Does Health Care Support Independence or Threaten It: 
A Population Based, Person Specific Analysis of 
Patterns of Use by Seniors

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Robert G. Evans\textsuperscript{1,3,4}  
Morris L. Barer\textsuperscript{2,3,4}  
Clyde Hertzman\textsuperscript{2,3,4}  
Samuel B. Sheps\textsuperscript{2,3}  
Arminée Kazanjian\textsuperscript{2,3}

\textsuperscript{1}Department of Economics, University of British Columbia  
\textsuperscript{2}Centre for Health Services and Policy Research, University of British Columbia  
\textsuperscript{3}Department of Health Care and Epidemiology, University of British Columbia  
\textsuperscript{4}Population Health Program, Canadian Institute for Advanced Research

For Further Information Please Contact  
the Investigators at:

Centre for Health Services and Policy Research  
429-2194 Health Sciences Mall  
Vancouver, BC V6T 1Z3  
phone: 604-822-4810  
fax: 604-822-5690

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Telephone: (613)-954-7943  
fax: (613)-954-7363
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EXECUTIVE SUMMARY

Major Findings

1. During the 1980s, decreasing rates in hospital use occurred even though rates for the elderly were continuing to increase. During the 1990s, downsizing has affected all age groups, the elderly included. Day surgery has increased dramatically, but there is no clear pattern of a transfer of care from inpatient to outpatient services.

2. Over this same period, age-specific per capita expenditures on physicians continued to increase, mostly because of increased spending on specialists. These increases occurred because a slightly larger proportion of BC's population was referred to specialists, they were more likely to see a larger number of specialists than in the past, and they were being provided with more expensive services (after adjusting for fee increases).

3. People who died in hospital accounted for an increasing proportion of total hospital care, but only because their use was declining at a slower rate than non-decedents. In the mid-1990s, people who died were as likely to use facility-based care as their counterparts in the 1980s, but had shorter lengths of stay. They were far more likely to use community-based services such as homemaker care and doubled their use of pharmaceuticals. Despite claims to the contrary, only a small fraction of the increase in pharmaceutical costs can be explained by hospital downsizing.

4. Those who lost independence were also affected by downsizing, with those in the mid-1990s using fewer facility-based services. More importantly, patterns of care prior to loss of independence suggest a relatively rapid transition, which indicates either that there may have been unmet needs prior to the loss of independence, or that many people went through this transition because of a 'traumatic' event.

Policy/Program Implications

1. The complex outcomes that have occurred as a result of hospital downsizing suggest that there should be a more explicit coordinating (and perhaps budgetary) link between facility-based and community-based care. Some mechanisms for this have been put into place with 'regionalisation'. These should be strengthened to ensure continuity of care, and to minimise 'off-loading' of clinical care from the formal health system to informal caregivers.

2. Since the years on which these analyses are based, BC has moved to a 'hard cap' system for physician reimbursement. The hard cap has been relatively successful in controlling physician expenditures, but these analyses are quite revealing in what expenditure shifts have taken place 'under the globe', and should be useful to policy-makers in identifying areas that may cause pressure in the future. For example, if specialists are 'better' at keeping their portion of the global budget up, there may be interest in moving to split caps for GPs and specialists, or perhaps in the creation of regional/specialty caps.

3. The doubling in adjusted pharmaceutical costs among the elderly -- for all age groups, and all 'groups' of patients, whether they used hospital services or not -- suggests that pharmaceutical expenditures must become a high priority area for policy attention. The BC program of reference-based pricing is one such form of intervention; calls for a national Pharmacare program are another. Any policy approach in this area would benefit from being both top-down (e.g. global budget) and bottom up initiatives to improve the appropriateness and cost-effectiveness of prescribing practices. Policy in this area would also benefit from coordinated action, at least at the provincial level, if not the national, or there is little hope of having control in this rapidly increasing sector.

4. A decreased use of facility-based services in the 1990s means that the BC government policy of 'closer to home' may have been achieved. What should remain of concern is whether this was accomplished through the deployment of more suitable health care services, or at the expense of informal caregivers.
OVERVIEW OF THE SOCIAL AND THEORETICAL IMPORTANCE OF THE WORK

Seniors' Use of Health Care: The Long Term Trends

The increasing use of health care by seniors is widely documented in the literature, particularly in Canada. In popular discussions this is usually attributed to the aging of the population. But the attribution is false, and the resilience of this error in the face of repeated refutation is itself worthy of some exploration [Barer et al., 1994a; Barer et al., 1998]. Two decades ago Boulet and Grenier [1978] demonstrated the very limited impact of demographic forces per se on health care use. More recent studies have consistently found large increases over time in age-specific use rates by seniors; these include: hospital use (acute and extended care), physicians' services, and drugs in BC [Evans et al., 1989; Hertzman et al., 1990; Barer et al., 1989; Anderson et al., 1990; Anderson et al., 1993]; hospital use and physicians' services in Manitoba [Roch et al., 1985; Barer et al., 1994b]; hospital use, physicians' services and drugs in Saskatchewan [Gormley et al., 1990]; and Canada-wide [Nair, 1991]. Less detailed but consistent data are found in the US [Barer et al., 1992] and Sweden [Evans, 1991].

All studies show substantial increases in the share of health care services taken up by seniors, increases which are largely unexplained by changes in population structure. Barer et al. [1994a] provide an updated survey. The increases in time spent in hospital-based long term care by the "oldest-old" are particularly marked [Evans et al., 1989]. These patients are predominantly suffering from psychogeriatric disorders or related chronic conditions which would seem to preclude independent living, yet curiously there is no evidence in the wider epidemiological literature of an "epidemic" of Alzheimer's disease or other psychogeriatric problems sufficient to explain the large increases in institutional use. If the population is not "sicker", why is there so much more care?

Common explanations offered by those "in the field" are that the resources that once supported such people in the community are no longer available. A darker view is sometimes expressed, that for the very elderly the experience of institutional care itself destroys the capability for independent living. Our impression is that this view is quite widely held, though rarely expressed publicly; remarkably, recent findings in neuro-physiology appear to be providing supportive evidence [Sapolsky, 1993].

These explanations are not in conflict, however, and both support the general opinion as to the desirability of greater independence for seniors -- better quality of life, and (less clearly) perhaps some reduction in costs of health care. Such "independence" seems to be represented by living at home or in a more home-like atmosphere -- the hospital is not the only model for congregate or communal living! But there is a more subtle question that is more rarely addressed. Does not the increased intensity of health care servicing of all types represent a form of dependence which extends beyond the institution?

If the home becomes a "therapeutic milieu", the "hospital without walls" has in effect extended itself into the home. The patient is dependent upon drugs, regular diagnostic and other interventions, home visits and other support services. The overwhelming opinion seems to be that homes are still better than hospitals. But a broad reading of the concept of "independence" should lead to some concern for the implications of "community-based care" in the context of ever-increasing intensities (per capita rates) of servicing. The theme of "Closer to Home" was intended to mean instead of in hospital; if interpreted as support for a further overall expansion of servicing of the elderly its implications for independence are much more ambiguous.
We did not include, in the present program, any specific research proposals for addressing these deeper questions. But the linked data set now available will permit us to identify the whole range of services being received by each individual, and so at a later stage to draw inferences about the actual conditions of those in "independent" versus "institutional" living.

