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TOWARD A FRAMEWORK FOR IMPROVING HEALTH CARE FINANCING FOR AN AGING POPULATION: THE CASE OF ISRAEL

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ABSTRACT

The conventional wisdom is that because at any time the aged cost more than the young, there is a positive relationship between aging and health care spending. It is hard, however, to find evidence that aging correlates positively with such spending. Intrigued by the puzzle, we account for the factors that contribute to changes of the age distribution of medical costs and their potential effect on aggregate cost. As changes in costs are not age neutral, the health system needs to facilitate a dynamic shift of resources from those whose relative cost rise less -- the young -- to those whose relative costs rise more -- the old. As there is an apparent market failure associated with uncertainty about growth in longevity (no market for "death insurance"), the private market does not seem to effectively facilitate this shift. Aging, and its known correlates and antecedents produce a complex picture about the potential effect of aging on total cost of medical care in Israel. Shifting morbidity and mortality to older age can lower cost of care, all other things equal. Growth in incomes and insurance coverage are likely to increase use of care particularly amongst the old. Rising levels of education would have the opposite effect, but among the relatively young. The effect of a key element, technology, remains unknown. The Israeli experience also points to the advantages of a unified publicly financed health system with a timely allocation mechanism.

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1. Introduction

It is hard to find evidence that the aging of the population correlates positively with aggregate health spending. This reality seems inconsistent with the 'common wisdom' whereby aging leads to higher aggregate cost of medical care. Yet, conceptually and practically there is no contradiction. While at any particular time, the aged incur higher medical care costs than the young, the aging process, in conjunction with its correlates, does not necessarily contribute to the higher spending implied by the cross-sectional observation. A better understanding of the dynamics of age-specific cost of care and total spending over time and across communities can help solve the apparent enigma. More importantly, from a policy perspective, such an understanding can help improve the efficiency of health system financing through an improved dynamic allocation of medical resources across age groups.

Aging, i.e., longer life expectancy, changes in disease patterns, socioeconomic change, widening public entitlement to care and technological change -- all influence spending in different ways that are not age-neutral. Indeed, the medical costs of the aged rise relative to the young. Consequently, the challenge for the health system is to facilitate a dynamic shift of resources from those whose relative cost rise less -- the young -- to those whose relative costs rise more -- the old. As there is an apparent market failure associated with the lack of information about longevity (no market for "death insurance") and its consequential cost, the private market does not seem to effectively facilitate this shift. The 'pay-as-you go' publicly financed health system can effectively facilitate this shift.

A cursory analysis of Israeli data shows that aging and its known correlates and antecedents produce a complex picture about probable use and, by implication, age-specific cost of medical care over time. Clearly, growth in numbers of the aged and changes in disease patterns raise the cost of the aged relative to the young. In addition, growth in incomes and insurance coverage are likely to increase the cost of care particularly amongst the old. Rising levels of education would have the opposite effect, but only among the relatively young. The same negative effect on spending is associated with higher ratios of females and less widowhood among the elderly. Hence, there is scope to shift resources dynamically from where the relative cost decreases to where it increases.

The Israeli publicly financed health system serves to illustrate the significance of a unified public financing system, including a well-timed capitation system, for systemic efficiency of health financing in the context of aging. Community care programs with pooled resources have managed to shift resources with time across age groups. Simultaneously, however, segregated programs have hampered time-related reallocation of superfluous general hospital beds to long term care of the aged, especially in the community. The lagging capitation mechanism in Israel contributes to such inefficiency.

2. The Evidence

There is little evidence in the literature on the correlates of aggregate health care expenditures to support the notion that increased aging results in increase expenditures. For example, Barros (1998) examines the determinants of growth of aggregate health expenditures in 24 OECD countries over the period from 1960-1990. Using the percentage of the population aged 65 and older, Barros finds that aging is not a statistically significant determinant of the growth in health care expenditures. Some other studies have similar findings (Getzen 1992, Zweifel and Ferrari 1992, Zweifel et al. 1999).

Yet other studies have shown ambiguous results. O'Connell (1996) uses two measures of aging to examine its effects on national health expenditures in a study of 21 OECD countries covering the period from 1975 to 1990. Using the percentage of the population age 65 and older as one measure of aging, the author finds mixed results depending on the model specification. In a linear model, the age coefficient is not statistically significant, although it is positive and significant in a logarithmic specification. The second measure of aging used in the study is a country-specific age variable which equals the product of the country 'dummy variables' and the percentage of the population age 65 and older. Results of these models show that aging has different effects in different countries.[1] Seven of the countries have positive and significant age coefficients (including the U.S. and Canada), eight have negative and significant coefficients (such as Sweden and Switzerland) and six have country-age coefficients that are not statistically significant (including the U.K., France and Germany).

Gerdtham et al. (1992) also finds mixed results. Their analysis uses a single cross-section of 19 OECD countries in 1987. Aging is first measured by the ratio of the population age 65 and older to the population ages 15-64. In models which try to explain the variation in aggregate health expenditures, the coefficient on age is positive, but its significance is sensitive to the exclusion of other variables such as the relative price of health care, global budgeting in hospital care, and female participation in the labor force. Next, Gerdtham et al. use another measure of aging, the share of the population under age 15. Results show that as the percentage of the young grows, health care expenditures also grow. Here again, statistical significance depends on the other included variables.

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[1] It is noteworthy that these results are influenced by specification and data problems.

In a more recent study, Kornai and McHale (1999a) examine the determinants of per capita health care spending in a sample of 81 developed and developing countries in 1990. This sample consists of 25 OECD countries and 56 additional countries (including Israel). Results show that in non-OECD countries, a one-percentage point increase in the elderly dependency rate increases per capita health spending by five percent. By contrast, increases in the elderly dependency rate have no effect on per capita health spending in OECD countries, indicating that aging has different effects on health spending in developing and developed countries.

Kornai and McHale's findings are reconfirmed in a similar study by the same authors which examine the impact of income, technology and aging on per capita total health care spending in a sample of 25 OECD countries for 1970-1996 (Kornai and McHale 1999b). In a variety of model specifications, including a country- and time-specific fixed-effects models, the authors show that aging (as represented by the shares of the population ages 65 to 74) has no statistically significant effect on total health care spending. They find that total spending actually falls with larger shares of the population over 75. Larger shares of the population ages 65 to 74 increase the public share of total health spending, although this result becomes statistically insignificant if aging is measured by the share of the population 75 and older.

The different findings, those by Gerdtham et al. (1992) in particular, suggest that other variables, operating in conjunction with aging, are probably as important as aging in the determination of aggregate health expenditures.

3. Aging and the Aggregate Cost of Medical Care – Basic Parameters

A priori, there is no inconsistency in that (a) at any particular time, the aged consume more and incur higher costs of medical care than the young, and that (b) over time, aging, in conjunction with its correlates, does not necessarily increase aggregate spending on medical care as implied by cross-sectional data. This can be shown as follows. Ex-post spending on health care is:

(1) $H(t) = [\Sigma N_i(t)\ U_i(t)\ P_i(t)]$ $(i = 1, \ldots, k)$

where:

$H(t)$ = aggregate health spending in period (location) t;[2]

N_i (t) = the number of people in the i-th age group, of k groups, in period t;

U_i (t) = average per capita age- and time-specific quantity of services used;

P_i (t) = unit cost of services used by group N_i at time t;

$P_iU_i = C_i$ = per capita cost of care of group N_i at that time.[3]

Health spending can be written as percentage of the GDP (Y(t)):

(2) $h(t) = [H(t)] / [Y(t)] = [\Sigma N_i(t)\ U_i(t)\ P_i(t)] / [Y(t)]$.

Assuming average rates of growth, equation 2 can be written as:

(3) $h(t) = \Sigma N_{i,0}\, e^{n_i t}\ C_{i,0}\, e^{c_i t} / Y_0\, e^{gt}$

where:

$N_{i,0}$ = the size of age group i at base period t=0;

$C_{i,0}$ = the cost of age group i in that period;

n_i = the average growth rate of age group N_i;

c_i = the average growth rate of medical costs of age group N_i;

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[2] The parameter 't' can be a country or location index in a cross sectional analysis.

