversified but coherent. It needs to be said in conclusion that we do not regard the systems approach, however useful, as a solution in itself. It is a tool which can be used well, misused or ignored. The attitudes of the majority of individuals, those served by the system and those operating the system, will decide its usefulness.

Several recommendations stress the need for further studies, even though health care has been one of the most extensively studied subjects during the past decade. However, our recommendations refer to the use of research, development, evaluation, and planning as the elements of an on-going process of continuous improvement inherent in the systems approach. Such studies take place in parallel with the process of reform, not in place of reform.

We do not underestimate the importance of some of the topics which had to be left outside the scope of this report. To name a few: the high degree of health problems among the native peoples; the plight of those who cannot afford the time to visit a doctor or a hospital as much as needed; or the predicament of the mother living with children outside the area of public transportation (she might still be better off than in the pioneering days, but she is likely to be less well adapted to cope with the problem of a sudden illness that may – or may not – be an emergency matter); the costs of drugs and the need for universal drug insurance; the

inadequate utilization of highly trained pharmacists; the list is endless but the reader's time is limited.

Our choice of subjects in this report was guided by our perception of the issues which have particularly broad implications and where significant gains can be expected from expanded use of science and technology. The principal role of technology is to extend human senses and to support human intellect. When properly used, technology can enable people to be more humane to each other, a trait which is of particular importance in health care.

Appendices

Appendix A–Note of Dissent

Note Explaining the Reservations of a Committee Member Concerning Recommendations on the Organization for the Federal Support of R & D on Health Care Delivery (page 86).

The recommendations which might be made on the subject of development policy in a given scientific field represent at best a compromise, and are almost always made on the basis of value judgements which we hope and assume are enlightened and disinterested. The difficulty I experience in accepting the final version of the above recommendations is probably due to the fact that my experience and values are sufficiently different from those of the other members of the committee as to lead me to different value judgements. I would like to thank the Science Council for allowing me to express my disagreement on the issue of the recommendations on page 86 and to give my reasons.

My guiding values and ideas are:

1) Research is a difficult intellectual exercise, requiring special ability and the fullest possible freedom of action.

2) Judgements on the scientific quality of the researcher and his project can be made only by experienced people, capable of understanding the objective and evaluating the correlation between the means and the end.

3) Any structure for the encouragement and coordination of research efforts must be removed as far as possible from the administrative and political area.

4) Procedures in the field of health care cannot be compared with those in the bio-medical field. The provision of health care must be carried on in a variety of institutions. It represents the main purpose of the institution. Research in this field must take into account a number of factors which are almost non-existent in most other fields of health research: provincial operating budgets, working conditions (frequently negotiated at the provincial level), provincial administrative policies, local administrative policies, and so on.

5) Research in the field of health care raises some constitutional difficulties: the provincial responsibility, recognized by all; the federal government's obligation to standardize and conduct research into better utilization of facilities, since the government contributes a substantial portion of the institutions' operating costs.

These principles lead me to the conclusion that the second of the relevant recommendations (page 86) would, if implemented lead rapidly to:

1) interference by the political sector of the government in the orientation of research projects. The "departmental corporation" suggested is in many respects nothing but a version of the present departmental organization. Its autonomy – assuming that the minister or deputy minister set little store by those values which are important to research – would be, to say the least, doubtful. The example given at the bottom of the page, that of the Defence Research Board, demonstrates for many people precisely how little autonomy is allowed to organizations of this type.

2) The danger of confrontations between the provincial and federal administrative sectors is increased by this kind of structure. It is easy enough to imagine intervention by those who hold the power at both levels of government, either to promote (and not propose) a research effort or to prevent its inception.
3) The first version of these recommendations was that:

The responsibility for awarding grants for the support of health care R & D of general or long-term significance (with the associated funding) should be transferred from Health and Welfare Canada to the Medical Research Council or to another autonomous research council set up for that purpose.

Provided that the implied necessary measures are taken, this recommendation proposes a more conventional structure, in which the researcher is better protected, and where, on a personal or group basis, the researcher or researchers have to have "made their peace" with the institution where the research will take place at the very start of the project, even before the grant request is submitted, permitting a more normal channelling of the research project to the agencies providing support. The proposed version would run the risk of producing the opposite in many cases.

The departments are always able to resort to contracts for research which they wish to promote. There is no need to provide them, in addition, with an opportunity to stifle nascent ideas which might embarrass their administration.

14 January 1974 L.P. Bonneau

Appendix B–Examples of Governmental Planning

During the past few years, a number of major Commissions and Task Forces have been looking into the future, considering the needs and planning improvements in the organization of health care delivery. There were many complaints that all this planning produced little action, but there were some reasons for the delays. First, the governments were busy changing the financial basis of health care, as individual provinces were gradually introducing publicly-financed medical care to complement plans in the hospital services field. Second, the recommendations of the various reform studying bodies showed a great deal of *consensus regarding the need for a major overhaul of the complete health care system* (Robertson 1973b, Appendix 10).

A major change in the structure of health care is, of course, much more difficult than a change in the method of financing such care. A change of financing alone can (and at times did) cause major administrative headaches, delays in payments, etc., but it does not directly interfere with the day to day care-giving operations in a hospital or in a physician's office. The introduction of new types of health care units does just that. Much planning and many pilot experiments are needed before the latter kind of reform can be tried without undue risk. However, one of the important effects of public financing has been to make a major system overhaul more urgent, as a result of increased demand and utilization.

The above situation led to serious consideration of reforms by all governments, with specific plans being introduced in several provinces. The total of the provincial studies of the general and special aspects of health care cannot be summarized here. Only a few special cases have therefore been selected for a more detailed description:

a) experience in Saskatchewan, the only province which has had a provincial medical insurance plan for over ten years;

b) developments in the provinces in which formal governmental action on general reform has been taking place or appeared to be imminent during the main phase of this study;

c) developments in federal-provincial relations.

It can be said that, in addition to any major structural reforms which are being discussed or implemented, most provinces are concerned with the problem of which types of services should be covered by publicly-financed health care and which should remain private responsibility. The tendency is to shift the line of demarcation in the direction of greater public responsibility, i.e., an expansion of the services covered by the plans. The position on 1 January 1974 is shown by the list of "Extra Benefits" in Table I.2 (see page 26) which had to be revised twice during the writing of this report, to include additions.

For the future, most provinces are considering, planning or introducing public dental care plans, beginning with preventive and basic treatment services for school children, plus certain services for the aged and the recipients of welfare. The present shortage of dentists has an inhibiting influence on the practical rate of expansion of dental care. New proposals generally provide for an increased rate of training and increased

use of dental auxiliaries who will provide some of the intra-oral services which were previously the exclusive prerogative of the dentist. This will permit faster expansion of personnel while reducing the average cost per unit service.*

Extension of hospitalization benefits to nursing homes and expansion of facilities for ambulatory treatment are also high on the list of priorities, but the rate of introduction of these extended services may depend on the modification of financial contributions to the provinces under the federal hospital and medical care programs (see "Financing of Health Care", page 113). There is also a tendency to eliminate collection of premiums in favour of financing from the general tax revenue, and for a stricter public control of professional corporations in the health field.

A more general review of developments in all provinces can be found in the Appendix, Vol I, to the "White Paper on Health Policy" (see our Appendix C, "Manitoba", item 2) and in a very recent federal publication (Health and Welfare Canada 1974a). Some of the relevant provincial documents are also listed directly in our Appendix C.

The most recent step toward a major reorganization of health care services in a province is the publication of a report on "Health Security for British Columbians" by Dr. Richard G. Foulkes (Appendix C, "British Columbia", item 2).† Although that report does not represent an accepted plan of the BC government, it has the status of a "green paper" (i.e., a proposal produced for the government as a basis for public discussion) and is bound to have a major impact on future developments in that province. Because of its recent publication, it is less well known than other proposals in the same category (cf. Appendix C), hence its principal orientation is presented below in the briefest outline.

The report proposes to set up a system based on:

- "Community Human Resource and Health Centres", combining public and private enterprise, as the points of delivery for primary care;
- A high degree of decentralization, with seven to nine Regional Health District Boards responsible for organization and financing of all health and social services in each region;‡
- The Ministry of Health divested of the majority of direct services and organized into three functional branches, (Standards; Finance and Administration; Services and Co-ordination (interface with the regions)) which together will be responsible for the centralized elements of planning, financing, monitoring, R & D and education;
- Public participation at all levels, with the Health Advisory Council providing public participation at the top policy level.

The proposal embraces the "total health care system" approach, with full use of modern management techniques. It calls for public regulation of the health care professions on behalf of the consumers, but without infringement of professional quality standards.