**The Era of "De-Institutionalization"

On the other hand, since the mid-1980s a process of "de-institutionalization" has been gathering momentum in Canada as in many other countries. There has been a slow decline in rates of inpatient use in Canada, starting in the early 1970s. Per capita use of General and Allied Special hospitals rose from 1632.9 patient days per thousand population in 1961 to 1907.6 in 1971, but fell to 1805.7 in 1981/2 and to 1529.6 in 1991/2, or 6.33% below the 1961 level [Nair, 1991; unpublished data, 1994]. The most rapid decline was in the latter part of the 1980s.

In BC the number of patient-days per capita in acute and rehab. beds fell by 22% between 1987/8 and 1992/3. Thus the provincial government's "New Directions" program was launched at the end (February, 1993) of a five-year period which had already seen the largest and most prolonged contraction in inpatient use in our history. Nor has there been any offsetting increase in other forms of institutional care.

The first order of business for this research program was to identify the distribution of these recent reductions by age-group. Even before starting, we knew that there had been a marked increase in the use of day care surgical facilities by elderly people, which might suggest a corresponding decrease in inpatient use. But previous studies in paediatrics showed that coincident increases in day surgery and decreases in inpatient use were in fact very weakly linked causally. Most of the decrease in patient days was among non-surgical diagnoses, or surgical diagnoses (T&A) which were not at that time considered eligible for day care [Evans et al., 1988].

In any case the observation of a recent and large drop in use, combined with the introduction of policies which include the expectation of substantial future cuts, raised obvious questions not only about which groups in the population are experiencing the reductions, but also about the effects upon them and upon the rest of the health care delivery system. By the beginning of 1994, some had begun to describe inpatient bed capacity and use as being in "free fall", in response to a variety of recent changes in provincial funding and labour relations policies. They feared that "over-shooting" might be placing patients at risk. On the other hand, the more recent data raise the possibility that the Seaton Commission's recommended targets were too conservative, underestimating the potential for "downsizing" inpatient care, and moving health care services "Closer to Home". If institutional use by the elderly was being substantially reduced, with more to come, was it possible that seniors were being "squeezed" rather than "supported" into independence?

Conventional wisdom among care-givers is that greater community support -- i.e. resources -- is an essential precursor to reduced use of institutions and greater independence. But both the long term increase, and the recent decrease, in institutional use occurred without identified or measured offsetting changes in community support. The decline in informal care-giving and support -- the increase in "needs" -- which is typically asserted as the "cause" of the previous expansion is not independently documented, only inferred from the expansion itself.

It may have happened, but one must recall that study after study, at different times in different jurisdictions, has found that the principal determinant of institutional use is institutional capacity -- "if you build it, they will come". And if you shut it, they won't. An independent role for
population needs in influencing institutional use is difficult or impossible to find. And yet there must be some connection, at some level. Hence the importance of developing a more comprehensive picture of what is happening to the patterns of care (and to the extent possible, outcomes) for seniors as the acute care system or at least bed use, shrinks.

The Linked Health Data Base in BC

The work of the BC Linked Health Data set (BCLHD) Project has created a powerful new capability for addressing such questions. This Project, undertaken and housed at the UBC Centre for Health Services and Policy Research and supported by the BC Ministry of Health, has successfully attached a (coded) common patient identifier to each of the service records from Hospital Programs, the Medical Services Plan, Pharmacre A Plan A (seniors) the Continuing Care system, and births and deaths, over the period from 1985/6 to 1995/6 [Chamberlayne et al., 1998]. It is now possible to define the trajectory of health care use by a particular individual, from 1985/6 to 1995/6, as reflected in these records. As far as we know, the only other research group with such a capability at the present time is the Manitoba Centre for Health Policy and Evaluation, which pioneered the development of this sort of data base (MCHPE, 1993), although linkage within a single year has recently been used to study drug use in New Brunswick [Davidson et al., 1995].

Historical data linkage is largely a probabilistic process; the BCLHD Project has succeeded in linking more than 95% of each of the program areas in each year. These are high success rates, comparable to those being achieved by Manitoba researchers [Roos and Wajda, 1990].

The development of the BCLHD Project proceeded under the direction of a joint Management Committee representing both the Ministry and the UBC Centre. This Data Access Committee continues to oversee the routine updating and utilization of the data base, dealing with the ‘ethical challenge’ of proposed projects and the use and dissemination of results, under guidelines set out in the Access Policy for Research Uses of Linked Health Data, which has been in effect since April 1996. These guidelines were designed to comply with BC’s Freedom of Information and Protection of Privacy Act. Thus the link between research and public policy has been in place from the beginning, providing a direct channel for dissemination of results in addition to the usual presentation and publication of research papers.

Since this research program involves analysis of retrospective data, rather than interventions, the only ethical issues which arise are those of confidentiality and privacy. The records used for this project include no personal identifiers; they are coded by scrambled versions of identifying numbers, which allow analysis at the individual level without the ability to identify a specific person.
OVERVIEW OF THE RESEARCH METHODOLOGY

Objectives

1) to extend previous research on the patterns of health care use by seniors in BC, to document the impact of health reforms (e.g. hospital bed closures) on the patterns of service use among the elderly (for instance, is there evidence that utilization constraints have increased the proportion of the frail elderly in the community?)

2) to develop a data-based indicator of the point in time at which 'loss of independence' may be deemed to have occurred, more or less permanently, which can then be used in the analysis of patient care trajectories among the elderly

3) to explore the precursors, correlates, and consequences of loss of independence including socioeconomic and geographic factors, and to explore the impact of various policies and programs which may have an effect on the care trajectories of seniors before and after loss of independence

In order to meet these objectives, the project has been divided into three phases; a ‘cross-sectional’ phase, to update previous research on trends in hospital and physician service utilization; a ‘deaths trajectory’ phase to look at the impact of time and hospital downsizing on the care of a (retrospectively) ‘at risk’ population in the 24 months prior to death; and a ‘cohort’ phase, to look at longitudinal use, and changes in patterns of use, of health services by the elderly.

Methodology

This was a retrospective study, utilising routinely collected administrative data on vital statistics and health services utilisation in the province of British Columbia. Probabilistic linkage methods were used to identify an individual to whom each utilisation record could be attributed (Chamberlayne et al., 1998). The data files included were: fee-for-service payments to physicians and alternative providers; acute, rehabilitation, extended, and surgical day care hospital separations; assessments and records of service use from the Continuing Care system; payments for pharmaceuticals for community-dwelling elderly aged 65+; and vital statistics records of death. These health care services are universal in BC, and linkage of greater than 95% of records from each program file and year was achieved, making this work population-based and individual-specific.

All analyses were done using a combination of custom-written perl and C programs, SAS, and Excel. A combination of approaches was used because of the large data sets involved. The specific approach taken was determined by the head programmer/analyst in consultation with the principal investigators and project manager.