[3] In a system that employs a capitation mechanism for prospective allocation or appropriation of resources, P_iU_i would be the capitation amount. It is possible to designate one age group as the numerraire, i.e., expressing cost as capitation coefficients and the entire system in terms of standard capita.

g = the growth rate of the real product.

That is, health spending at any time, standardized by the real product, is a function of:

a. the growth of the product,
b. changes in the age distribution, and
c. age-specific real cost of care that are in turn a function of:
   i. epidemiology,
   ii. socio-economic circumstances,
   iii. access to care, which is influence mainly by public entitlement, and
   iv. technological change and other supply-related factors which affect the price of care.

This simple framework, which expresses changes in aggregate costs of care in terms of age specific changes, is used to discuss the potential effects of different variables on aggregate cost of care. It clearly does not suggest that aging, defined as change in a host of variables, necessarily increases the total cost of medical care as share of the product. This follows because aging is more than only a change in the age distribution.

4. Age Distribution and Aggregate Cost of Care

Aging is first and foremost a change in the age distribution whereby the share of the aged, however defined, in the total population rises. Disregard, for the moment, other changes or assume that except for the age distribution, the age-specific cost of care, the GDP as well as the total population size, change at the same rate; i.e, c_i=c_j=g, but $n_i \neq n_j$ in equation 3. That is, we can portray the change in (or cross sectional difference in) an age distribution by two hypothetical cohorts, A and B (Figure 1). These cohorts differ only in their age specific mortality rates. (The last survivors reach the theoretical oldest age humanly possible T_T). The two density functions show the percentage of the people who die in each cohort up to a given age or time. Aging is thus viewed as a shift from A to B.

From this particular perspective, aging can be associated with simultaneous savings at younger age groups (denoted by the area SSS in Figure 1) and rising cost at older age groups (denoted by EEE), *ceteris paribus*. That is, is not clear that cohort B costs more than cohort A. In other words, it is clear that the cost of the aged of total health spending increases, following the shift in cost to older age groups. However, the effect on total spending, as share of the product, is not as conclusive and, a priori, might go either way.

This portrayal is consistent with evidence that the very young are relatively costly for the health system (e.g., Gerdtham et al. 1992, Cutler and Meara 1998), and that falling shares of them in the population can contribute to cost reduction (per capita or as share in the GDP). It is also consistent with the argument by Zweifel et al. (1999) who show that health care spending is associated mostly with dying. Consequently, with aging this cost shifts at least in part, from young to old age.[4] Other factors can reinforce or mitigate this effect, as per relationship (3) above. We explore those below.

5. Correlates of Aging and Age Specific Cost of Care

Indeed, a comparison of the type suggested between cohorts A and B is strictly theoretical. The difference in the mortality pictures of cohorts A and B are a result of other differences between the two that are pertinent to age-specific use of medical services and relative costs of care. As suggested above, such costs follow changes in epidemiology or age-specific disease patterns; access to care that is influenced by public entitlement and socio-economic factors; and technological change combined with other supply-related factors that affect the age-specific cost of care in ways that are not age-neutral.

We cannot explore and predict theoretically all pertinent developments affecting age specific cost of care. Combining theory and evidence, we can nonetheless hypothesize how some key developmental factors might affect age specific and aggregate cost of care in conjunction with aging.

Epidemiology and Behavior. In the United States, there has been a dramatic decline in mortality rates over the last 50 years. According to the CDC (1999), age-adjusted death rates from cardiovascular disease have declined 60 percent since 1950, representing one of the most important recent achievements in improving public health. Age-adjusted death rates for heart diseases have decreased from 307.4 per 100,000 persons in 1950 to 134.6 in 1996. Similarly, death rates from stroke have declined, with death rates falling from 88.8 per 100,000 persons in 1950 to 26.5 in 1996. These improvements in health are attributed to declining smoking rates, lower blood pressure and cholesterol levels, improved diet and advances in medical care.

Similar patterns are observed when mortality rates for cardiovascular diseases, liver diseases, and cancers are divided into age groups (Annex 1). Since 1970, the mortality rate from cardiovascular diseases has fallen for all age groups. Similarly, the death rate for chronic liver disease has fallen over time for those ages 45-74, and has stayed at about the same level for those above age 74 over time. The death rate for cancer has fallen over time for those in the age group 45-54. However, for all other age groups, the mortality rate has risen. These data strongly suggest the potential dynamic savings possible in the health system, especially amongst the middle aged.

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[4] The two functions should have a curvature at the very beginning, reflecting high infant and child mortality relative

Economic development. Growth in income and levels of education are key features of development that affect both the demand for, and supply of, medical resources through a host of factors. Income and education are hypothesized to increase the demand for health (Grossman 1972). Their effect on the demand for medical care is less clear even theoretically. While income contributes to higher use of care, education may have a negative effect, as the educated are more efficient producers of health, using non-medical inputs or healthier life styles. Thus, growing income and education, probably the strongest correlates and predictors of aging, have an effect on the demand and supply of care in their own right, obscuring the real impact of aging. Moreover, the effects probably interact with age because age-specific, as well as cohort effects, are associated with each variable as suggested in Section 3 earlier in the discussion.

As for income, the same level of income or a change thereof has different consequences at different ages because of the life-cycle welfare implications. Following Grossman's (1972) investment approach to the demand for health and medical care, we hypothesize that any time, all things being equal (mainly current asset position), income growth will more positively influence the demand for health and medical care by the young than by the old, because the former are better collateral and have lower capital costs. That is, rising income, holding all other things equal, is likely to increase the cost of care of all, but more for the young as compared with the old.

As for education, because of technological progress, the young will always be better educated than the old. When age 25, an older person had been exposed to a different environment than a person age 25 today. That is, while the two share the same *level* of

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to succeeding age groups. Ignoring this hump does not affect the generality of discussion.

education, the two educational levels reflect different technological qualities. Consequently, the dynamic impact of education, might be to reduce the cost of the young relative to the aged.

Access to care and public entitlement. An increase in access to care due to private insurance and public entitlement is a key factor influencing use of medical care and its societal costs. Following a human capital approach to the expansion of such insurance and entitlement, modern societies tend first to secure publicly supported entitlement to the young, starting with the very young and their mothers, and often during pregnancy. Next, with socioeconomic development, nations, in conjunction with employers, extend private and public coverage to the working population, and lastly to the elderly. This process accompanies the process of aging, especially in developing nations. That is, both private insurance and public entitlement increase simultaneously with aging. Although probably last and least affecting the aged, public entitlement as well as private insurance concurrent with aging, may be the strongest correlates of high usage and costs of care associated with aging. This effect would be strongest where the population and especially the aged are relatively poor (Wong 2000).

Once universal coverage, i.e., public control over most health spending, is accomplished, care becomes more comprehensive and complete following the growth of resources.[5] Consequently, the nature of the development of public entitlement, which follows the growth in resources, probably critically affects the development of aggregate medical spending in conjunction with age because *total* spending becomes increasingly influenced by politics and policy.

In this regard, we must consider two paradigms: (a) before universal entitlement is fully reached, and (b) after universal entitlement is fully reached. In the first, aggregate spending increases -- which is correlated with aging, but not necessarily because of aging -- would be more in tandem with income growth. In the second, it might be less correlated with income, as cost increases are more constrained by government and, possibly less correlated with income growth (Getzen 1992). This type of analysis can help explain the relatively higher sensitivity of health spending to aging in developing nations when compared with their developed counterparts (Kornai and MacHale 1999a, 1999b). The former systems are more privately financed than the latter, and are in the process of extending universality of coverage while the population is aging.