*In some provinces this trend was stimulated by the report of the "Ad-Hoc Committee on Dental Auxiliaries" (see Appendix C, "Canada", item 7). Further assistance to future planning may be provided by the recent projections for dental manpower/population ratio (Lewis and Brown 1973).

†See also a paragraph on the "Mustard Report", pp. 111–112.

‡This represents a considerable reduction in number from the present 22 Regions (item 1).

On the financial side, the proposal is in favour of global budgeting* and of an evolution toward salaries in place of fee-for-service. The need for containment of expenditures and integration of health care with socially supportive services is stressed. The health professional is recognised as the *de facto* chief allocator of resources at the direct-service level. Rational development of manpower for health services receives much attention.

It is expected that the provincial government will give urgent consideration to the proposals contained in the above report. Some legislation related to it has been introduced already (Appendix C, "British Columbia", item 3).

Eleven Years of Experience in Saskatchewan

The government of Saskatchewan has not yet unveiled any plan for a major reform of its health care system, but since this province introduced medicare years ahead of the others (1962) and is now in the unique position of having 11 years of experience with its plan, no analysis of health care in Canada could be complete without a report on the lessons learned from that experience.

It is often said in industry that the way to make a profit on innovation is to be the second firm introducing it. The leader spends money and effort making mistakes in a new endeavour, while also having to convince the mistrustful, unprepared public. That was the situation in Canada with respect to medical insurance ten years ago. No other province has had to live through the same situation.

The introduction of medicare in Saskatchewan most likely decided the future nature of medicare for the rest of the country. There are three basic options: (1) a universal provincial plan; (2) two or more competitive plans, one of them run by the province; (3) non-governmental plans only, with the government paying premiums for those below a certain level of income.†

The decision of the government of Saskatchewan, basically in favour of the first option, set a precedent for the country.‡ The unfortunate controversy over the introduction of that plan, and the subsequent change of government, made it much more difficult for Saskatchewan to introduce more fundamental structural reforms. However, a large number of voluntary community clinics and group practice units sprang up at that time. Few of the clinics survived (seven, including three large units in Prince Albert, Saskatoon and Regina). Those which did, provided a major

*"Global budgeting" refers to assigning a given annual sum for all the health services to be provided by a health care unit, instead of assigning separate budgets for each type of service (or service personnel) or meeting an open "fee-for-service" account. This budgetary approach can be applied to a clinic, a hospital, or to the totality of health services provided to all insured members in an area.

†In the case of options (2) or (3) the province would have to exercise a certain amount of regulatory control over all plans.

‡Private non-profit plans continue to exist in Saskatchewan and nearly one-third of physicians send their bills through them, but these plans are really intermediate administrators of the government plan rather than independent economic units. However, they offer coverage for minor benefits not provided by the provincial plan, such as private room, special nursing, ambulance service, etc.

contribution to the Canadian experience in this mode of operation, which is again attracting much attention all over the country.

The effect of length of experience on the provincial ability to keep in check the cost of health care is an interesting question. Table II.3* showed that the per capita costs of personal health care in Saskatchewan were slightly above the Canadian average in 1965, but that the increase from 1965 to 1971 was the lowest among all provinces, resulting in costs 17 per cent below the average in 1971. This relatively low cost might seem surprising, since the province has a problem with a rather large number of small hospitals, regarded as uneconomical, which have to be maintained in operation because of the wishes of the local population. (The closing down of eleven of these units is reputed to have made a significant contribution to the defeat of the Liberal government there in 1971, although probably not as much as the imposition by that government of the deterrent fees which provided a major plank for the NDP election platform.)

The statistics for the early years of the Saskatchewan medical care insurance plan show that the average annual per capita payments for physicians' services between 1963 and 1968, i.e., when it was the only provincial plan (except for British Columbia in 1968), increased at an average annual rate of 4.8 per cent while the corresponding rate for all Canada at the time was 9.7 per cent (Health and Welfare Canada 1973e, p. 35). Changes in the level of medical fees associated with the introduction of medical care plans in other provinces had their repercussions in Saskatchewan, as had the experiment with deterrent fees, but the overall record, as shown in Table II.3, is still good. It appears therefore that long-term experience with cost control in that province was satisfactory. Factors which contributed to this success were the province's, early in the existence of the plan, starting research into cost and quality control and putting some incentive and control plans into operation. Among these were:

1. Detailed statistical analysis of the operations, derived from an advanced data base and published in the Annual Report.
2. Elective global budgeting for hospitals, i.e., freedom to move funds locally from one budgetary item to another within a given total amount (global budgeting became mandatory for small hospitals in 1973).
3. Several types of hospital inspections by the representatives of the College of Physicians and Surgeons and by Insurance Commission inspectors, as well as those provided by the Canadian Council on Hospital Accreditation.
4. An early (1964) start on developing "Medical Profiles"† of participating physicians and surgeons. These permit the Commission to compare the activities of the individual participants with statistically established reference limits.
5. Assessment and verification of claims, involving computer scanning, followed by an expert review of anomalies and by adjustments in case of proven defaults.

*The figures in this table are not adjusted to correct for the differences in the age and sex distribution among the provinces, but the resulting distortion is not significant.

†Medical profiles were also used by the Physicians Services Incorporated (PSI) in Ontario since the mid-fifties.

6. The experience in the Swift Current Health Region, which has been providing medical care to a region of 15 000 square miles since 1946. The region is financed on the basis of per capita grants (which have been provided by Saskatchewan Medical Care Insurance Commission since 1962). Any additional financial needs are met through a personal tax levied on residents of the region. This introduces a positive incentive to keep the costs down.

For a province with a relatively small population comparatively lacking in wealth, Saskatchewan has demonstrated a considerable degree of leadership in health care innovation. This dates back to the establishment of municipal health districts in 1909 with public health doctors on salaries, and includes such other areas as the beginning of regionalization (Union Hospital Districts in 1916 and larger Health Regions in 1944) and the establishment of the first provincial universal hospital insurance plan (including outpatient benefits) in 1946 (Appendix C, "Saskatchewan", items 1a, 1b, 1c). Later, in addition to the progressive experiments with group practice and community clinics, there has been a voluntary grouping of nine hospitals for the purpose of using a common computer service.* More recently (1 March 1972) global budgeting has been extended, on an experimental basis, to community clinics which were previously supported by the income generated by their physicians on the fee-for-service basis. An evaluation of this method of financing will be very relevant to further development of community health centres.

Another area in which the province has shown much initiative is dental care for children (Curry 1974). After a survey in 1968, a pilot mobile clinic (with federal financing) was established in 1969. The clinic was operated by a dentist, two dental nurses, three certified dental assistants, and a receptionist. This successful experiment was followed by the establishment of a school for dental nurses in Regina and a planning effort that led to legislation (see Appendix C, "Saskatchewan", items 2 to 7), representing, together, the application of the systems approach in dental care. The present objective is to provide preventive and basic treatment services to all children of age 0 to 17, (with parental initiative required below the age of 3), through a gradual expansion of the age group receiving care. The system will become operational in 1974 for 6-year-olds, following the graduation of the first class of dental nurses in Regina.

With long experience in public health care, the province should be able to provide a better than average service, but we have as yet no indices available for a definitive interprovincial comparison of the quality of service. For example, vital statistics from 1966 show that Saskatchewan leads the other provinces in life expectancy at birth and throughout life (Statistics Canada 1972e, pp. 279–284), but we have no way yet of establishing to what extent this is due to health care, as compared to such other factors as the genetic characteristics of the population or their life style.

*The Saskatchewan health care system in general, and community clinics in particular, are well described in the literature. See, for example, Beck 1971; Anderson and Crichton 1973; Crichton and Anderson 1973; Wolfe and Bagdley 1973. The latest evaluation of the hospital utilization of Community Health Association Clinics (Saskatchewan 1973) evoked considerable discussion in the professional press, e.g., in the *Canadian Medical Association Journal*, 6 October 1973, vol. 109, pp. 684–656 and, 19 January 1974, vol. 110, pp. 207–216.

The picture is further complicated by high perinatal mortality (Statistics Canada 1974, p. 7).

Quebec Legislation

Universal Medical Insurance in Quebec is relatively new (1 November 1970), but this province was the first to pass a law that provides the basis for a reorganization of health services. The reorganization under the new law is intended to introduce changes which go further than any currently planned elsewhere in Canada.* Commonly known as Bill 65 (Statutes of Quebec 1971, Chapter 48; see Appendix C, "Quebec", item 2), it bears the title, "An Act respecting health services and social services". As the name indicates, it is concerned with both health and social services, and reflects the contemporary understanding of the indivisibility of physical, emotional and social health. The most revolutionary aspect of the Act is that it paves the way, from a legal and administrative point of view, for a true integration of health and social services at the primary service level.