The methodological approach for each phase, including the data used and cohort selection, where appropriate, is below. Further details for all phases can be found in publications relating to those analyses (Meddings et al., 1997; Meddings et al., 1998a; Meddings et al., 1998b; Morgan, et al., 1997; Barer et al., 1998; McGrail et al., 1998).
Phase I: A cross-sectional analysis of trends in the use of hospital and physician services

HOSPITALS

This analysis was intended to provide a detailed understanding of how 'hospital downsizing' or 'deinstitutionalization' actually 'played out' in the data for BC over the past decade or so, and to provide an update to previous work by the principal investigators in this area. It is the one piece of analysis for this project that does not involve linked data.

Included are all acute, extended, rehabilitation and surgical day care separations from BC hospitals in 1985/86, 1993/94 and 1995/96. The latter year was added well into the project in order to keep the analysis current, and because we discovered that significant downsizing continued to occur in these last two years. Tables were generated outlining separations (discharges from or deaths in hospital) and days of separations (i.e. accumulated lengths of stay for patients separated), by five-year age group to 90+, and 'bed type'. For purposes of comparison to previous work including data from 1969 and 1978, all stays recorded as 'acute' were counted as such, while all other inpatient stays were counted as 'extended'. This means the small number of rehabilitation stays were counted as extended, as were stays recorded as 'long term care in acute', which were present in the 1985/86 and 1993/94, but not the 1995/96 data. Surgical day care events were kept separate, adding to the total number of separations, but not to the days of separations.

Age was calculated at the date of admission, after determining that choosing age at admission vs. age at discharge made virtually no difference in the results. Days of separations were calculated by subtracting the date of admission from the date of separation; i.e. admission on Jan 2 and separation on Jan 4 of the same year yields a length of stay of 2 days.

All numbers are reported as rates per thousand population, using population figures provided by BC Stats' P.E.O.P.L.E. projection model, version 21.

PHYSICIANS

This phase of analysis is based on fee-for-service payments to physicians in 1985/96 and 1993/94, contained in the Payment Information Masterfile of the Medical Services Plan (MSP) in BC. Fee-for-service payments account for more than 90% of all payments to physicians in both years under study, and the linkage rate was greater than 99% in both years. The working data set represented payment records totalling approximately $780 million in 1985/86 and $1.27 billion in 1993/94. In order to compare utilization patterns, we first needed to remove the effects of fee changes. This was done by valuing each fee item in each of the two years using the same (April 1, 1988) fee levels. Details of the methods are described elsewhere [Pascali, 1995]. Removing the effects of fee changes on expenditures results in fee-adjusted expenditures of $832 million in 1985/86 and $1.19 billion in 1993/94.

An individual's utilization of physician services in any given period may be described in ways that reveal considerably more about their patterns of use than summary statistics such as expenditures or utilization per capita. Specifically, for each person who contacts at least one physician during a given period, it may be of interest to know how many different physicians they saw and, for each such physician, how many times the patient was seen, and the patterns of servicing per visit. Using data from the BCLHD, we were able to disaggregate patterns of use for each person in the province who received physician services, as follows:

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429-2194 Health Sciences Mall
Vancouver, BC V6T 1Z3
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of the period). This is not a problem when counting services, contacts, or expenditures, all of which are attributed based on the age of the person at the date of service. But it is a potentially large problem when attempting to create an additive system of MDPPs and DPs. In the case of DPs, each person who sees a physician during the fiscal year must contribute exactly ‘1’ to the Discrete Patient count. But in the course of that year, an individual will spend some proportion of time at age ‘x’ and 1 minus that proportion at age ‘x+1’. We have thus ‘split’ each DP according to the proportion of the year spent in each age. The total, rather than a cross-sectional count, represents person-years, by age, of the subset of the BC population who visit a physician at least once during that year.

MDPPs are a bit trickier, but only because there is no necessary correspondence between the number of MDPPs and the number of people who make physician visits. If all visits to a particular physician occur while an individual is age ‘x’ or age ‘x+1’, then no additional computation is required; 1 MDPP is attributed to the appropriate age for each physician-patient combination. If, however, a patient visits a particular doctor both before and after his/her birthday, into which age category should that MDPP be placed? We considered assigning these MDPPs based on age at a particular point in time - the beginning of the period, the middle of the period, or the end of the period - but in all cases this caused large biases for the under 1 age category. Instead, we decided to calculate age at service date for all services, and to assign a proportion to each MDPP based on the proportion of the fiscal year the patient spent in each age category. For example, a person born in the sixth month of the fiscal year who received services from a single MD both before and after the sixth month, this physician-patient pairing would count as 0.5 MDPP at age ‘x’ and 0.5 MDPP at age ‘x+1’, where ‘x’ is the age of the patient at the beginning of the fiscal year. (The 1985/86 data contain only service month and year, so for ease of computation we have assumed all patients are born on the last day of the month.)

But this is really only half the story. The data available are in the form of a payment file, which means records included are for services which were paid during the fiscal year rather than services that were received during the fiscal year. This means that services paid during a fiscal year starting in April and ending the following March actually represent services rendered from approximately the beginning of March through the following February. To most accurately calculate proportion of time spent in each age, then, a frame of a March to February ‘service year’ is used rather than an April to March fiscal year. For example, a person born in May would count 0.25 towards a discrete patient in age ‘x’ and 0.75 of a discrete patient in age ‘x+1’.

Initial Discrete Patient/Population results showed several older age groups with ratios above 1.00. We hypothesized that part of what we were seeing were the effects of increased mortality at these older ages. In our discrete patient calculation, a patient’s proportion of time spent in an age was not adjusted for mortality, so we were effectively counting patients in the numerator who were not in the denominator at the time the population estimates were developed. We considered making mortality adjustments to the discrete patient numbers using linkages between MSP and deaths information, but were not able to do so because of poor death linkage rates in the first part of 1985/86. As an alternative, mortality adjustments were added to the denominator (population) rather than subtracted from the numerator (discrete patients). One person was added to the population count for each person who died between March 1 (the start of our ‘service year’) and July 1 (the date of the population count). These ‘population’ figures, then, overstate the number of people alive at July 1, but accurately reflect the number of people who could have received services at a given age.
As an example, a person who turned 80 on May 31, and died on June 30 would count as 0.25 of a discrete patient in age 79, and 0.75 at age 80 (because in the discrete patient count, mortality is not considered). In all likelihood, this person would have received services at age 80, but would not be counted in the population at age 80, because she died before the population count at July 1. Therefore, since we are unable to adjust her proportion of ‘exposure’ in the numerator, we include her in the denominator, by adding ‘1’ to the population count for age 80 (age at death). This may seem like over-counting, but in the example above, without adjusting, the person contributes ‘1’ to the numerator (though divided into two age groups), but does not contribute to the denominator, because they die before the July 1 cross-sectional population estimate. With the adjustment, the person is included, as ‘1’, in both the numerator and denominator.\footnote{These adjustments increased the denominator count by less than 1% for all age groups except the two eldest; the 75-84 year old group increased by about 2% in both years, and 85+ by about 5%. This methodology also had the expected effect of moving all the Discrete Patient/Population ratios down to or below 1.00.}

**Phase II: An analysis of the use of health care services prior to death**

This phase of the analysis utilised data from all five program areas of the linked data set, as outlined above. We identified all BC decedents in 1988 and 1993, and using the linked data, extracted all health care utilisation information for the 24 months (730 or 731 days) preceding death. Subsequent analyses were limited to those aged 65 and over at the time of death, who composed approximately three-quarters of total decedents in both years.