Technology. Technology is considered an essential factor in the rising cost of care (Newhouse 1992). Like the other developmental factors, technology correlates with aging, and consequently, its cost might be related to aging at a time when technological progress can, in fact mitigate the medical cost of aging. It is beyond the scope of this discussion to explore the effects of particular technological developments of age-specific cost of care. Several general observations can be made, nonetheless. Long term care is the driving force in the cost of care for the aged (Meerding et al. 1998). This labor intensive care is less amenable to technological change than other types of care requiring relatively invasive, real and virtual, diagnosis and treatment. Indeed, length of general hospital stay that has been related to issues other than long term care, including cardiovascular diseases and cancers, have declined as suggested by the American public health data presented above. At the same time the intensity of care, including use of drugs may offset some or all implied saving. Still, technological development in medical care is not age neutral: it favors the young and the middle aged but in a dynamic sense. Costly procedures may shift to older age groups. This does not mean that technology necessarily increases the cost of the elderly. That is, for example, an average person age 60 is more likely to

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[5] For discussion, see Chernichovsky (2000). It is noteworthy that technology development is influenced by

be operated using costlier technology today than say 40 years ago (Fuchs 2001). However, the share of the cost of this group in total spending or compared with the cost of the groups 60 and above may not increase. The share or relative costs of the those 60+, especially those requiring labor intensive long term care will surely increase with aging. Hence, technology it can be a contributing factor in the reduction of the relative cost of young age groups compared of the cost of the elderly, dynamically speaking.

6. The Policy Issues

It is evident form the discussion thus far that the allocation of spending across age groups is the crucial policy issue here. To spur an increase in the share of aggregate spending on medical care (as share of GDP or per capita), aging and its correlates must induce a net (relative) shift of resources from non-medical to medical uses, once all the changes considered above took place.[6] Such a shift can be offset, at least in part, by a transferring dynamically the cost savings from the young to the old as suggested above. The key policy issues is therefore: how can the health system shift dynamically most effectively resources from one age groups to another?

Suppose that people plan for their medical spending when old. If not 'highly risk averse', cohort A, represented by the cost associated with α (Figure 1), anticipates the consequences of δ, which it observes, but eventually due to development, the cohort finds itself with the outcome of γ. These arguments can be least exemplified by the proposition that some genetic change extends life expectancy, say by 30 years. In other words, *ex-post-facto* this cohort is short of funds (marked the area EEE, horizontal stripes, in Figure 1) to

availability of resources.

finance its medical cost at old age. The faster the increase in longevity, the more acute is the issue. By the same token, for the generation that follows, cohort B, the health system anticipates the consequences of α, relatively speaking, but eventually finds itself due to development following the results of β that requires fewer medical resources, relatively speaking; the area SSS (vertical stripes) is a potential saving.[7]

From the sole perspective of the health system, i.e., disregarding accumulated savings by the elderly for other purposes, the challenge is to shift dynamically, with time, the medical resources represented by SSS to the needs represented by EEE (Figure 1). There is no obvious market insurance mechanism --"death insurance" (*a'la* life insurance) -- to insure for the rising financial medical cost of unexpected extended life.[8] In other words, unless reasonably predictable, or expectations fully adjusted, the intergenerational transfer implied here cannot be made by a private health insurance mechanism. Barring this possibility, a 'pay-as-you go' public finance, which also solves distribution issues, is called for to coerce the *ex-post-facto* medically better off, the young, to support the worse off, the elderly. That is, the public system, in which all medical resources are pooled, can help correct for a market failure that is associated with the lack of information about extended longevity and its cost.

Once a publicly financed system is in place, the faster the intergenerational shift, the less the growth of aggregate spending. Suppose that at some base period (or location) the 'young' and the 'old' number in the population N_y and N_o correspondingly, and that their real per capita cost are C_y and C_o. Let us set C_y=1 and C_o=C_o/C_y . That is, C_i (i= y, o) are the pertinent

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[6] It is noteworthy that the definition of 'medicine' is also changing over time and space (Chernichovsky 2000).
[7] Without loss of generality, we disregard long-term cost or supply factors that concern shifting resources from one use to another. Rather, we focus on the marker and institutional issues that initiate such shifts.

capitation coefficients in the system. Accordingly, total health spending, H, would be shared by the young and the old according to the following ratios $\sigma_y = N_y/(N_y + C_o N_o)$ and $\sigma_o = C_o N_o/(N_y + C_o N_o)$. Let's assume, as suggested above, that the cost of the old, relative to the young, increase so that $r = (C_o'/C'_y)/(C_o/C_y) > 1$. If the allocation coefficients remain unchanged or their change is lagging, as may be the case in most publicly financed health systems, the old are shortchanged, as their new share in H should be $\sigma_o' = rC_o N_o/(N_y + rC_o N_o) > \sigma_o$. If the system does not facilitate this increase by changing the allocation coefficients, the young have a windfall while the elderly need to resort to private financing to finance the extra cost. Hence, the lagged adjustment contributes to the rising cost of aggregate spending.

7. Evidence About Development of Age-Specific Cost of Care

Data pertinent to the discussion thus far are scarce; there is no database for disaggregating the specific effects. Lubitz et al. (1995) report for the USA that the cost of medical care actually decreases with age, especially that of acute hospital care. Meerding et al. (1998) argue that it is the cost of long term care in 'non-medical' facilities not accounted for in the American study that drives up costs for the elderly. The latter Dutch study indicates that most costs of care are caused by mental disorders, which are indeed most prevalent amongst the aged, and not by the leading causes of death. In any event, the authors state that the relationship between disease and cost of care is not straightforward. Cutler and Meara (1998) demonstrate that cost of care in the USA increased differentially between 1953 and 1987 for different age groups, with cost for infants and the elderly leading the cost increases. As shown in Figure 2,

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[8] Theoretically, part of this cost could be financed by the benefits life insurers have from the shits in mortality to later age. Working off of lagging life expectancy tables, these insurers too do not fully anticipate the situation from which they ultimately gain.

these data, combined with population statistics, support the dynamics of the situation depicted in Figure 1. The age distribution of health care spending changed considerably in the quarter of the century between 1963 and 1987. The share of infants below one year of age in total spending increased; so did the share of those ages 55 and above. The share of the intermediate groups decreased. These data encompass all the changes discussed above affecting age-specific cost of care, size of total population, and its age distribution.

Being *ex-post facto* the data reflect both supply and demand factors that produced this picture. They also conceal whatever shift in resources took place across age groups in the American system. The data indicate, nonetheless, the potential scope for shifts in resources. This assertion can be argued as follows. In a world in which all things change, except for the total health budget, data of the kind presented in Figure 2 would by definition, indicate resource redistribution across age groups, and not necessarily worsen the situation of those groups whose costs declined. The same would hold in a purely supply-driven system where the health budget grows at a given rate that is independent of particular or age-specific health needs, but then re-distributed according those needs and age-specific costs. In a purely demand driven system, assuming an infinite supply elasticity for each age group during a given period, age groups would demand per "need" (independent of supply factors); nobody gets anything at the expense of another group. Resources would come from other potential non-medical uses.

Indeed, there exists a set of multiple confounding factors involving the association between aging and aggregate cost of medical care. The empirical verification of the singular contribution to cost of each factor in the previous section may be an impossible task. At the same time, a review of data that is guided by the conceptual discussion thus far can be insightful. We proceed with such a review using Israeli data. The review aims to identify the potential contribution of different factors on the medical cost of the aged, and explore the effects of the institutional setting on the efficiency of dynamic transfer of resources such as suggested above.

8. The Aging of Israel and Health Spending – The "Common Wisdom"

Among industrialized democracies, Israel has the most youthful but fastest growing aging population. In 1996, the 65 and older age group constituted 9.9% of the population (CBS 1999, Table 2.47). In Britain, the United States and Japan, for example, percentages for that year were 15.6%, 12.7% and 14.6% respectively (Anderson and Poullier 1999, Exhibit 6). The percentage of population age 65+ in the total rose from 4.7% in 1955 to 9.9% in 1996, and continues to rise (CBS 1999, Table 2.21). Israel is undergoing a process in which the elderly proportion of the population is coming to equal that of other developed countries.