The Act is based to a large extent on the philosophy developed by the Castonguay-Nepveu Commission (Appendix C, "Quebec", item 1), the first chairman of which, M. Claude Castonguay, resigned to run for office and was the Minister of Social Affairs in Quebec when the above legislation was formulated, passed and went through the crucial initial stages of implementation.

It would be impossible to do justice to the work of the Castonguay-Nepveu Commission in a short summary. Suffice it to say that the Commission embraced and expanded the "point of delivery concept" (cf. p. 42 in this report) and proposed a hierarchical network of increasingly sophisticated and specialized health care delivery centres, culminating in a university centre for each of four regions. The integration of the health and social care would take place primarily at the lowest level, the Local Health Centre. The general framework of the health plan proposed by the Commission is shown in Figure B.1, reproduced from charts in its report.

The Act adheres to the basic philosophy of the Commission, but the passage of time and further developments led to some significant structural changes (as well as to different names for the various types of establishments). The basic principles of the Act are expressed in Sections 3, 4, 5 and 6 which may best be quoted:

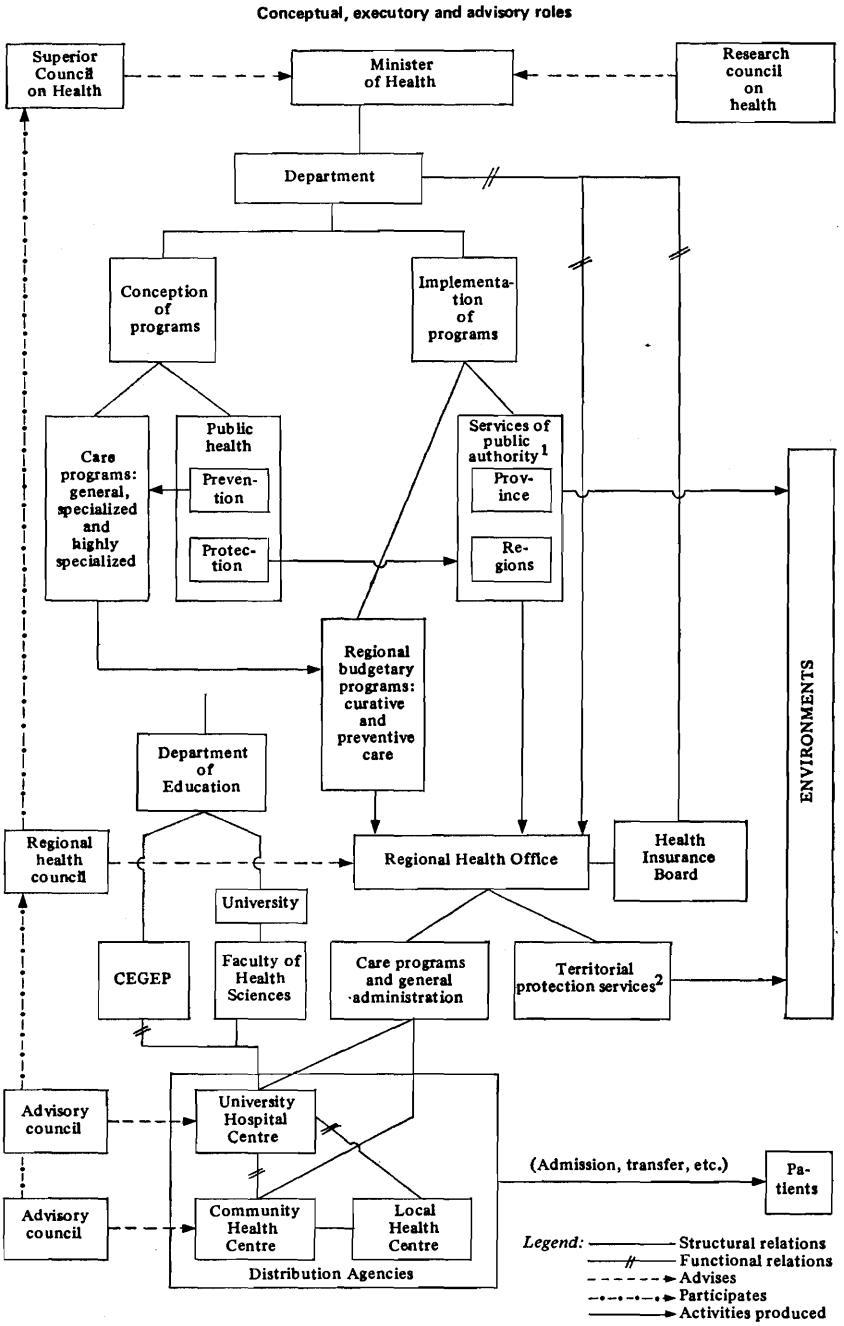
3. The Minister shall exercise the powers that this act confers upon him in order to:

(a) improve the state of health of the population, the state of the social environment in which they live and the social conditions of individuals, families and groups;

(b) make accessible to every person, continuously and throughout his lifetime, the complete range of health services and social services, including prevention and rehabilitation, to meet the needs of individuals, families and groups from a physical, mental and social standpoint;

*The Foulkes report (see pp. 97–98) might lead to reforms of a similar extent in British Columbia, if accepted as the basis of governmental planning in that province.

Figure B.1–Administrative System of the Health Plan



[1]Protection services (control of the environment and of products); improvement measures; administrative and hospital regulations; inspections and control of the system.
[2]Visits and samplings sponsored by the Department.
Source: Commission of Inquiry on Health and Social Welfare, Chairman, Claude Castonguay, later, Gérard Nepveu, *The Health Plan*, Quebec Official Publishers, 1967, vol. 4, tome 2, pp. 141, 150.

(c) encourage the population and the groups which compose it to participate in the founding, administration and development of establishments so as to ensure their vital growth and renewal;

(d) better adapt the health services and social services to the needs of the population taking into account regional characteristics and apportion among such services the human and financial resources in the most equitable and rational manner possible;

(e) promote recourse to modern methods of organization and management to make the services offered to the population more effective;

(f) promote research and teaching.

4. Every person has the right to receive adequate, continuous and personal health services and social services from a scientific human and social standpoint, taking into account the organization and resources of the establishments providing such services.

5. Health services and social services must be granted without discrimination or preference based on the race, colour, sex, religion, language, national extraction, social origin, customs or political convictions of the person applying for them or of the members of his family.

6. Subject to section 5 and any other applicable legislative provision, nothing in this act shall restrict the freedom of a resident of the province of Québec to choose the professional or establishment from whom or which he wishes to receive health services or social services or that of a professional to agree or refuse to treat such person.

In addition, section 7 states the principle of confidentiality of records (with a provision of access for research purposes), while also giving each patient the right to demand access to his record and to have a summary transmitted to another public or private establishment of his choice.*

In the nomenclature of the Act, the "local health centre" becomes "local community service centre" to stress the inclusion of social services. The major structural change is that autonomous regional health offices (see Figure B.1) are eliminated, although the advisory regional councils remain. The hierarchical structure of public establishments is also eliminated, with each establishment relating directly to the Ministry. A *de facto* functional relation will remain because the more specialized services in some establishments will result in referrals and provision of services under contract, but a direct entry to any centre is possible and there is no administrative or financial dependence (other than by voluntary contracts to provide specified services, including research and teaching).

The Act concentrates on specifying a uniform administrative structure for each type of centre (i.e., public establishments) and for the regional council.† The four types of centres are:

1. Local community service centre (LCSC)

*Public establishments comprise the centres listed on pp. 103–104 when maintained by a non-profit corporation or corporations established under the Act. Physician's consulting offices or private group practice clinics are thus not included.

†The regulations specify twelve regions (rather than four): one kind of LCSC and SSC, but four kinds of HC (general care, specialized care, highly specialized care and extended care) and four kinds of reception centres (day care, transition, rehabilitation and nursing home (Appendix C, "Quebec", item 3).

2. Hospital centre (HC)
3. Social service centre (SSC)
4. Reception centre (RC)

The essence of the administrative provisions lies in defining the composition of the boards of directors for each type of establishment. These boards will comprise representatives of the public, government, a corporation (if any) operating the establishment, professional staff, non-professional staff, and other establishments with which a contract of service is maintained (for example, universities, in the case of establishments which have a contract with a university, teaching hospitals in particular). Similar provisions are made for the board of directors of the regional council, which is intended to include representation from the public, all universities and colleges, and all health and social services establishments within each region. The constitution of the administrative committees for all organizations and of the professional advisory councils (for hospital and social service centres) is also specified.