Using these data, records of each decedent’s level of the following health care utilization measures in the two years preceding death were constructed: (1) the number of days spent in extended or long-term care hospital beds; (2) the number of days spent in acute care hospital beds; (3) the number of day surgeries; (4) fee-adjusted payments to physicians and other health care providers; (5) price-adjusted pharmaceutical payments (Pharmacare Plan A); (6) the number of hours of home maker services used; and (7) the number of days spent in adult day care.

Two of these measures of health care utilization are fee- or price-adjusted expenditures; the rest are utilization counts. Utilization proxies were created from payments made by the Medical Services Plan (MSP) and Pharmacare Plan A (Pharmacare) on behalf of each decedent, by ‘adjusting out’ the effects of changes in fees/prices.

The adjustment of MSP payments employed the methodology referred to above (under ‘Phase I’). Pharmacare payments were all converted to what they would have been in 1993 prices. ‘Prices’ for drugs in 1993 were assigned based on the per-unit reimbursement for each unique drug in the 1993 pharmaceutical file, identified by the Canadian Drug Identity Code (i.e., branded and generic drug costs were calculated separately). For the (very few) drugs that were prescribed in earlier years and not in 1993, costs were inflated using an overall Laspeyres index of pharmaceutical prices, calculated at the two-digit therapeutic code level.

\footnote{The population adjustments were not ‘split’ between ages as the DP counts were for the sake of simplicity. Such a split would have required a good deal of extra programming, and would have affected the resulting numbers very little.}
Previous analyses of the utilisation and cost of care for the dying have often focused on the elderly decedent population as an aggregate cohort. Comparisons are often made between “decedents” and “survivors” use of health care services in a given year. The approach taken here is different. To better describe treatment patterns, the population of elderly British Columbian decedents in 1988 and 1993 was divided into categories according to the nature of their exposure to different types of institutional care during the last 24 months of life. The principal criterion for distinguishing decedents was their length of stay (if any) in acute care hospitals and extended or long-term care (nursing home) facilities during their last two years of life.

The linked database is central to this analysis because it allows one to categorize individuals based on their use of selected services, acute care for example, and then measure their use of other services conditional on the level of the first. This would not be possible with data files that did not permit the analyst to identify services used by a specific individual across different health care programs (e.g., the Pharmacare, MSP, and Hospital insurance programs). Categorizing decedents based on the form of institutional exposure (the conditioning variable) provides the means to ascertain whether there were changes in (1) the relative magnitudes of populations within different institutional settings over time, and (2) the intensity of services provided to patients in similar institutional settings during the two periods of analysis.

The division of categories was as follows: Decedents who spent their last 24 months within health care institutions were broken into two groups: those who were in extended care or long term care facilities exclusively (the ‘All Facility, no AC’ group), and those who spent at least one day in acute care (the ‘All Facility, with AC’ group). This distinction was made because of the differences in estimated average costs of caring for patients in these types of beds ($650 per day in acute care versus $150 per day in extended care)—reflecting differences in the acuity/needs of patients.

Those decedents who had some form of institutional care, but were not continuously within institutions in their last two years of life, were disaggregated into three groups: ‘Some Facility’, ‘Died in Hospital’, and ‘Some Hospital’. The ‘Some Facility’ category are those who spent at least one night in an extended-care facility or a nursing home in the two years prior to death. A small minority of individuals in the ‘Some Facility’ group did not spend any time in acute care. The ‘Died in Hospital’ cohort are those who had no contact with either extended care or nursing homes, but died in an acute care hospital. Those in the ‘Some Hospital’ group spent at least one night in acute care during their last two years of life, but did not die in hospital. The distinction between the latter two groups is made because of perceived differences between those who die in hospital and those who die elsewhere—either with formal supports and preparation, or suddenly. Finally, the last of the six categories, ‘No Hospital,’ is made up of people who had no in-patient hospital care in the two years preceding their death.

**Phase III: A longitudinal cohort analysis**

The study population in this phase was people aged 65, 75-76, 85-87 or 90-93 on the first day of January in 1986 and 1993. We limited analysis to specific ages so that comparisons of utilisation could be made over time without the necessity of adjusting for changes in age composition. Increasing the ‘band widths’ with age was done to ensure that the numbers of
people involved would remain relatively high. There were just under 80,000 people included in the earlier time period, and just over 92,000 in the later, with even the smallest groups (90-93) containing 7,820 patients in the 1986 cohort and 9,158 in the 1993 cohort.

Health services utilisation data for these cohorts was extracted for the subsequent three years, or until death, whichever came first. The first part of this analysis involved repeating, with some minor modifications, the methodology developed for the deaths cohorts, as described above. The only changes made were to the 'institutional use' groups, removing the 'died in hospital' group, and adding a 'Some home care' group, which included people who did not stay overnight in either a hospital or long-term care facility, but who did receive home-based (formal) care services through the continuing care system. The former category was dropped, because it was felt that it would be of limited use/interest since this analysis is not based on a death outcome, as was the previous. The latter group was added partly because this phase has a larger focus on community-based care, but more importantly because our knowledge of the data, how to organise them, and what measures could reasonably be created, was more robust at this stage of the project.

The second part of this phase involved attempting to define the point at which people lost 'independence'. Loss of independence (LOI) can clearly be defined in many ways, and it was not our intent, nor do we think it possible, to arrive at the 'definitive' parameters for this construct. Because this project is based on administrative data, we developed the following definition: 'Loss of independence' occurs at the point in time at which a person becomes permanently dependent upon institutional care (extended, nursing home, or acute), or upon a significant level of community-based continuing care services.

For our purposes, permanent refers to the receipt of services until death. Because our data are 'right censored' by the end of our study period (except for those who die, but that is a relatively small proportion of the total), we had to estimate our notion of permanent. To do this, we looked at patterns of care during the third year of study for those people who were in facilities at the end of the second year. A survival analysis suggested that after about 60 days, individuals were very unlikely to return to the community. This sixty day cut-off was then used at the end of our three-year study period; i.e. only those people who met our criteria for loss of independence for a minimum of 60 days before the study period ended were included in the LOI group.

We then had to decide how 'a significant level of community-based continuing care services' could be defined within the administrative data. The BC continuing care system (which is a universal program) assigns ‘levels of care’ based on an assessment by a case manager. These assessments consider both clinical factors -- how sick the person is, and how much ‘professional’ care is required -- and social factors -- whether the person lives at home, or has informal caregiving available. The assigned levels of care are associated with both the type and intensity of services that can be received by an individual through this system. For example, homemaker services are available at any level of care, but more hours per month are possible for people assessed at higher levels of care. Assuming that all care in the community implies a level of independence greater than care in a facility, we ranked the levels of care as follows:

\[0 = \text{no care} -- \text{may be receiving physician services or pharmaceuticals, but no facility-based services, and no community-based services through Continuing Care}\]

\[2\] Definitions for these care levels have not changed over time, though in practice, of course, their application probably has (but this is difficult, if not impossible, to quantify).
1 = **home nursing care, no LTC assessment** -- home nursing care is the only care received, and is anticipated to be of short duration
2 = **personal care (community)**
3 = IC1 (community) -- Intermediate care level I in the community
4 = IC2 (community) -- Intermediate care level II in the community
5 = IC3 (community) -- Intermediate care level III in the community
6 = EC (community) -- Extended care in the community
7 = **personal care (facility)**
8 = IC1 (facility) -- Intermediate care level I in a facility
9 = IC2 (facility) -- Intermediate care level II in a facility
A = level IC3 (facility) -- Intermediate care level III in a facility
B = EC (facility) -- Extended care in a facility
C = **acute care**
D = day surgery

The administrative data often contain ‘errors’ in the sense that an individual may appear to be receiving two types of services at one time. For example, he or she may be reported as being in extended care and in acute care on the same day, or, as is perhaps more common, may be receiving community-based services, but on one particular day also have a ‘day surgery’ event recorded. In these cases, we used the hierarchical structure above to decide which service type would override. We chose day surgery as the ‘highest’, not because it is necessarily the most intense in terms of service, but because it will appear for only one day, and, because of the nature of the data, will often conflict with the other service types.