The actual and projected aging of the Israeli population from 1960 through 2050 for alternative projection scenarios is presented in Table 1. Population figures are presented in actual numbers and in standard capita (SC) based on the Israeli capitation formula that assigns a higher allocation to the aged (Annex 2). The aging of the population is indicated by the growth rates of the SC, the percentages of those 65+ and those 75+ in the population. The "high" projections indicate that the group 65+ will increase by 64% from the current 9.83% to 16.12%, while those 75+ will increase by 88%, from 4.24% to 7.97%. The "low" scenario suggests an increase of 142% in the share of those 65+, up to almost a quarter of the population, and a 174% increase in the population of those 75+.

In a stationary world with only the age distribution changing, the Israeli health system would allocate resources to medical care as suggested in Table 2. That is, in 1996, if Israel had the age distribution ('low variant') projected for 2050, it would have allocated, *ceteris paribus*, in line with its current capitation mechanism, 12.80% of its Gross National Product (GNP) to health. According to the 'high variant', 10.51% of GNP. Those figures compare with 8.90% Israel's actual share in 1996.

According to these expenditure projections, Israel would have needed, all other things being equal, to sacrifice more in favor of health care because of aging. The sacrifice would be either from other uses of its GNP or from a shift in resources from the care of younger populations to the elderly. Reality would probably be a compromise leaving everybody worse off. The healthy and able population would pay more for medical care, shifting more resources into this system. The younger sick would receive somewhat less medical care than they receive today, and so would the elderly. This prospect tends to reflect the "(old) common wisdom" and the concerns associated with it.

As suggested earlier in the discussion, reality is more complex also in Israel. The Israeli past does not seem to lend support to these cost projections. In an effort to track the potential effects of aging on aggregate health spending per capita in Israel, we estimated the regression model reported in Table 3 for the period for which data are available, 1966 – 1998. The results, corrected for biases due to serial correlation, show no effect of median age on health spending per capita. The only statistically significant predictor of spending is GDP per capita. When we use public spending per capita as the dependent variable (not reported), income per capita remains the most statistical significant explanatory variable, but with a very limited significance. This finding is fully consistent with the findings reported above about the low or lack of, apparent effect of aging on aggregate health expenditures in developed nations. Consequently, we try to explore, in view of the earlier framework, the factors that might contribute to the lack of correlation between aging and health spending in Israel.

9. Aging, Socioeconomic Factors, and Use of Medical care in Israel

The potential for cost shifting in the future is apparent already in the population projections for Israel. As in any other case of an aging population, even if growing in size, the falling shares of the younger age groups provide that potential (Table 4). The available data concerning the use of primary health services permits further examination of the potential impact of socio-economic circumstances. These data indicate behavioral propensities within an aging population whose age-specific epidemiology and technology change rather fast.

We perform an analysis using household-level data on health utilization collected from the Israeli Use of Health Services Review, 1993. Specifically, information is collected on the number of visits to a doctor, nurse, or specialist in the two weeks preceding the interview. Regressions examining the determinants of use of care in the community are estimated for all respondents and then separately for four different age groups: ages 25 to 44, ages 45 to 64, ages 65 to 77, and 75 and older. A Tobit methodology is used to estimate the determinants of health utilization. Ordinary least squares regression gives similar results. The models include a number of variables that are hypothesized to influence the use and relative costs of age-specific care. These variables include the respondent's gender, religion (Jewish or not), marital status, and an indicator for whether the respondent immigrated in 1990 or later. Next, the health status of the respondent is included, as indicated by the presence of a chronic illness: diabetes, hypertension, and a cardiovascular ailment. The education level of the respondent and a measure of household income are also included. Income is measured by a crowding factor, that is, the number of people living in a household divided by the number of rooms.[9] Higher levels of crowding indicate lower levels of income. Where applicable, respondents under the age of 16 are assigned the values of their parent's income and education. Lastly, all models include dichotomous indicators for which sickness fund, of the four making the Israeli scene, provides the respondent with health insurance; “Mehuedet”, “Leumit”, “Macabee”, or a category for fund unknown, no insurance, or other fund (“Clalit” is the omitted category in all models).

The data reported in Table 5 show the means and standard deviations of all variables in the regressions. The simple means show not surprisingly that older people have more chronic illnesses and visit doctors, specialists, and nurses more frequently than do younger people. Younger groups are more educated, but are less wealthy (as measured by the crowding factor). The sample is almost evenly split between males and females, and is primarily Jewish and married. Only 13 percent of Jews in this sample fall into the category of uninsured or of an unknown sickness fund, while non-Jews in this category total 27 percent. Note also that the Clalit fund is the largest sickness funds, and has a relatively high population of 65+. Seventy-three percent of respondents ages 65-74 and 75 percent of respondents ages 75 and up are enrolled in the Clalit fund. Tables 6, 7, 8, and 9 show the regression results.

Age. In Table 6 we present results for the number of visits to the three providers of health care (doctors, specialists, and nurses) across all age groups. First and most importantly, the data show that utilization increases with age, even when the presence of a chronic condition is controlled for. In models that include dummies for age groups 0-14, 15-24, 25-44, 65-74 and 75+ (the omitted baseline age category is 45-64) aging results in more frequent visits to health care providers. The models predict that each successive age group after age 14 uses doctors' services more frequently

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[9] As most housing in Israel is owned, ‘crowding’ can be a reasonable measure of wealth, in the absence of other data.

than the previous age group. Similar statements can be said for the number of visits to specialists and nurses, although for specialists the trend holds for all age groups.

Separating the models into different age categories allows for an examination of the important factors of the determinants of health care utilization within age groups (Tables 7-9). That is, the coefficients in these tables show the effect of education and income, for example, on health utilization within each age group. This approach also allows for a comparison of relative importance of the effects across the different age groups, keeping in mind that we have to speculate about cohort effects. Respondents under the age of 25 are not included in the age-specific models because at young ages, parental factors influence the level of health care received by the children.

Within each age group, age and age squared are included in all models. This is to capture the effects of aging within the broader groupings. Joint tests of significance of age and age squared show that age has little effect on health care utilization within each age groups.[10] In fact, the only time within-group aging matters is for the number of doctor visits for those in the age groups 25-44 and 45-64, and for the number of specialists for those in the oldest age group. For the youngest group, evaluating age at the mean, an increase in age will increase the number of visits. For the older groups, an increase in age will actually decrease the use of specialists (for those ages 75+) or doctors (for those age 45-64). For specialists, there is probably some sample selection occurring within this top age group in that the sickest people may die out leaving only healthy people in the sample.

Gender. The results show that females are more likely to visit health providers, but this statement only holds for certain age groups. As shown in Tables 7-9, being a female increases the number of visits to doctors and specialists for those in the younger age groups (25-44 and 45-64), while being female increases the number of visits to nurses only for those who are ages 25-44. The effects of gender generally disappear for those over 64, although females over age 75 visit specialists

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[10] Unless otherwise mentioned, statistical significance refers to the 5 percent level in a two-tailed test.

less than their male counterparts. One might attribute this last result to the fact that women tend to be healthier and live longer in this age group, but interestingly enough, the proportion of females and males in this age group is almost equal. Fifty one percent of respondents in this age group are female.

Health status. Not surprisingly, the presence of a chronic illness for all age groups is positively related to the number of visits to all types of health care providers. That is, people who report being on medication or a restrictive diet because of diabetes, high blood pressure, heart disease, kidney disease, an ulcer or asthma are much more likely to use health services. The magnitude of this effect generally falls as people age, with younger age groups visiting doctors, specialists and nurses more frequently than older ages groups. This conforms to the predictions of Grossman's model (1972). This finding is important in conjunction with the data presented in Figure 2. A shift of disease to higher age groups lowers demand for disease–related care.