The prime purpose of the regional council is to encourage public participation in the definition of regional needs; to promote rationalization of services through advice given to the establishments and to the Minister; and to hear and make recommendations regarding complaints. Each establishment and each regional council must hold an annual public meeting.

Within the above uniformity of administrative structure (which called for drastic changes in many of the present boards of directors and management arrangements) the establishments are expected to determine their own forms of providing service, developing more or less specialized interests, depending on the local needs.

The principal new type of establishment in the system is the local community service centre. Such centres will not be created automatically in all communities, but are expected to evolve as the needs demand. All will be affiliated with hospital centres, but some might be set up so that patients will have a rapid access to specialized hospital outpatient services when needed.

The method of integration of health and social services in these centres in not specified in the Act. Some might lean more toward health, others toward the social side. They will provide full-time service (24 hours or nearly so); but some of the individual members of a local community service team might not work full time on the team. It is expected that they may sometimes share their services between a community centre and a hospital centre. However, the law is intended to encourage the growth of the local community service centres by defining their status and providing a financial base.

The difference between the provisions of the Act and the Castonguay-Nepveu proposals might be more pragmatic and temporary in nature than appears at the first reading. The concept of regionalization (i.e., structuring of services in a region) is not abandoned but is left to evolution instead of to imposition by law. The regions are made much smaller to correspond to the regions in other Departments, for better coordination, and to facilitate integration through natural coherence of a small region. A provision is

made in the Act (Section 16d) for regional councils to assume direct responsibilities for certain programs at the request of the Minister. Also, the establishments are free to amalgamate.

There is no explicit reference to the greater role of the paramedical personnel (foreseen in the Castonguay-Nepveu report) except by providing them with representation on boards of directors. This again is only an apparent change, for the regulation of the functions of professions (which affects the non-professional staff as well) is the subject of other Acts. Bill 250 "Professional Code" (Appendix C, "Quebec", item 4a) is concerned with the regulation of professional corporations in general, in accordance with the following objectives:

1. Establishing standard administrative procedures for all corporations.
2. Establishing criteria to determine if a professional corporation may or may not be constituted.
3. Improving the protection of the public by excluding from the function of corporations the protection of the interests of its members, requiring that each adopt a code of ethics and set up an inspection committee to supervise the quality of the professional work.

The application of the above principles to the various professions is the subject of over twenty other bills which together have jurisdiction over thirty-four professions, including physicians and surgeons, nurses, dentists, dental hygenists, pharmacists, optometrists, psychologists and physiotherapists.*

An important provision of Bill 250 is the requirement that all professions covered by that legislation set up effective disciplinary procedures, with government-appointed lawyers presiding over the discipline committees.

The overall objective of the above legislation is to set up, across the province, a uniform infrastructure for the carrying out of health care programs. Almost all new elements are now operational, except for the Local Community Service Centres. These are being set up with deliberate care to meet locally felt needs: 69 centres have been announced and 12 installed by March 1974, with the final number intended to exceed 160.

New health and social care programs are being put into operation at the same time, gradually replacing the old programs. The principal difference is that each new program must be designed so as to permit, and provide for, its evaluation with respect to clearly defined objectives. Sixteen major programs have been designed, most of which are already approved and working. Each establishment must participate in some approved programs, but the priorities and the details of implementation are selected locally.

Quebec introduced free dental care (including preventive services) from 1 May 1974 for children 0 – 7 years old under amended medicare legislation. The necessary dental auxiliaries are being trained in CEGEPS. The service will eventually be extended to all children of school age (Appendix C, "Quebec", item 6).

Among the many studies associated with reforms in Quebec (in

*Appendix C, "Quebec", items 4b, 4c and 5a–5k refer to several examples of such Bills.

addition to those already mentioned) one should note a major study on health manpower for hospitals and another on policy for research on social problems, including health, completed in 1973 (Appendix C, "Quebec", items 7, 8).

Manitoba White Paper

In July 1972 the Government of Manitoba published a "White Paper on Health Policy". Two volumes of Appendices were issued later (see Appendix C, "Manitoba", items 1, 2, 3). The paper indicates the nature of the health care reform that the province intends to pursue without bringing down "omnibus" legislation. It states the inequalities in the delivery of health care, and the alarming rise of costs, as the most urgent reasons for reform. Its objective is to find methods that "will allow the health care throughout the province to approach more and more closely the best standards modern medicine can provide". The Paper states that the absence of reform will result "in general decline of the quality of the system in all its respects and for all the population, and an increasing inequality in the distribution of care". The health personnel and establishments in the province are praised for their high calibre. The root of the crisis is diagnosed as resting in the "technical and organizational aspects" of health care. In greater detail, the system* is being described as lacking incentives to use scarce resources efficiently, being fragmented, and especially lacking integration with the social services – all these factors leading to its being drastically uneconomical.†

The disproportion between the availability of intensive care hospitals and the shortage of much less costly facilities is stressed. The corresponding disproportion between the utilization of suitably skilled and overskilled personnel is blamed on a lack of suitable motivating forces. In general, the Paper links lack of motivation for economy with the prevailing "fee-for-service" method of reimbursement.

The White Paper presents a considerable amount of statistical evidence in support of its criticism of the present situation and the forecast dangers of runaway costs if the past approach were to continue. These figures indicate that, with the present structure, cost control in Manitoba has been less effective than, for example, in Saskatchewan.‡ Particular emphasis is placed on the inequalities in the amount of service received by inhabitants and on the per unit cost of service as a factor of geographic location and, by implication, of the average income in different locations. Very significant variations in the incidence of particular surgical operations among the various localities are also pointed out. Similar differences exist with respect to the availability of social services. A notable feature of the Paper is a detailed description of the health care situation in a typical small

*The name "system" is applied in the report in a loose sense, referring to the present structure, which does not meet the scientific criteria for a true system as described here in the Section "Systems Approach".

†Most of the diagnoses presented in the White Paper agree with the general conclusions arrived at by Dr. H. Rocke Robertson during his Background Study for the Council (Robertson 1973a), "Main Conclusions", pp. 1–8).

‡Cf. Table II.3.

town, introduced to illustrate a complete lack of coherence among the various services. The accent on "curative" medicine at the expense of preventive activities, and complete separation between these two aspects of health care, are also pointed out.* The White Paper recognizes the need for a gradual evolution to a new system that should remain pluralistic in nature, and for major experimentation before any large scale adoption of new forms of health care delivery.

The proposed evolution is through the gradual establishment of district boards for health care, boards which will have direct motivation for introducing economy in the operations under their supervision. These boards would seem to correspond to the regional health offices of the Castonguay-Nepveu report (see Figure B.1), since they would have delegated powers to allocate (from a global budget) financial resources among various types of establishments, to decide on the degree of integration between medical and social services, etc.

The provincial authorities would make the general allocation of resources to health and social care, would divide them among the districts, review budgetary proposals from the districts, undertake research and planning, set up standards, and provide educational programs to improve the expertise of the district authorities.

The district boards discussed above are proposed as a long term solution that has to evolve in one of several possible ways. An immediate start was to be made, however, on experiments with "health centres" or "community health clinics". The community health centre is presented as an institution principally designed to restore unity of health care, providing within a single framework the services and professionals to assist people over a broad range of health and social problems. These centres are to reduce the distorting incentives inherent in the fee-for-service system and fill the vacuum where no incentive to efficiency exists. The close parallel to the Castonguay-Nepveu proposals (which are quoted in support of this policy) is obvious.† Two health centre projects had been approved at the time of publication of the White Paper, with several others under discussion.‡ The Paper ends by stating that pending the evolution of a new integrated system, *ad hoc* measures will be used to reduce inequities and improve efficiency. The speed of progress will depend on public reaction and participation in Manitoba and on the outcome of the federal-provincial negotiations on the expansion and financing of public health care insurance.

On the administrative side, the way for reform has been prepared by a complete reorganization of the Department of Health and Social Services (Appendix C, "Manitoba", item 4) to permit integration and regionalization of services. An Advisory Council on Health and Social Development (item 5) has been established to provide broad professional and lay participation at the central policy level, as an apex for the regional organization.

*It may be observed that most of the problems listed in the White Paper are typical of the situation in other provinces and in much of the world.

†Compare also with the "Community Health Centre Project" (pp. 115–118).

‡Five centres have now been established with seven more being set up or discussed. Also, full time professional staff has been appointed to all seven regional organizations.

Most recently (January 1974), Manitoba made a step toward a denticare program for children with the publication of a report proposing a plan for the introduction of preventive and basic care for children up to 12 years of age (item 6).