We then had to decide where to draw the line, above which a person would be considered ‘dependent’ and below which ‘independent’. We conferred with several people who work in the Continuing Care system for the Vancouver/Richmond Health Board. Based on that meeting, we defined ‘loss of independence’ as the point in time at which an individual begins (permanent) receipt of services at coded level ‘5’ and above (IC3 - community). This cut-point was thought realistic by our consultants from continuing care, because they believe it reflects a level of care *without which* an individual would be forced to enter an institution. In other words, at level IC2, there is potential that without those services the individual in question could stay at home (though there may be hardship to informal caregivers, and eventual decline). At IC3 - community, however, if those services were removed, the person would have to be moved to a long-term care facility. The services are being provided precisely to keep a person at home. (The consultants also noted that many people at this level of care are those with diagnoses of advanced dementia or alzheimer’s disease.)

For comparison purposes, a more conservative definition, continuous (permanent) care starting at coded level ‘7’ (the lowest level of facility care) was also used. In both cases, in order to allow for data inaccuracies and temporary absences for various reasons, a period(s) ‘out of care’ for up to 31 consecutive days was allowed. A period of 7 days was also examined, but there was little difference in ‘assignment’ based on 7 vs 31 days.

With these definitions in place, we proceeded to building ‘arrays’ for each patient that recorded their level of care (as above) on each day of the study period (for those who died during the study period, the date of death, and all subsequent days’, were recorded as ‘X’). The result is a string of alphanumeric characters, 1095 or 1096 bytes long, for each member of the cohort. These arrays allowed us to: 1) define the point of LOI, according to the definitions above; and 2) compare patterns of utilisation (excluding pharmacare and MSP) both before and after LOI.
STATEMENT OF MAJOR FINDINGS

Space limitations for this report precluded us from including tables/charts that we know would be helpful complements to these findings. All such material is available upon request from the authors. A more detailed analysis and discussion for each phase can also be found in publications either currently available or in draft ((Meddings et al., 1997; Meddings et al., 1998a; Meddings et al., 1998b; Morgan, et al., 1997; Barer et al., 1998; McGrail et al., 1998).

Phase I: A cross-sectional analysis of trends in the use of hospital and physician services

HOSPITALS

The use of acute and extended hospitals in BC has changed dramatically over the past quarter century. Acute days per thousand population fell from over 1,800 to 764 between 1969 and 1995/96. At the same time, the use of extended care increased from 150 days/thousand to over 750/thousand. The overall conclusions from our analysis of changes in the hospital sector were:

1. The proportion of hospital inpatient days in British Columbia used by the elderly has continued to rise during the past decade. Downsizing has had its principal impact on younger patients, lowering both case rates and lengths of stay.

2. Declining use of acute care by non-elderly patients is in fact a long-established trend, going back into the 1960s. This decline has, however, accelerated over the last decade, and even over the last couple of years, raising questions as to where the bottom might be? This period of steeper decline may well reflect the effects of policies intended to reduce inpatient use.

3. It is notable that acute care use has, over the last decade, fallen significantly among the elderly population as well. This rate had been declining prior to 1985/86, but appeared to be bottoming out. Again this may be a consequence of policies to discourage inpatient use.

4. The decline in acute care use among the over sixty five population is, however, less rapid than among younger patients. Lengths of stay are falling at the same rate in both populations, but the separation rate is falling less rapidly among the elderly. This suggests that there may be fewer alternative sites for elder-care, or less discretion as to hospital use.

5. The rapid increase in use of surgical day care by elderly patients does not appear to explain much of the drop in their use of inpatient days, though it may account for a significant share – but by no means all – of the reduction in separation rate.

6. While acute care use by the elderly is falling, extended care use is not. The extended care sector has, however, largely ceased to expand (per capita) over the last decade. The continuing increase in the proportion of all hospital care in the province that is extended care is therefore the result of stability in rates of extended care use, while acute care use has declined. This contrasts with the experience prior to 1985/86, when extended care use rates were increasing to offset the declines in acute care.

7. There was a decline in rates of use of extended care between 1985/86 and 1993/94, but in contrast to acute care, where declines accelerated after 1993/94, the rate of use of extended care flattened out in the more recent period. This suggests that efforts to reduce extended care use may have run into increasing resistance. Alternatives may not have been developed for meeting unavoidable needs.
8. Among long stay patients, it is only those whose episodes end in death for whom patient day use rates have not fallen. Long stay patients discharged alive have accounted for a more or less stable share of total days since 1978, implying that since 1985/86 their use has declined in parallel with the rest of the hospital system. Care of the dying does not appear to be placing increasing pressure on hospital capacity -- use by those over seventy five has been relatively stable over the last decade, though use by (the much smaller group of) younger long-stay decedents appears to be rising. But care of the long-stay dying is taking up a rapidly increasing share of the total as the overall system shrinks.

9. It would appear that the overuse of acute care beds, which has been alleged to be a failing of the Canadian hospital system for nearly half a century, has been largely solved. No one, in Canada or elsewhere, knows what “the” appropriate rate may be, but whatever it is, we are likely to be much closer now.

10. As acute care use declines, however, the care of the very elderly, and particularly of the dying, stands out in much sharper relief. The policies of the last decade, at least in British Columbia, have had limited effect on this component of use. Perhaps they have obviated the need to build still more extended care beds -- these data do not tell us. But the prospect of an ever-larger extended care sector, most of whose patients will depart only through death, seems unsatisfactory on a number of grounds (of which cost is not necessarily the most important).

DAY SURGERY

The use of surgical day care services grew dramatically between 1985/86 and 1995/96, particularly among the elderly. Cataract surgery alone accounted for over one-third of the growth in day surgery for the elderly between 1985/86 and 1993/94, which prompted further investigation into this service. A survival analysis comparing people who underwent cataract surgery in 1985/86 and 1989/90 to controls who did not, found that the subsequent mortality of people who have undergone cataract surgery at younger ages (50-80) was higher than for controls (controlling for age, sex, and presence of diabetes). This suggests that the development of cataract may be indicative of generalised tissue aging and thus a marker for increased probability of ‘premature’ death. We also found that this association did not diminish between the two time periods, during which time, as noted above, rates of cataract surgery increased dramatically. While we do not have information on pre-operative lenticular changes, it seems safe to assume that at least part of the increase in utilisation is associated with operating at earlier stages of cataract development -- i.e. more minor lenticular changes. If this is true, then the fact that association did not diminish between the two time periods suggests that even minor lenticular changes may serve as a marker for early mortality (Meddings et al., 1997a, 1997b).