Religion, marital status and immigrant status. Focusing on the models in Tables 7, 8, and 9 being Jewish has no relationship with the number of doctor visits, but does predict visits to specialists and nurses for those in age groups 25-44 and 44-65, and visits to nurses for those in age group 65-74 as well. A similar statement can be made about marriage. Being married has no relationship with the number of doctor visits, but may have an effect on visits to specialists or nurses for certain age groups. Being married will raise the probability of visiting a specialist for those ages 25-44, but will lower it for those age 75 and older. Being married has a positive effect on nurse visits for those ages 75 and older, but a negative effect for those aged 65-74. Having immigrated after 1989 is associated with fewer doctor visits and fewer specialist visits only for those in the youngest age groups. Immigration generally has no effect on the health utilization of older people, with the exception of fewer nurse visits.

Income/wealth. Income is represented by a measure of crowding, thus, higher values for the crowding variable indicate lower levels of income as people can only afford to live in smaller residences. When the entire sample is considered, crowding has a negative effect on doctor, specialist and nurse visits, indicating that health use of medical services declines as income falls (Table 6). Once the sample is divided into age groups, crowding has a negative impact on doctor visits, but this result is statistically significant at only the 10 percent level in a one-tailed test for the three oldest age groups. Higher crowding also predict fewer visits to specialists for people ages 25-44 and ages 65-74, and fewer visits to nurses for people ages 25-44. (This last result holds at about the 10 percent significance level).

Education. Education is negatively related to the number of doctor visits, and, as shown in Tables 7, 8, and 9, the magnitude of this effect gets larger in absolute value as people age. This result holds until the respondents reach age 65, at which time the coefficient on education is still negative, but the effect of education on the number of doctor visits is smaller than for people in the 45-64 age group. For some age groups, education has a negative effect on the number of nurse visits, but there is no clear trend in the effects of education on utilization by age. In addition, education has no effect on the number of visits to a specialist. As suggested earlier, because of technological progress, the quality of education is increasing with time. Hence, the cohort effect may probably be the most paramount with regard to this variable. Rising levels of education will dynamically reduce the use of medical care.

Sickness funds – organization and management of care. In general, the type of sickness fund does not seem to influence use of care. Individually or as a set, the four funds are rarely statistically significant in predicting the number of visits to the providers we examine. The two exceptions for doctor visits are that those ages 25-44 in the Mehuedet fund have fewer visits, and those 65-74 in the Leumit fund have higher utilization. Although the two funds operate 'gate keeping' models, their primary care practitioners control referrals. For specialists, the funds Leumit and Macabee, which contract for almost all services, are associated with higher utilization for those ages 25-44. Membership in Macabee is associated with lower use of nurses services for those of ages 25-44, 45-64, and 65-74. The same holds for those ages 45-64 in the Leumit fund. Finally, being uninsured or fund missing often results in lower nurse and doctor visits.

In sum, this cursory analysis of the determinants of primary health care utilization using cross sectional data shows that the elderly, especially those with chronic diseases, use more services than those of the young and healthy. By implication, the elderly also cost more (Zmora and Chernichovsky 2000, Shmueli and Levi 1996). This, however, may not translate in a linear fashion over time into higher use and cost of care according to the 'common wisdom' (e.g., Table 2). Our finding suggest that, other things constant, the following can be expected:

(a) A shift of disease/mortality to older groups will reduce the use of services.

(b) A larger female population, at old age, may reduce levels of service use, especially of relatively expensive specialist services among the old.

(c) Lower widowhood rates result in lower use of expensive services (specialists) among the aged.

(d) Higher levels of education lead to less use of services, especially among the young, meaning that age cohorts may have lower levels of care.

(e) Higher income levels lead to increased use of medical services, especially among the old.

(f) Higher levels of insured population increase use of services, more amongst the old.

(g) Model of health care delivery (sickness fund) does not affect in any way use of service.

10. Aging in Israel – Cost of Medical Care and Institutional Issues

The Israeli experience, which is consistent with the inconclusive evidence about the potential effect of aging on aggregate cost of medical care, points also to some key institutional issues that concern the systems ability to shift resources dynamically across age groups.

Entitlement. The 1995 National Health Insurance Bill extends a minimum level of care to all. Public entitlement includes long term care for the elderly (Chernichovsky and Chinitz, 1995). The Bill's stipulations about long term care has not been implemented, however, and its full effect on cost remains a speculative issue; yet, this change would have undoubtedly affected the public spending for the aged (which is the reason it is not yet implemented). The effect on national spending would probably not be by the amount it would affect public spending because of substitution between private and public spending, should the right substitution mechanism be developed. Given our previous findings about the effect of insurance on use of primary care, especially among the aged, overall costs will increase once long-term care is a public entitlement. The management of the public budget can mitigate this effect.

Pooled public funds. Israel provides an example of the advantages of pooled public funds for handling the care of the aged. The positive side is furnished by the change that has come about in the course of time in the designation assigned by the Ministry of Health to its family health clinics. These "Tipat Halav" ("Drop of Milk") clinics, as they were called in the past, treated mothers and children only. With the relative decline in birth rates and the rise in the education level of mothers, the need for such clinics declined. They were thereupon re-designated with time to care for broader populations, including that of the elderly. They became "family health" clinics. The change could be implemented thanks to sensible policy and the fact that resources could be reallocated within the same budgetary and institutional framework.

On the negative side is the separation between the budgetary and institutional frameworks of the "Nursing Bill" of 1984-86 which assists long term care in the community, and the "National Health Insurance Bill" that provides for long term care mainly in general hospitals. This separation presents a major obstacle to the efficient allocation and organization of the care for the elderly in Israel by impeding the possibility to effectively shift resources from redundant general hospital care to long term care. The medical services try to "push the buck" to the community services (non-medical) operating under the NHIB, and *vis a versa.* Indeed, as regards rationalization, Israel has a large, untapped potential in the development of apparatuses for the ongoing treatment of the elderly (and others) within the community. These apparatuses are less costly than treatment in in-patient institutions (Stessman et al, 1996). Thus, an essential condition, today, for such rationalization, is to combine the "Nursing Bill" which forms the basis for financing ongoing community care, with the "National Health Insurance Bill", which forms the basis for financing the publicly supported health system. Such a combination will result in a more efficient allocation of resources where long-term treatment of the elderly is concerned. That is, the operations over time of the budget of the Ministry of Health serve as an excellent example for a dynamic shift in budgets across age groups. By the same token, the segregated budget between the Ministry of Health and the Ministry of Welfare is an example of inefficiency brought about by the impossibility to shift gains from reduced hospitalisation of young age groups in general beds, for community care of the elderly.

The allocation system. The Israeli capitation mechanism 'unfairly' allocates more resources to the young than to the elderly because the lagging adjustment mechanism. The specific capitation coefficients are based on 1994-5 cost estimates. As suggested earlier, in Section 6 above, an outdated capitation formula tends to short-change the allocation to the elderly with time, if indeed their relative costs of care increase. The political reluctance to update the formula, ironically, proves the argument. There is an uneven distribution of the population age 65+ across sickness funds in Israel. The three smaller funds average about 7% of their enrolled population in this age category. The largest fund has about 13%. That is, even if the initial capitation/allocation coefficient were right, they must have become distorted over time, favouring the smaller funds which indeed object to the change in the capitation formula.

11. Conclusion

The Israeli data support the fact that aging and its known correlates and antecedents produce a complex picture about the potential effect of aging on total cost of medical care. Shifting morbidity and mortality to older age can lower cost of care, all other things equal. Over time, growth in incomes and insurance coverage are likely to increase use of care particularly amongst the old. Rising levels of education would have the opposite effect, but among the relatively young. The same effect is associated with higher ratios of females and less widowhood among the elderly. The Israeli experience also points to the advantages of a unified publicly financed health system with a timely allocation mechanism.

This paper constitutes a first effort to summarize the host of issues that concern aging and cost of care. It raises more questions than answers. As such it points to future research directions and policy options. Key among those are the effect of changes in age-specific disease patterns and medical technology on cost of care, and development of private and public financing mechanisms that would facilitate reallocation over time of medical resources across age groups.