Ontario Reorganization Plan

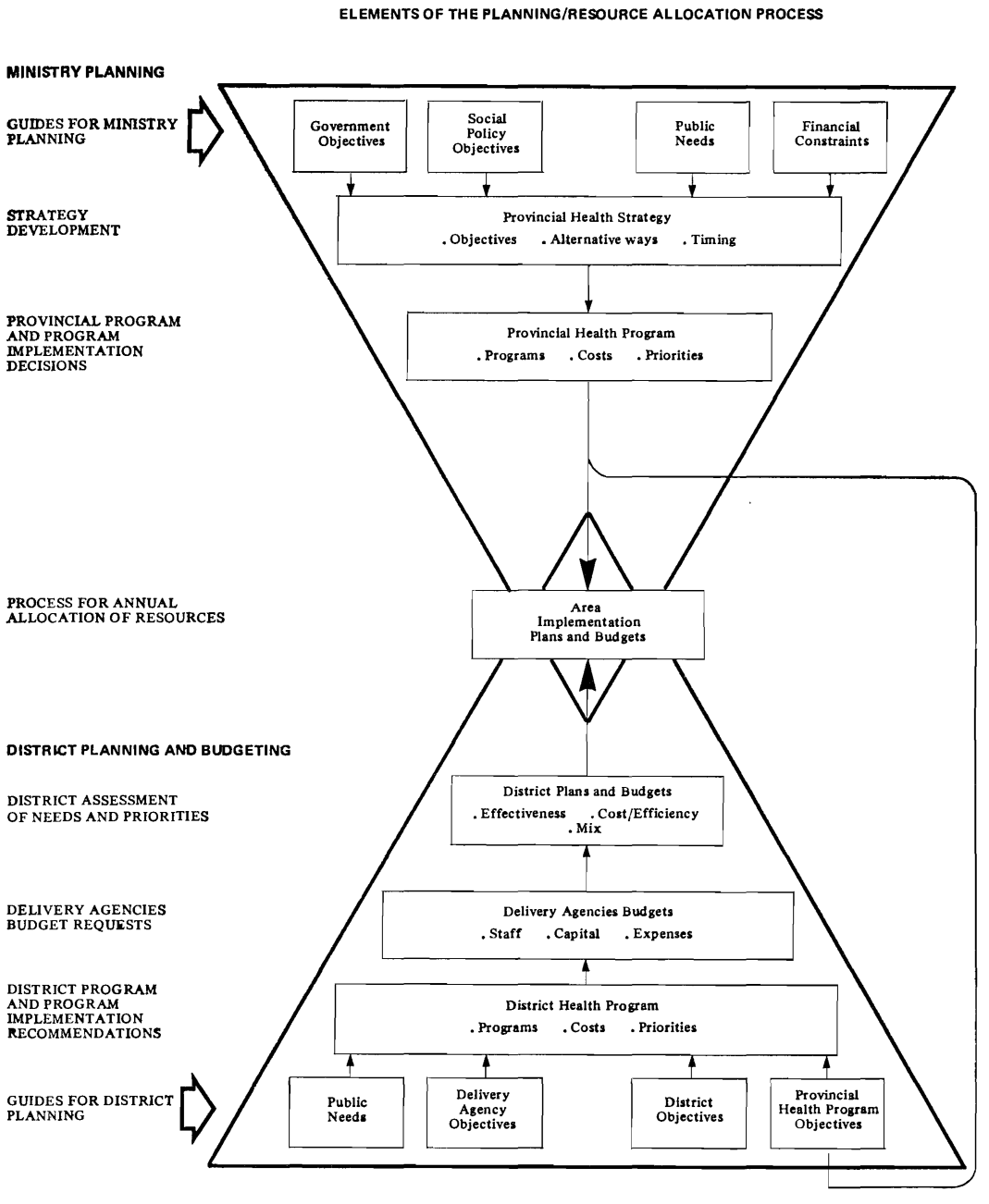
The government of Ontario has been supporting in-depth studies of health care delivery for a number of years, through the on-going work of the Ontario Health Council, the major study effort of the Committee on Healing Arts (see Appendix C, "Ontario", items 1, 2) and through numerous special studies or experiments, including approval and support of consumer initiated and sponsored community health centres in Sault Ste. Marie and St. Catharines. The first formal step toward a major structural reform of health care across the province was made in August 1972 through the announcement of "An Implementation Plan for the New Orientation and Structure of the Ministry of Health"* (Appendix C, "Ontario", item 3a). In this document, the need for reorganization is attributed to an increased public reliance on government programs for health services; difficulties of achieving proper distribution of highly specialized services; and fragmentation of health services and of planning within the Ministry, caused by a vertical organization based on three, essentially independent, program areas: (1) Health Promotion and Disease Prevention, (2) Treatment and Rehabilitation, and (3) Psychiatric and Retardation Services.

The following principles have been established for the reorganization:
1. All health needs will be served by one comprehensive program.
2. The responsibility for health care will be shared by the Ministry and District Health Councils.
3. The public will be strongly represented on the District Health Council, and will participate in the development of district programs.
4. Greater responsibility and accountability for health care will be shifted to the community."

The three main delivery programs will be replaced by three primary functions: (1) setting of standards, (2) ensuring the delivery of services, and (3) financial management. This will permit coordinated planning and evaluation in terms of the overall benefits, rather than the benefits of a particular program to a particular group. Managerial responsibilities for delivery services will be clearly separated from technical responsibilities for setting standards for health care, which require different types of personnel. The organization based on the above principles is indicated in Figures B.2 and B.3. The District Health Councils in this organization will have a role somewhat similar to that of the Regional Councils in Quebec. Their interaction with the Ministry is shown in Figure B.2. Within guidelines and standards set by the Ministry, they should ensure the development of programs to meet local needs by identifying these needs and setting objectives and priorities. As in Quebec, the Councils will have no

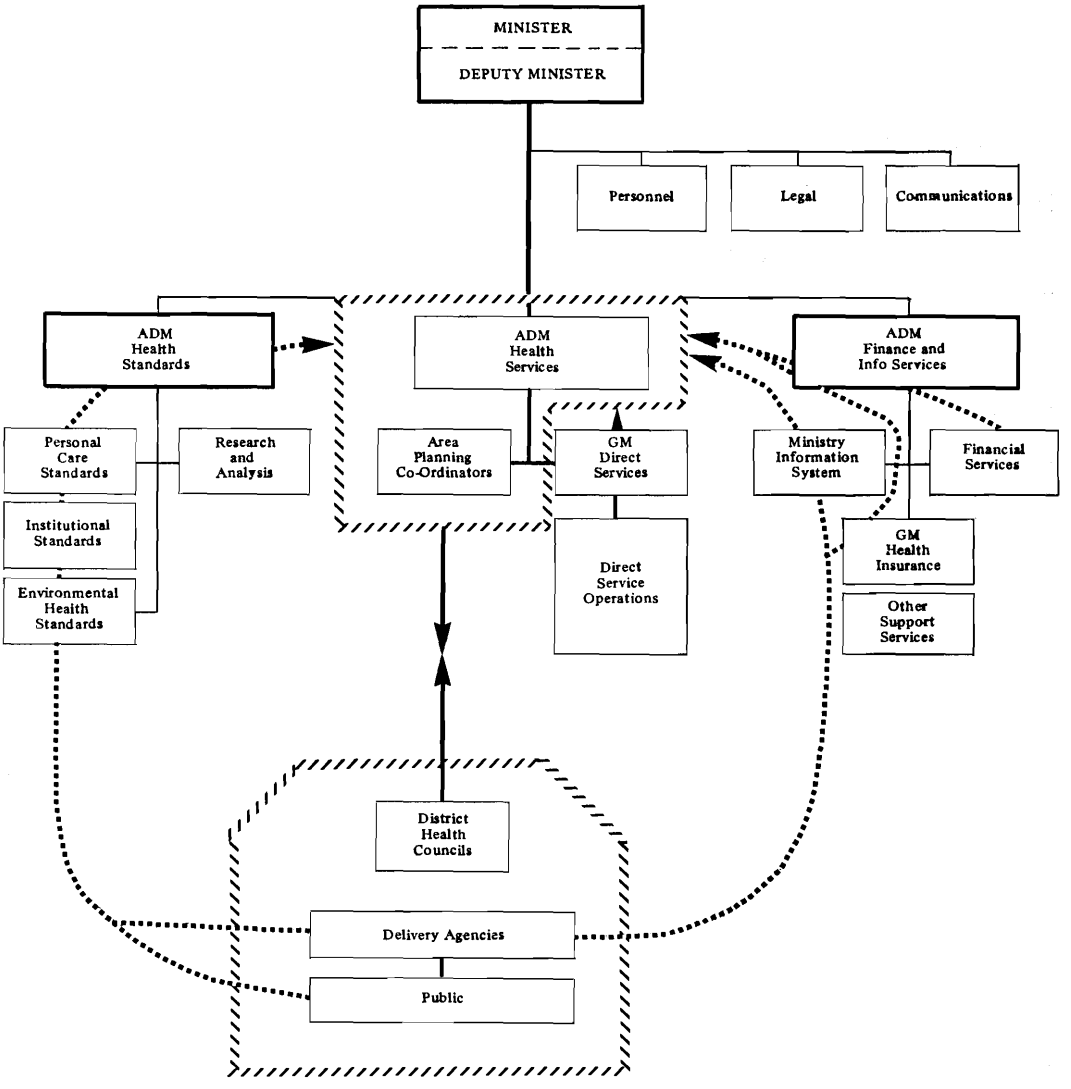
*An expanded description of the same plan was issued in 1973 under the title "The Implementation of the New Orientation and Structure of the Ministry of Health", (Appendix C, "Ontario", item 3b).