The results of this paper prompted us to look more closely at the relationship between cataract and early mortality at younger ages (50-65). A socioeconomic analysis showed that early cataract is inversely associated with SES, as well as with subsequent mortality independent of SES. This suggests that generalised tissue aging may in part explain the gradient in health status seen across levels of SES (Meddings et al., 1998).

PHYSICIANS

Fee-for-service expenditures on physician services grew by almost two-thirds between 1985/86 and 1993/94. After taking out the effect of fee increases, the growth was 43%, which was almost equally split between the effects of a growing provincial population and increases in
age-specific patterns of utilisation. Separating the effects of changes in the age structure from overall population growth showed that ‘aging’ explains increases in physician expenditures of approximately 0.2% per year, and is by far the least important component of change. Most of the growth in expenditures is attributable to increases in specialist services, but patterns of care provided by GPs were changing as well. The analytical approach described above helps to identify the sources of those changes.

Despite little (for the non-elderly) to virtually no (for the elderly) growth in per capita expenditures on GP services, we found significant changes in the patterns of care that patients receive from GPs. A slightly larger portion of the population visited a GP at least once in 1993/94 compared to 1985/86, and those who did make a GP visit were (on average) seeing a larger number of different GPs. At the same time, each patient made fewer visits to each GP. A decrease in services per visit and expenditure per service, along with the decrease in visits per unique GP (almost completely) offset the increase in number of different GPs seen. In short, people of all ages in BC are (on average) making more trips to a wider variety of GPs, but are having fewer (and slightly less costly) things done to/for them once there. There may be implications in these changes for quality of care, but the resulting impact on expenditures per person in BC has been relatively small.

Per capita expenditures on care provided by specialists, in contrast, increased for all age groups, ranging from 13% for the youngest age group to 60% for ages 75-84 (all three elderly age groups grew between 50 and 60%). As with GPs, a larger proportion of each age group (except the youngest) saw a specialist in 1993/94 compared to 1985/86. The increases were, in fact, larger for specialists, though the proportion of any age group that sees a specialist remains considerably smaller than the proportion that sees GPs. Also similar to GPs, each patient (on average) saw a larger number of specialists in 1993/94 compared to 1985/86, though these increases were larger for the elderly than they were for the non-elderly. In contrast to GPs, however, there was no compensating decrease, in fact there was virtually no change at all, in either visits per unique physician or the number of services provided per visit. And there has been a shift toward the provision of more expensive services, again with increases more pronounced among the elderly. Overall, then, a larger proportion of BC’s population was seeing specialists by the end of the period, they were more likely to see a larger number of specialists than in the past, they were being provided with more expensive services, and these trends were not offset by a ‘group practice’ phenomenon or by decreases in service intensity (Barer et al., 1998).

The increase in the number of MDPPs for GPs was large enough to generate curiosity about why this might have occurred. One explanation might be that ‘doctor shopping’ caused this --- that a small number of people are seeing a very large number of GPs, and are thus pushing the averages up. This explanation does, of course, assume that not only are ‘doctor shoppers’ a problem, but that they became a far larger problem in 1993/94 compared to 1985/86. Another explanation might be the phenomenon of group practices and/or after-hour clinics, which may result in more people seeing a larger number of GPs.

A cumulative frequency distribution of the number of GPs seen by each patient suggests that the latter is a better explanation; the vast majority of patients still saw relatively few GPs -- 1 to 3 -- at the later point in our analysis, but there has been a definite shift in this lower end of the distribution, e.g. with more seeing three in 1993/94 compared to 1985/86. In addition, however, there are, indeed, those who would appear to fall in the ‘doctor shopping’ category, seeing more than 50 GPs in a single year, but their numbers are very small -- they cannot account for the
overall trend. Nevertheless, they are a subject of some interest in their own right, and we are hoping to pursue further research on “high users” in a subsequent project being considered by NHRDP.

**Phase II: An analysis of the use of health care services prior to death**

There was little change, comparing the 1988 and 1993 cohorts, in the proportion of each cohort that fell into each of the ‘institutional use’ categories, but there have been decreases in the amount of facility care that they receive. In other words, the same proportion of people are going into hospitals and long term care facilities, but they appear to remain there for shorter lengths of time. People who die, who are known to be heavy users of health services, have clearly not been entirely shielded from the effects of the downsizing in the acute care hospital sector. They appear, however, to be affected to a lesser degree than the rest of the population — this group continues to increase its share of total inpatient days (as noted above).

The average number of days spent in acute care by elderly decedents fell 17 percent between 1988 and 1993, whereas use of all other services increased markedly. Declining use of acute care could have a number of influences on the demand for other health care services by the elderly. Not only could demand for outpatient and community based health care rise, but a trend toward long-term care may also be noted as some chronically ill patients are 'moved' from acute care facilities to extended or long-term care facilities. The former appears to have had a larger influence than the latter, as we see large increases in the community-based services, such as adult day care, homemarker services and pharmacare, and only small changes in the distribution between groups.

Some of the observed increase in adult day care use and homemaker services can be explained by a change in priorities for BC’s Continuing Care Systems, in accordance with the provincial government’s New Directions policy. This policy, implemented in 1993, was designed to provide services ‘closer to home’, in effect, to de-emphasize the use of institutional services in favour of those based in the community. This shift in priorities away from facility care runs counter to some pressures created by downsizing of acute care (from which one might expect a transfer to a facility, albeit a less clinically-intensive one), which may further exacerbate pressures on community based services.

More dramatic changes occurred in pharmaceutical use and day surgery rates among decedents. It may be conjectured that the rise in day surgery rates and pharmaceutical use is due to the shift away from acute care for some patients. For example, some people are now undergoing surgical day procedures for conditions that would previously have required an inpatient stay. If pharmaceuticals are a necessary part of follow-up care for these procedures (e.g. antibiotics), then as day surgery use goes up, we would expect pharmaceutical costs to rise to some degree as well, as what would have been covered as part of an inpatient stay is provided in the community instead (and the pharmaceutical expenses that we have are for people who are living in the community). But we already know that the increase in day surgery is not fully explained by the decrease in the provision of acute inpatient services, and both pharmaceutical expenditures and day surgery rates are increasing at about the same rate across all groups — including those who had no acute stays.
The utilization changes in the ‘no hospital’ group do, in fact, provide the strongest evidence that other factors are affecting outpatient services and pharmaceutical use among the decedent population. If the contraction of hospital services were the only cause of the increased ‘need’ for day surgeries and pharmaceuticals, then we would expect that the relative size of this group would grow as fewer people use acute care services, more would be found in the ‘no hospital’ group. If this group did grow, then increased utilisation could be explained by suggesting that some proportion of this group were ‘kept out’ of acute care hospitals, but in order to accomplish that, increased spending on community-based services (pharmaceuticals, day surgery) was required. In fact, however, the relative proportion of the ‘no hospital’ group was remarkably stable between the two cohorts; the proportion was actually slightly lower in 1993 than 1988. At the same time, utilisation of day surgery and expenditures on pharmaceuticals per capita doubled. This is not to say that acute care downsizing had no part in these increases. The complexity of changes that occurred in the acute care system would make this statement difficult to support without a far more detailed analysis. But it is clear that this is not the only, and certainly not even the most important, explanation for these changes.