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Figure 1: Density Functions of Mortality of Cohorts A and B

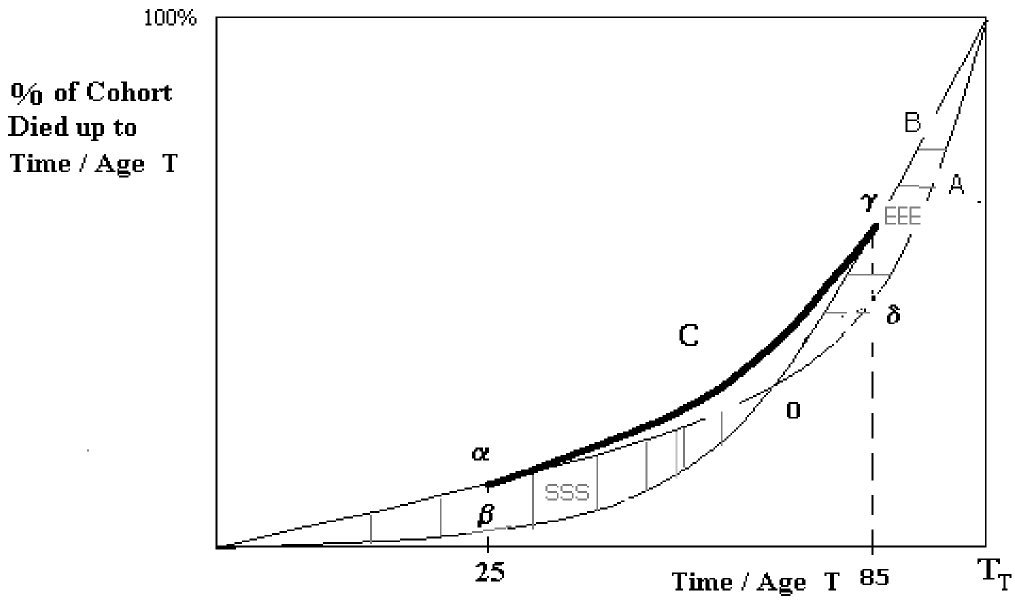
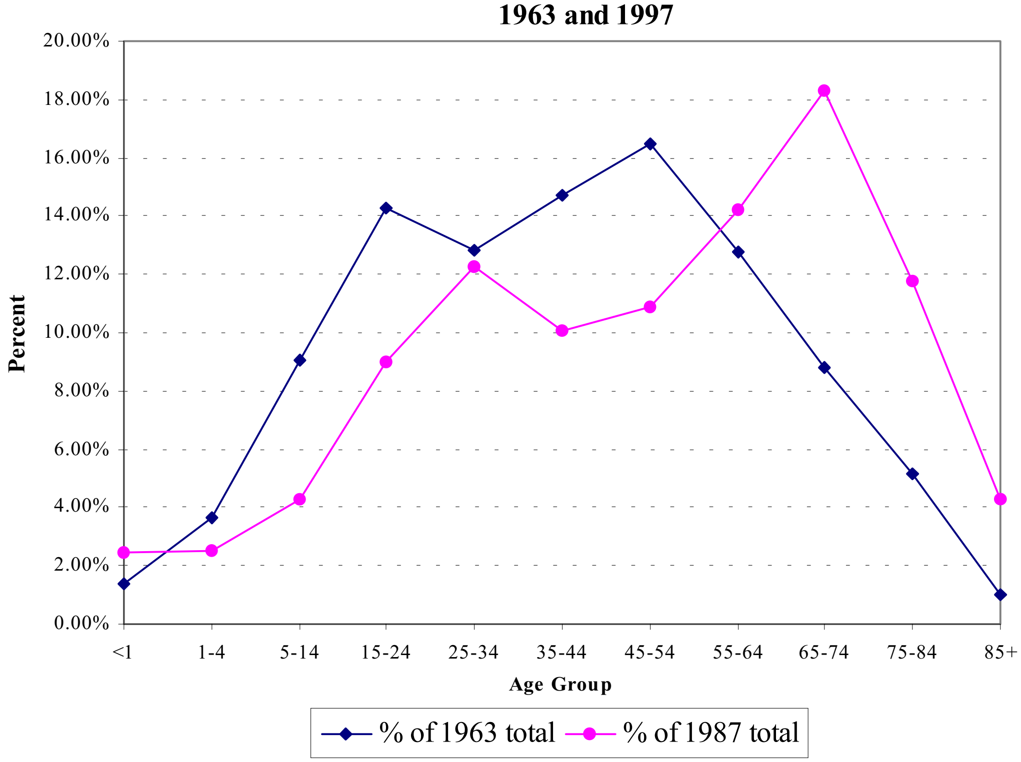


Figure 2
Percent of Total Spending on Medical Care by Age Group-- USA
1963 and 1997



Source: Cutler and Meara (1998); U.S. Census Bureau (1999).

Table 1
Actual and Projected Population -- Total, Standard Capita, and Elderly, 1960-2050

Year	Total population X1000	Total Standard Capita X1000	Percentage of Change in Total Population	Percentage of Change in Standard Capita	Percentage of Change in Population age 65+	Percentage of Change in Population age 75+	Percentage of Age 65+ in Total Population	Percentage of Age 75+ in Total Population
Medium projection								
1960	2150.40	2701.85	0.00	0.00	0.00	0.00	4.97%	1.53%
1970	3001.40	3920.97	0.40	0.45	0.90	0.76	6.75%	1.93%
1980	3881.80	5239.24	0.29	0.34	0.67	0.87	8.72%	2.80%
1990	4660.20	6302.92	0.20	0.20	0.25	0.64	9.08%	3.83%
2000	6216.00	8702.09	0.33	0.38	0.44	0.48	9.80%	4.23%
2010	7209.00	10498.19	0.16	0.21	0.20	0.30	10.14%	4.74%
2020	7952.00	12335.60	0.10	0.18	0.39	0.16	12.79%	4.99%
2030	8575.00	14206.09	0.08	0.15	0.26	0.48	14.95%	6.87%
2040	9068.00	15879.44	0.06	0.12	0.21	0.26	17.16%	8.20%
2050	9441.00	17363.98	0.04	0.09	0.18	0.21	19.43%	9.55%
High projection								
1960	2150.40	2701.85	0.00	0.00	0.00	0.00	4.97%	1.53%
1970	3001.40	3920.97	0.40	0.45	0.90	0.76	6.75%	1.93%
1980	3881.80	5239.24	0.29	0.34	0.67	0.87	8.72%	2.80%
1990	4660.20	6302.92	0.20	0.20	0.25	0.64	9.08%	3.83%
2000	6351.00	8923.88	0.36	0.42	0.47	0.51	9.83%	4.24%
2010	7687.00	11196.02	0.21	0.26	0.24	0.34	10.06%	4.67%
2020	8809.00	13430.20	0.15	0.20	0.39	0.18	12.21%	4.82%
2030	9827.00	15665.89	0.12	0.17	0.26	0.46	13.76%	6.32%
2040	10854.00	17844.20	0.11	0.14	0.21	0.26	15.07%	7.20%
2050	11895.00	20000.42	0.10	0.12	0.17	0.21	16.12%	7.97%
Low projection								
1960	2150.40	2701.85	0.00	0.00	0.00	0.00	4.97%	1.53%
1970	3001.40	3920.97	0.40	0.45	0.90	0.76	6.75%	1.93%
1980	3881.80	5239.24	0.29	0.34	0.67	0.87	8.72%	2.80%

1990	4660.20	6302.92	0.20	0.20	0.25	0.64	9.08%	3.83%
2000	6083.00	8481.59	0.31	0.35	0.40	0.45	9.76%	4.24%
2010	6795.00	9895.10	0.12	0.17	0.17	0.27	10.26%	4.81%
2020	7180.00	11361.42	0.06	0.15	0.39	0.14	13.45%	5.17%
2030	7468.00	12955.43	0.04	0.14	0.27	0.52	16.40%	7.54%
2040	7530.00	14212.52	0.01	0.10	0.22	0.26	19.76%	9.43%
2050	7419.00	15193.78	-0.02	0.07	0.19	0.22	23.78%	11.63%

Sources: United Nations (1999), pp. 238-239; CBS (1999); Annex 2

Table 2:
1996 Spending on Health in Israel, with Alternative Age Distributions, Per Projected Population Scenarios