Figure B.2–The Ontario Health System



Source: Ontario Ministry of Health, *An Implementation Plan for the New Orientation and Structure of the Ministry of Health*, Toronto, 1972.

Figure B.3–Organization for Performance Assessment



Source: Ontario Ministry of Health, *An Implementation Plan for the New Orientation and Structure of the Ministry of Health*, Toronto, 1972.

executive powers either administrative or financial in nature, but they are expected to be deeply involved in the coordination and evaluation of local health care. The budgets and proposals of all health agencies within a district will be reviewed by its Health Council before being submitted to the Ministry with the Council's recommendations. The Councils in their work will be able to draw on the personnel resources of the agencies in the district and on the technical assistance and support of the planning and management functions within the Ministry.

Local circumstances will determine the size of the districts, which will be grouped into five areas. The Ministry will assign a coordinator to each area for maintaining relations with the District Health Councils. These area coordinators are assigned a key role in the system since they are expected to ensure that the District Health Councils effectively carry out their assigned role, and that the Ministry's activities permit meeting the local program objectives and priorities that are within the constraints established by the Ministry. At the same time, the coordinator has no executive power over the Councils.

The principles established for the above reorganization plan (as quoted on p. 108) appear sound in theory. How they can be made to work in practice remains to be seen. The complexity of the interactions shown in Figure B.3 is indicative of the problems that may be encountered. At the time of the principal phase of the study (May 1973) the reorganization had not yet reached outside the Ministry – in particular, no new health councils had been formed. It was apparently realized that a further planning effort was needed for defining a strategy for that part of the health care delivery system that lay outside the proper departmental structure. A Planning Committee for Health Care Systems was therefore established in January 1973, under the chairmanship of Dean J.F. Mustard (McMaster University) with the following terms of reference, "to develop proposals for a comprehensive plan to meet the health needs of the people of Ontario. The plan should be realizable with the forecast available fiscal resources, and should provide for implementation by voluntary means. The plan should also provide for the eventual coordination of health and social services...."*

Meanwhile a major drive was started toward reducing the rate of increase of costs of health care. In the absence of the District Councils, such detailed decisions as the number of beds to be eliminated in the particular wards of individual hospitals were made centrally in the Ministry, by-passing even the few existing local councils. Some subsequent consultations and modifications took place, but the difficulties of implementing the intentions of the plan in practice were already illustrated.

Since then, three area coordinators have been appointed and the first District Health Council has been established in Ottawa† but major action awaited publication of the report of the above mentioned Planning Com-

*Communication from the Ontario Ministry of Health.

†An experimental Regional organization with a Council of Health in the Hamilton Area has been in operation for some years but it was not set up along the lines defined in the reorganization plan discussed above (Appendix C, "Ontario", item 5). Several Hospital Councils are also in existence, some of them incorporated as "Health Councils."

mittee. That report (known as the "Mustard Report") was released too late for a detailed comment in the report, hence only a bibliographical reference can be included here (Appendix C, "Ontario", item 4).

Federal-Provincial Cooperation

In the Canadian situation, where the constitutional responsibility for most of health care resides with the provinces, the federal government has a role to play which is as important as it is difficult. (See Robertson 1973a, pp. 82–90 for a more detailed discussion of this role.) Outside the area of its own jurisdiction, the federal government has to rely on the development of good will, the authority of knowledge, and financial incentives to fulfill the role which makes the difference between a federation and a group of separate states in the provision of health care.

Liaison

The general public is likely to hear more about the difficulties than about the achievements of cooperation. The expansion of the mechanism for federal-provincial cooperation at the senior policy level has been already referred to in Chapter IV (p. 66). The work of the Conference of Health Ministers is now supported by the Conference of the Deputy Ministers of Health, organized as a standing body, with a full-time secretariat supplied by the federal government. Its terms of reference are to facilitate the consideration of all matters relating to the protection (promotion and maintenance) and restoration of the health of the people of Canada. It may undertake federal-provincial action and initiate recommendations to Federal and Provincial Ministers of Health individually, or to the Conference of Health Ministers and other appropriate bodies on matters related to health.

The Conference has reorganized the structure of Federal-Provincial Advisory Committees at the program and operational level. Subject to annual review, the present structure consists of the following Committees, reflecting the areas of priority considerations:

- Community Health
- Health Insurance
- Health Manpower
- Health Standards

The federal government has been considering the establishment of a Canada Health Council, composed of members of various sectors of society representing both consumers and providers of health services, whose function would be to assist and advise the Minister of National Health and Welfare with respect to the overall health goals, policies and priorities in Canada.

In addition, a much closer liaison between professional associations and the Department has been established recently.

Support of Research

Next to development of, and liaison in, matters of policy, comes federal responsibility for the support of research and development which may provide the foundation for many of these policies. A new Directorate of Research Programs, with broader terms of reference, took over a much

expanded and unified R & D program from the older directorate of Health Grants (cf. "Sources of Federal Support", p. 85). The objective here is to convert a passive secretariat to a dynamic influence with responsibility to exercise leadership in the field of research on health care, including the selection of priorities (with due regard to the needs of individual provinces) and the evaluation and dissemination of information on R & D. Our recommendations on the magnitude and sources of federal funding are intended to support and expand the above objective (cf. pp. 85–87).

Consultative Services

The Task Force Reports of the Committee on Costs of Health Services highlighted the growing concensus regarding the need for the development of health services as a system (see Appendix C, "Canada", item 2, vol. 1, p. 13), but much evaluation and planning is needed to fill the gap between the results of R & D and operational improvements. To assist in meeting this need, the Health Programs Branch of Health and Welfare Canada set up in 1971 a special group of consultants, the Health Systems Group. The activities of this group are directed to providing assistance to provinces and other appropriate bodies in the planning and development of an improved health services system, using a multidisciplinary approach and applying the principles contained in the recommendations of the Committee on Costs of Health Services. The Committee itself was, in a way, a forerunner of the group, having been set up on a multidisciplinary basis to provide recommendations to the Conference of Health Ministers.

The Health Systems Group established working agreements in five provinces to undertake comprehensive studies of the total health care system in each, placing priorities on those areas determined by the province. Five progress reports have been issued and three more are due shortly. These reports are regarded as provincial studies and their publication takes place at the discretion of the province concerned. An example of a published report is provided in Appendix C, "Nova Scotia", item 1.

Financing of Health Care

The provincial responsibility for health care, combined with their dependence on major federal contributions to the provincial hospital and medical insurance plans, gives the federal-provincial agreements on the financing of health care paramount importance.

The provisions of the Medical Care Act regarding the amount and manner of federal contributions to participating provinces were due for review in 1973. The Hospital Insurance and Diagnostic Services Act requires a five year notice of termination by one party, unless terminated or amended by mutual agreement. Past experience has shown that both Acts suffer from serious drawbacks. The principal disadvantage is the lack of flexibility. The Acts specify the types of services and institutions covered by insurance, thereby discouraging the use of other services or institutions. The intention to meet the greatest need by providing coverage for the most costly care supported the tendency to use these types of care even when less costly, but not covered, services or facilities would be adequate. The

resulting rapid escalation of costs is well known.* The parallel existence of two separate Acts also adds to administrative complexity.