**Phase III: A longitudinal cohort analysis**

The first part of this phase, in which we analyzed care use by all individuals who met the age criteria, showed there were some small changes in the composition of the ‘institutional use’ groups. Though small, they were somewhat larger than those seen in the deaths cohort analysis, and suggested a trend away from institutional care, with increases in the proportion of people in the ‘home care’ and ‘no home care’ (meaning no facility and no home-based continuing care) groups. It should be noted that nearly half of all people in these cohorts fell into the ‘no home care’ group -- 45.2% in 1986 and 47.4% in 1993.

The use of services within groups followed the same general pattern seen for the deaths cohorts; acute days and long-term facility days declined, while the use of homemaker services, adult day care, and pharmaceutical use increased. Also similar to the deaths cohorts, the increase in the use of these services occurred at the same rate among the ‘no home care’ group as among the others, suggesting that there are multiple factors explaining the growth. Here, however, there is stronger support for the argument that a move away from care in acute hospitals (at least partially) explains these increases.

An argument common among community caregivers is that one effect of changes in service delivery over the past decade has been a transfer of responsibility for care from the formal system to informal caregivers. One interpretation of the trend we identified, of a (slightly) greater proportion of people in the ‘no home care’ group in the later cohort, and a general push ‘downward’ from the more facility-based groups to the less, is consistent with this argument. Decreasing sizes of the ‘higher intensity’ groups suggests that an individual must be sicker in 1993 before being admitted to facility-based care. It would follow, then, that the general state of health of those in the community would be lower if the underlying health status of the population had not changed in the intervening years. An alternative hypothesis, of course, would be that the health of the average resident had improved so that there was less need for higher intensity levels of care. This might be the case, for example, if morbidity was becoming more compressed over time, that is, a greater proportion of each age cohort was living to older ages, and people are healthy for a
larger proportion of their lives. In any case, these are all small numbers, and while they suggest a trend, they should not be considered conclusive until it is demonstrated that this pattern continues over time.

The second part of this phase was the development and implementation of a definition for loss of independence (LOI). We identified people who lost independence in the latter two years of each of the study periods, to allow analysis of the twelve months of health service utilisation preceding that loss. The two definitions that were used (as outlined above) identified 6,926 (out of 66,011 ‘eligible’\(^3\)) individuals who lost independence based on the more liberal definition during the earlier time period, and 3,168 for the more conservative definition, compared to 7,837 (out of 75,637) and 3,427 for the later cohort. The proportion of the cohort who lost independence was quite stable over time, while the ratio of the second definition to the first (the proportion of the total LOI group that also lost independence according to the more conservative definition) decreased slightly in the later cohort. This finding is consistent with the decrease in institutional services seen in the initial analysis, and with a greater emphasis on community-based care.

A logistic regression looking at loss of independence showed that the use of facility care (acute or long-term), and the use of homemaker services and adult day care, are all strong predictors of the transition from independence to dependence. While this may at first appear to be an expected finding, since our definitions for LOI are based on the use of health services, it should be kept in mind that LOI only occurs once there is a permanent transition to continuous use of these services. The fact that less permanent use of these is a good predictor for LOI actually suggests people who use these services at all are at greater risk of loss of independence, that these services mark the initiation of a downward, and permanent, functional trend which could be used to plan needs for services.

What is more interesting, and perhaps a bit confusing given the above findings, is that >50% of people who DID lose independence in each time period did not use any facility or continuing care services in the 12 months prior to their loss of independence, and >90% used only acute care, homemaker and home nursing care services. They did have higher than average use of pharmaceuticals and physicians, but there does not seem to be a generalisable ‘pattern’ to the use of health care services in the year preceding loss of independence; except that for most people it is generally quite low. So, while the use of homemaker services and adult day care may be good predictors of LOI, they will actually predict LOI for only a fraction of people who experience it.

These findings suggest that for many people, the loss of independence may be caused by a traumatic event; a health-related accident of some sort, such as a hip fracture, or perhaps the death of a spouse or other informal caregiver. Again, this would be consistent with the ‘compression of morbidity’ hypothesis. Alternatively, what we may be seeing is a great deal of underlying need that is only addressed, or addressed adequately, following an acute stay -- caregiver burden again. It should be a priority to ‘dig a bit deeper’ with these data to see if one or the other of these alternatives can be supported.

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\(^3\) The number ‘eligible’ to lose independence is based on the number of people who had not died by the beginning of the second year of study, and who had at least 32 recorded ‘out’ of care (i.e. were known to still be ‘independent’ by our definition).
POTENTIAL PRACTICAL AND THEORETICAL USES OF THE RESEARCH FINDINGS AND METHODS

Phase I: A cross-sectional analysis of trends in the use of hospital and physician services

During the 1980s, rates of hospital use in B.C. declined, although rates for the elderly were continuing to increase. During the 1990s, downsizing has affected all age groups, the elderly included. In the latter period, these decreases have occurred in both short (<60 days) and long-term (>=60 days) stays. At the same time, the use of day surgery has increased dramatically, particularly for the elderly, but there is no evidence to suggest that this increase is entirely (or even mostly) a result of a transfer of care from inpatient to outpatient services.

This project has identified the macro-level trends in the use of hospitals, but there needs to be a clearer understanding of the types of patients now cared for by the hospital system -- inpatient and outpatient -- and the ways in which the ‘mix’ of patients has changed over time. Specifically, are there significant ‘sub-populations’ of people who are being excluded from necessary hospital care, because of age, medical condition, socioeconomic status, location of residence?

The changes in the mix of clinical care provided, and in the types of patients who are receiving this care, as a result of ‘downsizing’ in the acute care sector are clearly very complex. This suggests that there should be a more explicit coordinating (and perhaps budgetary) link between facility-based and community-based care. Some mechanisms for this have been put into place with ‘regionalisation’. These should be strengthened to ensure continuity of care, and to minimise ‘off-loading’ of clinical care from the formal health care system onto informal caregivers.

While the acute care sector was shrinking between the mid-1980s and the mid-1990s, age-specific per capita expenditures on physicians continued to increase, mostly because of increased spending on specialists. These increases occurred because a slightly larger proportion of BC’s population was referred to specialists, they were more likely to see a larger number of specialists than in the past, and they were being provided with more expensive services (after adjusting for fee increases). There was also a trend toward patients seeing a greater number of different GPs, but this did not have the same effect on expenditures, because it was offset by a decrease in the number of visits per GP, the number of services provided during each visit, and the provision of (slightly) less expensive services.

The specific reasons for continued increases in expenditures on physician expenditures (e.g. changing technologies, changing patterns of practice), and their explicit connection to changes in other components of health services (e.g. pharmaceuticals) require further investigation. Physician associations across the country continue to claim that "patient needs" are outstripping the meagre increases provided by Ministries of Health under global budget arrangements. Yet these budgets, including that in BC, are growing at rates sufficient to cover population growth and aging. Our work here has offered some preliminary indications of what else is going on within the underlying utilization growth dynamics, but much more work remains.