Year	% Spending of GNP
Medium projections	
2000	8.75%
2010	9.10%
2020	9.69%
2030	10.35%
2040	10.94%
2050	11.49%
High projection	
2000	8.78%
2010	9.10%
2020	9.53%
2030	9.96%
2040	10.27%
2050	10.51%
Low projection	
2000	8.71%
2010	9.10%
2020	9.89%
2030	10.84%
2040	11.79%
2050	12.80%

Sources: United Nations (1999), pp. 238-239; CBS (1999); Annex 2

Table 3
Regression Coefficients, Health Spending Per Capita, Israel (1966-1989) as Dependent variable

Independent variable	Coefficient (t-Statistic)
Median Age	-47.43
	(-0.65)
Doctors per 1000 cap.	0.01
	(0.17)
Mean years of school	-189.60*
	(-1.36)
GNP per capita	0.08**
	(3.14)
Constant	31.33
	(1.04)
R-squared	0.32

* significant at 5% level; ** significant at 1% level

Table 4:
Distribution of Age Groups in 1998, 2020, 2050

Age		Medium		High		Low	
	1998	2020	2050	2020	2050	2020	2050
0--4	10.23%	7.44%	6.36%	8.68%	8.16%	6.02%	4.43%
5--14	18.67%	14.49%	12.53%	16.45%	15.41%	12.16%	9.29%
15-24	17.51%	15.18%	12.71%	15.39%	14.30%	14.94%	10.62%
25-34	14.11%	14.75%	12.58%	13.83%	13.08%	15.84%	11.54%
35-44	12.35%	13.67%	12.09%	12.84%	12.06%	14.62%	11.66%
45-54	10.66%	11.86%	12.52%	11.25%	11.16%	12.58%	14.17%
55-64	6.62%	9.82%	11.79%	9.34%	9.70%	10.39%	14.52%
65-74	5.71%	7.80%	9.87%	7.39%	8.15%	8.29%	12.14%
75+	4.14%	4.99%	9.55%	4.82%	7.97%	5.17%	11.63%

Source: United Nations (1999), pp. 238-239

Table 5
Means of Key Variables
(Standard Deviations)

	All Ages	Ages 25-44	Ages 45-64	Ages 65-74	Ages 75+
Health Utilization					
Number of doctor visits	0.30	0.17	0.39	0.59	0.58
	(0.78)	(0.59)	(0.92)	(1.02)	(1.03)
Number of specialist visits	0.09	0.10	0.13	0.19	0.19
	(0.41)	(0.48)	(0.46)	(0.56)	(0.52)
Number of nurse visits	0.05	0.03	0.07	0.16	0.19
	(0.38)	(0.26)	(0.47)	(0.68)	(0.87)
Age					
Age 0-14	0.28				
	(0.45)				
Age 15-24	0.18				
	(0.39)				
Age 25-44	0.26				
	(0.44)				
Age 65-74	0.07				
	(0.25)				
Age 75 +	0.04				
	(0.19)				
Age		34.62	53.47	69.06	80.68
		(5.70)	(5.97)	(2.71)	(4.38)
Demographic					
Female	0.51	0.52	0.52	0.53	0.51
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Jewish	0.85	0.87	0.89	0.95	0.96
	(0.35)	(0.34)	(0.31)	(0.21)	(0.21)
Married	0.62	0.79	0.87	0.73	0.49
	(0.49)	(0.41)	(0.34)	(0.45)	(0.50)
Immigration after 1990	0.06	0.09	0.10	0.13	0.11
	(0.24)	(0.29)	(0.30)	(0.34)	(0.31)
Health					
Chronic illness	0.14	0.06	0.29	0.57	0.54
	(0.34)	(0.25)	(0.45)	(0.50)	(0.50)
Socio-economic					
Education	11.90	12.51	10.60	8.72	8.11
	(4.81)	(3.90)	(5.21)	(5.12)	(5.39)
Crowding	1.35	1.35	1.15	0.82	0.78
	(0.69)	(0.61)	(0.60)	(0.48)	(0.48)
Sickness Fund					
Mehuedet	0.06	0.07	0.04	0.03	0.03
	(0.24)	(0.26)	(0.20)	(0.18)	(0.16)
Leumit	0.07	0.07	0.05	0.06	0.05
	(0.26)	(0.26)	(0.23)	(0.23)	(0.22)
Macabee	0.13	0.16	0.10	0.07	0.07
	(0.33)	(0.37)	(0.31)	(0.26)	(0.26)
Clalit	0.58	0.55	0.60	0.73	0.75
	(0.49)	(0.50)	(0.49)	(0.44)	(0.43)
Uninsured/fund missing	0.16	0.14	0.20	0.11	0.10
	(0.36)	(0.35)	(0.40)	(0.31)	(0.30)
Number of observations	20,327	5,336	3,511	1,389	789

Table 6:
Tobit Regression Coefficients, Number of Visits as Dependent Variables

		Doctor Visits	Specialist Visits	Nurse Visits
Age Category				
	Age 0-14	0.794	-1.014	-0.212
		(9.57)**	(-7.67)**	(-0.91)
	Age 15-24	-0.974	-0.952	-2.035
		(-10.06)**	(-6.89)**	(-6.18)**
	Age 25-44	-0.661	-0.047	-0.596
		(-7.88)**	(-0.42)	(-2.65)**
	Age 65-74	0.263	0.185	0.866
		(2.57)*	(1.31)	(3.67)**
	Age 75 +	0.269	0.246	0.995
		(2.17)*	(1.45)	(3.60)**
Demographic				
	Female	0.251	0.525	0.335
		(4.97)**	(6.94)**	(2.36)*
	Jewish	0.270	0.913	1.225
		(3.24)**	(6.06)**	(4.24)**
	Immigration after 1990	-0.331	-0.344	-0.645
		(-2.94)**	(-2.32)*	(-2.08)*
Health				
	Chronic illness	1.632	1.075	1.514
		(21.69)**	(10.27)**	(8.17)**
Socio-economic				
	Education	-0.052	0.001	-0.059
		(-8.62)**	(0.06)	(-3.56)**
	Crowding	-0.180	-0.258	-0.494
		(-4.01)**	(-3.66)**	(-3.49)**
Sickness Fund				
	Mehuedet	0.034	0.514	-0.817
		(0.30)	(3.38)**	(-2.28)*
	Leumit	0.271	0.577	-0.535
		(2.78)**	(4.15)**	(-1.80)
	Macabee	0.268	0.295	-1.094
		(3.47)**	(2.63)**	(-4.21)**
	Uninsured/fund missing	-0.219	-0.014	-0.882
		(-2.82)**	(-0.13)	(-3.71)**
Constant		-1.956	-4.757	-6.882
		(-14.39)**	(-19.44)**	(-14.36)**
Standard Error		2.501	2.711	3.753
		(74.36)**	(42.48)**	(28.14)**
Observations		20,327	20,327	20,327
Pseudo R-squared		0.06	0.05	0.08

T-statistics in parentheses.
* significant at 5% level; ** significant at 1% level

Table 7:
Tobit Regression Coefficients, Number of Doctor Visits as Dependent Variable