A more complete discussion of the influence of federal-provincial shared-cost programs on the rapid rise of the costs of health care, together with recommendations for improvements, may be found in the Task Force Reports of the Committee on Costs of Health Services (Appendix C, "Canada", item 2). The importance of the above problems has been generally recognized, as indicated by the quotation in the Highlights (p. 10). This led to federal-provincial discussions aimed at working out a new financing arrangement. These started in December 1970 but have not yet resulted in a new agreement. The history of the discussions and the details of the latest federal proposals are presented in the press releases on the Joint Meeting of the Ministers of Health and the Federal-Provincial Committee of Ministers of Finance and Provincial Treasurers which took place on 8 May 1973 (item 6).

In brief, the objectives of the reform were selected as a reorganization toward a total health system through:

1. Flexibility
2. Simplification
3. Cost Control
4. Effectiveness
5. Guaranteed standards
6. Financial support of reorganization

It was agreed from the beginning that the objectives of flexibility and simplicity (with their influence on costs) could largely be met through replacing the present federal cost sharing, limited to special services, by per capita grants (with a suitable formula for growth). These grants could be applied toward the entire range of health services selected by each province, provided that the existing national standards of comprehensiveness, accessibility, universality and portability were retained with respect to the basic hospital and medical services.

After many exploratory discussions the federal government came up with a complete formula for future payments in the fall of 1971. The essential elements of this proposal were:

1. Incentive to cost control through a gradual reduction of the rate of growth of the per capita grants to that of the GNP.
2. Provision for the initial costs of streamlining the system through the "thrust fund" of $640 million, to be disbursed over six years (again on a per capita basis).
3. Selection of initial grant levels so that no province would receive less than under the old arrangement, but with a gradual adjustment to equalize the per capita levels in all provinces by 1977-78.

The eventual pegging of the grants to a fixed percentage of the GNP, which has been the mainstay of the federal approach, proved to be the chief bone of contention. The provinces in general do not believe that cost control can be achieved to that extent and want the federal government to share the risk. Some of the anticipated risks were related to the fact that the federal formula was not designed to cover any possible new major

*This tendency already existed due to a similar lack of comprehensive coverage in many earlier non-governmental insurance plans. See also the footnote on U.S. influence, p. 50.

national programs, such as dental or pharmaceutical care. This position might not withstand the pressures of growing public demand.

The latest federal proposal (of 8 May 1973) is based on the original principles, but contains the following provisions:

1. The fiscal year 1972/73 to be the base year with payments according to the present formula.
2. Theoretical per capita payments in 1973/74 to be equal to those in 1972/73, escalated by the growth of GNP* plus 1 per cent. Actual payment still based on the present formula.
3. The additional escalator to be reduced from 1 per cent by 0.2 per cent per year to GNP alone by 1978/79, with the new formula coming into effect in 1973/74.
4. A complex risk sharing formula† to provide for additional federal contributions, on a reducing scale, if the provincial costs rose at a higher rate than anticipated. During the first five years, excess costs in a given year would also affect federal contributions in the subsequent years.
5. The thrust fund to be available in 1973/74 for programs falling within agreed guidelines, without the need for specific federal approval of individual projects.
6. The interprovincial levelling of per capita payments spread over ten years.
7. Provision for review and negotiation of changes in 1979/80.

In addition to the above, the Minister of Finance put forward a federal proposal for the gradual elimination of cost sharing through the following provisions (item 6d):

- Reduction of the federal personal income tax by six percentage points, effective 1 January 1977.
- Elimination of the existing federal excise taxes and duties on domestic and imported tobacco products, spirits, brandy, wine and beer, effective 1 January 1975.

The provincial governments could then take over these sources of revenue without any increase of burden on the population. The federal government would guarantee to make up for any deficiencies in the above revenues with respect to the proposed cost-sharing formulae, until such revenues would exceed the cost-sharing obligations.

The above proposal is being considered by the provinces but there are no indications of an impending acceptance or counterproposals. It is not impossible that a series of bilateral agreements might become necessary to break the deadlock. The delay in the crucial negotiations is most unfortunate, but at least it did not preclude good federal-provincial cooperation in other areas of common concern as shown by the successful meeting of the Conference of Ministers of Health in February 1974 (item 7).

Community Health Centre Project

Another important example of federal-provincial cooperation has been provided by the recent "Community Health Centre Project". The con-

*The growth of GNP to be calculated on a 5-year moving average.
†See Appendix C, "Canada", item 6c.

census found in the earlier studies regarding the need to reduce the hospitalization rate in acute care facilities in favour of ambulatory and home care and the team approach, attracted the attention of all Ministers of Health. The conference of Health Ministers commissioned the above study, with the aid of federal financing and other support. The objective of the established Committee, chaired by Dr. John E.F. Hastings, was "to make specific recommendations on the provision of health services through community health centres and the possible role which governments and others might play in encouraging their development". After one year, the Committee presented a report (the "Hastings Report") and two supplementary studies (Appendix C, "Canada", item 4) based on over 100 commissioned papers and seminar summaries, 127 formal briefs and hundreds of communications, interviews and seminars.

The report (vol. 1) consists of two main parts: one discussing the concept of the "Community health centre" by itself, the other concerning itself with the broader "Health Services System" necessary to obtain maximum benefits from the centres. Since the report is quite short, an extensive use of quotations was selected as a means of representing its contents.

Principal Recommendations

"1. The development by the provinces, in mutual agreement with public and professional groups, of a significant number of community health centres, as described in this Report, as non-profit corporate bodies in a fully integrated health services system.

2. The immediate and purposeful re-organization and integration of all health services into a health services system to ensure basic health service standards for all Canadians and to assure a more economic and effective use of all health care resources.

3. The immediate initiation by provincial governments of dialogue with the health professions and new and existing health services bodies to plan, budget, implement, coordinate and evaluate this system; the facilitation and support of these activities by the federal government through consultation services, funding, and country-wide evaluation." (p. i).

Basic Concept

"The central concept of the community health centre is teamwork. The kind of teamwork which is meant is not the kind of teamwork which has been developed in hospital operating theatres, a para-military system to deal with the inert patients, but the milieu therapy approach, developed first in mental hospitals, and later in community psychiatry. This approach recognizes that all those who have contact with the client may influence his behaviour and his self-concepts, but that professionals have a special responsibility in making their interventions not only to help the patient but to help others to help him, and to help him help himself. The focus is not upon the physician as team leader but upon problem-solving processes for the client/patient. Naturally, the physician is better equipped to treat organic (i.e., medical) problems, but other members of the team may have more useful contributions to make to psychosocial or social

difficulties and this approach focuses upon helping the patient to take greater responsibility for his own health and the community to take greater responsibility for its members." (pp. 10–11).

The Reasons for Community Health Centres

The "Hastings Report" points out the concensus among authorities regarding the area with the greatest potential for economies – namely, the reduction of hospital costs especially in the acute care general hospital. These savings can be realized only if alternative forms of care result in a reduction in the number of hospital beds. There are indications that, with proper incentives and management, community clinics are capable of reducing the hospitalization rate, thus offsetting the higher initial costs of out-patient care in the group health clinics. However, the available evidence is not yet sufficient to make generalizations other than that a *replacement* of hospital beds by out-patient services will lead to savings.

A review of the broad range of community health services operating in Canada has shown that the team work which is characteristic of such services increases the efficiency and productivity of the professional members of the team. Also, the use of less highly trained personnel than is now common for a number of functions has been found to be practical and safe. Such substitution usually does not reduce the cost but increases the amount of services provided.

Other economic gains are possible through cooperation of a number of clinics in bulk purchasing of supplies and drugs, joint use of special facilities, efficient administration, etc., provided that a sufficient number of centres exist within a single health services system.

There is public concern regarding the availability, accessibility, continuity, and the process of health care, although it is not normally stated in those terms. The authors believe that these concerns can be dispelled by the more suitable service and by the different approaches provided by the community health centres. They also see the centres as an important element in public education and attitude formation.

The concerns of health professionals with the present system are discussed at some length. It is stated that with the interactions among the team and the public inherent in the concept, the centres are well suited to provide relief for many of the present frustrations. The concerns of the government could also be alleviated by a contribution to the reduction of costs on one side and by making the public more cost conscious (through greater involvement in the process of health care) on the other side.

The Health Services System

In accordance with its principal recommendations, the Committee felt that the subject of community health centres could not be discussed without sufficient reference to the more general concept of the health services system that would provide the necessary environment for the proper functioning of the Community Health Centres. Thus a large part of the report is devoted to the development of the systems approach to health care.

"The Community health centre is one way of controlling costs,

introducing new patterns of care, and providing a communications network to put people in touch with services when they need help. But our investigations have led us to the conclusion that real economies in using resources to meet the needs of people can be achieved only if the community health centre is part of a health services system which is fully integrated administratively and financially." (p. 36).