Meanwhile, changes in policy have been enacted across the country to try to limit the growth in this area of health expenditure. Since the years on which these analyses are based, BC has moved to a 'hard cap' system for physician reimbursement. The hard cap has been relatively successful in controlling physician expenditures, but these analyses are quite revealing in what expenditure shifts have taken place 'under the globe', and should be useful to policy-makers in
identifying areas that may cause pressure in the future. For example, if specialists are ‘better’ at keeping their portion of the global budget up, there may be interest in moving to split caps for GPs and specialists, or perhaps in the creation of regional/specialty caps.

**Phase II: An analysis of the use of health care services prior to death**

By the mid-1990s, people who died in hospital accounted for an increasing proportion of total hospital care, but only because their use was declining at a slower rate than that of non-decedents. At that time, people who died were as likely to use facility-based care as their counterparts in the mid-1980s, but had shorter lengths of stay. They were far more likely to use community-based services such as homemaker care and doubled their use of pharmaceuticals. Despite claims to the contrary, only a small fraction of the increase in pharmaceutical costs can be explained by hospital downsizing.

For all types of patients, there needs to be a better understanding of the direct connection between decreased use of acute care and increased use of community-based services. Are sufficient community services available? How much of the increase in pharmaceutical costs is due to ‘shifting’ from hospitals to communities, and if that amount is small, what is the major contributor to the large increases in the ambulatory use of pharmaceuticals? What has been the increased demand on informal caregivers? And are there qualitative data available that might tell us something about whether people are ‘better off’?

The doubling in adjusted pharmaceutical costs among the elderly -- for all age groups, and all ‘groups’ of patients, whether they used hospital services or not -- suggests that pharmaceutical expenditures must become a high priority area for policy attention. The BC program of reference-based pricing is one form of intervention; calls for a national Pharmacare program are another. Any policy approach in this area would benefit from combining top-down (e.g. global budget) and bottom up initiatives to improve the appropriateness and cost-effectiveness of prescribing practices. Policy in this area would also benefit from coordinated action, at least at the provincial level, if not the national, or there is little hope of having control in this rapidly increasing sector.

**Phase III: A longitudinal cohort analysis**

A decreased use of facility-based services in the 1990s means that the BC government policy of providing services ‘closer to home’ may have been achieved. What should remain of concern is whether this was accomplished through the deployment of more suitable health care services, or at the expense of informal caregivers.

Comparing people who lose independence in the mid-1980s to those who go through this transition in the mid-1990s suggests two things; first, that even this vulnerable group of patients has been affected by acute care downsizing, and second, that many of these people appear to make this transition quite rapidly, perhaps because of a specific medical (or social) event. An alternative view may be that this ‘rapid’ transition (based on analysis of the use of health care services) actually signals a level of unmet need prior to the diagnosis and response that leads to
the loss of independence. Clearly, either of these alternatives should be of some concern to policy-makers.

The transition to 'dependence' needs to be better understood. Are there particular diagnoses that predict this transition, or particular patterns of care from physicians, or certain categories of pharmaceuticals? How often are there truly 'traumatic' events associated with the transition, and can the incidence of those, or the treatment of them, in some way be changed? Can 'predictive' information such as that generated from this project be used to project resource needs for that segment of the population that will lose independence in future years?

Overall, on the basis of this project, there is no compelling information to suggest that acute care downsizing has had major deleterious effects on the elderly, although we have no way of assessing the impact on care-givers, which is an important issue. The mix of services received by the elderly has clearly changed, with the use of community-based continuing care services increasing rapidly as facility-based care has declined, but these changes are consistent with stated policy objectives of the BC Ministry of Health, and with the wishes of the public, as summarised by the BC Royal Commission on Health Care and Costs (B.C., 1991). There has, in addition, been a huge increase in the use of community-based pharmaceuticals. These changes suggest that the National Forum on Health, and now the federal government, have identified appropriate policy targets for the coming term.
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APPENDIX 1: The nature of the collaboration, networking and input of other researchers, decision-makers and seniors

As with all research, the analytical approach taken to this project, and the interpretation of findings, was influenced by contact with research colleagues, policy-makers, seniors, and so on.

Faculty and staff at the Centre for Health Services and Policy Research have ongoing relationships with officials at the British Columbia Ministry of Health. These contacts proved invaluable in implementing the research methodology. The following people at the Ministry of Health provided significant consultation throughout the course of this project: Jim Cruikshank, Bob Hart, Linda Low, Kate Pengelly, Petr Schmidt, Bill Selwood, Ron Strohmaier, Janet VanKlaveren, and Shirley Wong. Dr. Alan Thomson, Dr. Doug Bigelow and Geri Hinton, among others, provided valuable comments and feedback on work-in-progress and drafts of papers.

Lynn Buhler, Jan Fisher, and Jerry Reichdorf, from the Continuing Care section of the Vancouver/Richmond Health Board, were instrumental in helping us modify our data-driven approach to the definition of loss of independence.

Attendees of the various sessions where we presented preliminary findings from this project, particularly the CAG conferences, provided useful feedback on alternative interpretations, and potential directions for future research.

Attendees at the 3rd Age Spring Lecture Series, where we presented early findings from phases I and II of this project, also provided useful comments, as well as assurance that there was support among the general public for this type of research endeavour.

More recently, a potential synthesis/collaboration with a SIRP group from the Centre on Aging at the University of Victoria, headed by Dr. Margaret Penning, offers assurance that we will be able to follow up on some of the more interesting findings from this project.
Appendix 2: Evidence of the innovativeness, multi-disciplinarity and complementarity of the design approaches and team skills

This was a multi-disciplinary team from the start, including epidemiologists, economists, physicians, and a sociologist. The team was further enhanced with the clinical knowledge of Dr. David Meddings, at the time a Community Medicine Resident, who headed the work on cataract surgery.

The research approaches used were varied, and were often developed specifically with the intent of exploiting the use of the linked data. Because this data set was quite new when the project started, many of the analytical techniques had to be developed de novo. The development of 'trajectories of care' -- which were essential for phases II and III -- and the 'equation' framework for the analysis of physician expenditures from phase I, were only possible because of the linked data. We intend to use both approaches in the future, and the latter has been adopted for some work in progress at the BC Medical Association.

Beyond the 'data management' techniques required to produce workable data sets, we used standard (though modified, in some cases) epidemiological approaches to analysis, such as sensitivity analysis, and survival analysis.
Appendix 3: Plans and prospects for publications and dissemination of results to service providers, program planners, policy-makers, voluntary organizations and seniors

We have several papers in progress, which will be submitted to journals as appropriate, when completed. Abstracts for all papers will be available on our web site (www.chspr.ubc.ca), as will full text documents when possible. In addition, all papers will be provided to Geri Hinton, Director of the BC Office for Seniors, to other policy-makers and researchers in the BC Ministry of Health, to colleagues, and to the general public when requested.

We plan to work with researchers from the Centre on Aging at the University of Victoria, to try to ‘synthesize’ results from our SIRP projects, specifically to see what overlap we can identify between our quantitative approach to loss of independence, and their more qualitative approach.

Results from this project will also continue to be incorporated, as appropriate, to the many formal and informal communications that Centre faculty and staff have with other researchers, interest groups and the general public.