		Ages 25-44	Ages 45-64	Ages 65-74	Ages 75+
Demographic					
	Age	-0.019	0.316	1.539	-0.098
		(-0.12)	(1.48)	(1.12)	(-0.17)
	Age squared	0.001	-0.003	-0.011	0.001
		(0.39)	(-1.37)	(-1.09)	(0.18)
	Female	0.555	0.323	0.173	-0.092
		(4.23)**	(2.65)**	(1.22)	(-0.45)
	Jewish	-0.142	0.074	0.417	-0.244
		(-0.70)	(0.35)	(1.21)	(-0.52)
	Married	0.153	-0.061	-0.039	0.024
		(0.84)	(-0.35)	(-0.24)	(0.11)
	Immigration after 1990	-0.506	-0.375	-0.305	0.233
		(-2.07)*	(-1.70)*	(-1.32)	(0.75)
Health					
	Chronic illness	1.562	1.710	1.191	1.097
		(7.11)**	(13.29)**	(8.32)**	(5.81)**
Socio-economic					
	Education	-0.049	-0.061	-0.056	-0.033
		(-2.58)**	(-4.51)**	(-3.94)**	(-1.84)*
	Crowding	-0.027	-0.177	-0.257	-0.341
		(-0.23)	(-1.50)	(-1.49)	(-1.52)
Sickness Fund					
	Mehuedet	-0.631	0.049	-0.086	0.617
		(-2.14)*	(0.16)	(-0.22)	(1.17)
	Leumit	0.080	0.396	0.673	-0.037
		(0.33)	(1.57)	(2.37)**	(-0.09)
	Macabee	-0.014	0.007	-0.162	0.212
		(-0.07)	(0.04)	(-0.62)	(0.63)
	Uninsured/fund missing	-0.268	-0.111	0.161	-0.563
		(-1.28)	(-0.72)	(0.70)	(-1.68)*
Constant		-3.621	-10.873	-55.993	3.257
		(-1.33)	(-1.89)*	(-1.18)	(0.13)
Standard Error		2.874	2.551	2.069	2.112
		(27.96)**	(34.40)**	(28.35)**	(21.36)**
Observations		5,336	3,511	1,389	789
Pseudo R-squared		0.02	0.05	0.04	0.03

T-statistics in parentheses.
* significant at 5% level; ** significant at 1% level

Table 8:
Tobit Regression Coefficients, Number of Specialist Visits as Dependent Variable

		Ages 25-44	Ages 45-64	Ages 65-74	Ages 75+
Demographic					
	Age	-0.011	0.012	0.308	-0.011
		(-0.06)	(0.04)	(0.16)	(-0.01)
	Age squared	0.000	0.000	-0.002	-0.001
		(0.05)	(0.06)	(-0.13)	(-0.10)
	Female	1.341	0.410	0.264	-0.648
		(8.40)**	(2.73)**	(1.28)	(-2.38)**
	Jewish	0.842	1.500	1.097	0.813
		(3.06)**	(4.35)**	(1.61)	(1.02)
	Married	0.363	-0.239	0.253	-0.625
		(1.78)*	(-1.15)	(1.06)	(-2.21)*
	Immigration after 1990	-0.676	-0.431	0.001	0.140
		(-2.46)**	(-1.61)	(0.00)	(0.36)
Health					
	Chronic illness	1.418	0.843	0.640	0.816
		(5.68)**	(5.37)**	(3.13)**	(3.26)**
Socio-economic					
	Education	0.019	-0.010	0.018	0.021
		(0.90)	(-0.60)	(0.87)	(0.91)
	Crowding	-0.352	0.006	-0.673	0.132
		(-2.53)**	(0.04)	(-2.17)*	(0.49)
Sickness Fund					
	Mehuedet	0.388	-0.242	-0.406	0.931
		(1.39)	(-0.61)	(-0.70)	(1.49)
	Leumit	0.858	0.405	0.204	0.671
		(3.37)**	(1.36)	(0.49)	(1.45)
	Macabee	0.598	0.095	0.045	0.577
		(3.07)**	(0.39)	(0.12)	(1.38)
	Uninsured/fund missing	0.120	-0.112	-0.276	-0.289
		(0.51)	(-0.58)	(-0.74)	(-0.64)
Constant		-5.690	-5.773	-16.217	1.094
		(-1.90)*	(-0.83)	(-0.24)	(0.03)
Standard Error		2.811	2.488	2.359	2.147
		(23.57)**	(21.22)**	(16.26)**	(12.37)**
Observations		5,336	3,511	1,389	789
Pseudo R-squared		0.04	0.03	0.02	0.04

T-statistics in parentheses.
* significant at 5% level; ** significant at 1% level

Table 9:
Tobit Regression Coefficients, Number of Nurse Visits as Dependent Variable

		Ages 25-44	Ages 45-64	Ages 65-74	Ages 75+
Demographic					
	Age	-0.049	0.180	2.579	0.205
		(-0.13)	(0.33)	(0.83)	(0.12)
	Age squared	0.001	-0.001	-0.018	-0.002
		(0.09)	(-0.29)	(-0.82)	(-0.15)
	Female	0.970	0.125	-0.059	-0.104
		(2.89)**	(0.41)	(-0.18)	(-0.19)
	Jewish	1.428	2.631	2.139	1.150
		(2.30)*	(3.28)**	(2.00)*	(0.84)
	Married	0.227	-0.331	-0.650	1.305
		(0.53)	(-0.78)	(-1.77)*	(2.23)*
	Immigration after 1990	-1.052	-0.096	-1.321	-0.148
		(-1.55)	(-0.17)	(-2.14)*	(-0.17)
Health					
	Chronic illness	2.501	1.486	1.129	0.857
		(5.15)**	(4.62)**	(3.45)**	(1.71)*
Socio-economic					
	Education	-0.032	-0.085	-0.049	-0.088
		(-0.68)	(-2.55)**	(-1.53)	(-1.79)*
	Crowding	-0.500	-0.455	-0.509	0.401
		(-1.61)	(-1.36)	(-1.13)	(0.78)
Sickness Fund					
	Mehuedet	-1.250	-0.943	-1.290	1.004
		(-1.64)	(-1.03)	(-1.18)	(0.75)
	Leumit	-0.695	-1.815	0.114	-0.008
		(-1.08)	(-2.07)*	(0.17)	(-0.01)
	Macabee	-1.278	-1.708	-1.595	-1.672
		(-2.45)**	(-2.61)**	(-2.08)*	(-1.47)
	Uninsured/fund missing	-0.980	-0.865	-0.577	-2.123
		(-1.77)*	(-2.04)*	(-1.00)	(-1.91)*
Constant		-7.512	-13.086	-95.406	-13.292
		(-1.14)	(-0.89)	(-0.88)	(-0.19)
Standard Error		3.751	3.796	3.248	3.986
		(11.06)**	(13.93)**	(13.98)**	(10.67)**
Observations		5,336	3,511	1,389	789
Pseudo R-squared		0.05	0.05	0.04	0.03

T-statistics in parentheses.
* significant at 5% level; ** significant at 1% level

Annex 1
Mortality Rates by Cause of Death and Age. USA 1970-1995

Cause of Death	Year	45-54	55-64	65-74	75-84	85 +
Cardiovascular diseases	1970	297.9	818.3	2,090.9	5,381.1	12,213.2
	1975	252.7	689.9	1,744.2	4,530.5	11,388.7
	1980	212.5	580.4	1,506.6	3,991.0	10,799.8
	1985	180.6	518.8	1,330.4	3,484.8	9,944.1
	1990	144.6	434.9	1,101.3	2,963.6	8,942.7
	1995	134.0	388.2	998.5	2,701.6	8,515.9
Chronic liver dis. & cirrhosis	1970	38.3	49.3	42.2	30.9	20.3
	1975	36.0	48.3	42.7	27.7	17.5
	1980	31.0	41.5	42.9	30.4	19.6
	1985	22.1	34.1	37.8	32.4	20.1
	1990	18.0	29.9	34.9	34.1	23.4
	1995	16.9	25.4	31.5	31.2	22.6
Malignant neoplasms	1970	182.5	423.0	754.1	1,169.2	1,320.7
	1975	181.9	424.9	773.2	1,168.0	1,452.1
	1980	180.4	435.1	814.2	1,223.3	1,572.4
	1985	170.1	454.6	845.5	1,271.7	1,615.2
	1990	158.9	449.6	872.3	1,348.5	1,752.9
	1995	142.1	416.0	868.4	1,360.8	1,796.0

Source: National Center for Health Statistics (1999).

Annex 2
Israeli Capitation Coefficients

Age Group	Capitation Coefficient
0-4	1.70
5-14	0.65
15-24	0.57
25-34	0.78
35-44	1.00
45-54	1.64
55-64	2.51
65-75	3.92
75+	4.92