The report provides a total of 23 specific recommendations for action (11 on Community Health Centres, pages 34–35, and 12 on Health Services System, pages 58–59). Two subsidiary volumes by Dr. A.P. Ruderman "Economic Characteristics of Community Health Centres" (vol II) and Dr. Anne Crichton "Community Health Centres: Health Care Organization of the Future?" (vol III) are reports to the Committee on the Community Health Centre Project and represent opinions of the authors. They were published too late for a detailed discussion in this document. The former provides a statistical analysis that is as detailed as possible of group practice in general, and community health centres in particular, compared with solo practice, from a purely economic point of view. The study points out some conditions necessary to attain economic advantages (mainly due to a lower hospitalization rate) if other considerations and a broader data base confirm the advantages of the community health centre approach when implemented as a common, rather than exceptional, mode of providing services. Ruderman is also a strong advocate of the systems approach, pointing out that the probability of minimizing the total national cost can be improved by increasing the freedom of allocating funds, in a national way, among the spectrum of functions that are available to provide the necessary care (vol. II, pp. 39–40).

The final volume (vol. III) brings together the sociological, epidemiological and general (except economical) evidence collected during the study, in the form of a critical summary and philosophical analysis. It is deeply concerned with the strategies for the necessary reform, recommending gradual progress, but stressing the need to move from the "missionary stage" to the normal alternative stage through setting up more than the critical minimum number of centres. Experiments with many types of centres are recommended. Above all, a careful evaluation based on "before and after studies" is called for to provide enough information for assessing the criteria for further successful development of community health centres.

The authors of these and other studies on community health centres are generally unanimous that there is a lack of hard and comprehensive data for evaluation of their merits. An early relief of this deficiency is the concern of Science Council recommendations on pp. 78–79 and the corollary recommendations on pp. 82–83.

Comparative Comments

Interprovincial

The degree of convergence which exists among the above governmental activities is the most important conclusion of the review. The ultimate ends and several of the mechanisms appear to be highly similar – most notably

the following:

1. Gradual expansion of the systems approach.
2. Acceptance of the need for greater community involvement in the planning, monitoring and, possibly, the operation of local health care services.
3. Involvement by consumers and providers of services in government planning at regional and/or top policy level, through various "Health Councils".
4. Tendency to retain administrative control at the provincial level, with the regional level generally restricted to an advisory role, if granted a role at all.
5. Intention to maximize ambulatory care with a concurrent reduction of hospitalization.
6. Acceptance of the concept of Community Health Centres (or equivalent) as a major instrument of providing ambulatory care, as well as non-medical needs for care, in varying degrees.

There are also some significant differences among the various proposals. At the present stage of their development, the differences are most apparent between the Ontario Implementation Plan and the Quebec Bill 65. The former defines in considerable detail the various mechanisms that will be set up for effective performance of the planning and resource allocation processes, such as development of plans; their conversion into approved budgets; and organizations for provincial health strategy development, operational plan formulation, program implementation, development of standards and guidelines, evaluation (using special task forces), spending control, performance assessment, and internal administration.

A great deal of thinking has gone into the development of these finely structured instruments for interaction. On the other hand, the exact membership of the District Health Councils and the method of the appointment or election of members are not specified, although it is indicated that the local residents will be strongly represented, together with the local agencies and providers of health services. The existence of subcommittees, on which special interest groups, such as hospital councils and mental health councils, will have planning and coordinating functions, is foreseen. The composition of the boards of directors of the individual health care delivering agencies is not affected in any way by the Plan.

Our review of the Quebec legislation (pp. 101–106) has shown the converse approach. No details of the interface with the Ministry were given (except for the role of the Regional Councils) but the organization of the Councils and the delivery agencies was specified. These differences are partially due to the different legal nature of the two documents. For example, a Ministry document cannot impose reorganization of the boards of directors of legally constituted corporations, while internal organization of a Ministry is not necessarily set up by an Act of the legislature. Nevertheless, it can be expected that the choice of the instruments of reform, with all the consequences of this choice, represents a major difference in the philosophy of approach to the implementation of health care reform between the two provincial governments. On the other hand, the similarity of roles proposed for the local councils in both provinces may be taken as an indication of the beginning of an interpro-

vincial concensus on some aspects of health care reform.*

Manitoba seems to have taken an intermediate approach between Quebec and Ontario. The developments taking place in that province show how much can be achieved through evolution, without legislating a detailed commitment to a specific structure.

The concepts presented in the Hastings Report and the Manitoba White Paper are philosophically very close to that of the Castonguay-Nepveu Report, except for the fact that the social care aspects have been played down, although not quite eliminated. (A social worker included in the team would more likely act as a referral and liaison person.) Unlike the other documents reviewed above, the Hastings Report recommended decentralization of administrative and financial powers to regional councils (as in the Castonguay report). This may be linked to the fact that it is a report to the governments rather than from a government.

The Foulkes Report in British Columbia, upon a quick reading, appears to be at least as radical as the Castonguay-Nepveu Report, the Manitoba White Paper, and the Hastings Report.

International

Canada is not alone in having major problems with its health care service. After nearly 25 years of experience in the field, Britain also found that its system required a major overhaul of its organization and administration. Following much study by two consecutive governments, a White Paper on "National Health Service Reorganization: England" was placed before the Parliament in 1972 (Great Britain 1972). The objective was to unify the various components of the NHS into a single service, with streamlined administration. The need for coincidence of the administrative areas for health and various other social services was considered very important, just as in many of our provinces.

The reorganization, to come into effect on 1 April 1974, introduced a system with a multiple-tier administrative structure, which was decried by many practitioners as being highly bureaucratic. While structural integration was the prime objective, it might be significant to the Canadian planners that social services were left outside the system. Community Health Councils, representing the users of the system at the District level (which is large by our standards, around one quarter of a million in population), will not be formally integrated into the planning structure, since budgets and programs of the delivery agencies will not be submitted through the Councils. All the Councils can do is visit, ask for information and make recommendations to which they must receive written replies from the Area Health Authority. Their influence will therefore depend solely on the initiative of their members.

Among the significant differences between the British and Canadian systems, two may be singled out. First, the general practitioners do not normally have direct admission privileges in the British hospitals and do

*A more accurate comparison between the approaches of these two provinces will become possible after a study of the "Mustard Report" (Appendix C, "Ontario", item 4) and of the government of Ontario reaction to it, since the latter report is expected to cover the same aspects of health care services as the Quebec legislation.

not attend their patients, once hospitalized. There are indications that this dichotomy might be much reduced in the future. There is a growing tendency to set up more Community Hospitals and Health Centres (a modernized version of the old Cottage Hospitals) attended by the local GPs. The trend appears to be stronger in Scotland than in England. Scotland has been reported to be planning construction of some 200 Community Health Centres.

Thus in the above area, it is Britain which might be moving toward the Canadian practice. The second major difference is the coverage of dental care by the British National Health Service. Here Canada is far behind, but is showing signs of moving toward the British plan.

The evolution of health care in the U.S.A. is of great interest to Canada. First, there is the mutual influence through proximity and the relatively easy movement of personnel. Second, the socioeconomic systems in the two countries make their experiences in health care particularly apt for cross-national comparisons. Third, the large size of the U.S.A. means that pilot projects involving as little as 10 per cent of its population can provide as much information as the whole Canadian structure of health care. Thus, the current experiments intended to guide our neighbours in the choice of their system for the delivery of health care can be of great significance to us.

It is very likely that the U.S.A. will introduce health care insurance of a universal and comprehensive type, although its more detailed nature is far from having been determined (Business Week 1974). There is much interest in the Health Maintenance Organization (HMO) type of delivery organization, which has much in common with the systems proposed in the Community Health Centre Project. The significant factor is that some 60 HMOs are in operation with another 80 being set up (Rothfeld 1973). Also, a system of Professional Service Review Organizations, working under government supervision, is being developed (Sanazaro et al. 1972).

There is much that could be learned from further carefully conducted interprovincial and international comparisons. The initiatives shown in this direction in Canada and on the international scale by the World Health Organization merit much support (cf. Robertson 1973 b, Appendix 11).

Appendix C–Selected Official Documents

The majority of reference material is listed in the Bibliography, in alphabetical order. However, it appeared advisable to list separately references to legislation, governmental policy papers and studies by bodies especially commissioned by governments to prepare recommendations for policy and planning purposes. Such documents have therefore been omitted from the general list of references, but are, instead, listed in this appendix. Only the relatively recent and/or the most relevant documents are included, starting with federal publications, followed by a province-by-province listing from East to West. The basic federal and provincial Acts regarding the financing of hospital and medical services, and the amendments thereto, are taken as known and therefore are not listed. The Acts regulating the professions are listed only when relevant to a reorganization referred to in the text.

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