PUBLICLY FUNDED MEDICAL SAVINGS ACCOUNTS: EXPENDITURE AND DISTRIBUTIONAL IMPACTS IN ONTARIO, CANADA

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SUMMARY

This paper presents the findings from simulations of the introduction of publicly funded medical savings accounts (MSAs) in the province of Ontario, Canada. The analysis exploits a unique data set linking population-based health survey information with individual-level information on all physician services and hospital services utilization over a four-year period. The analysis provides greater detail along three dimensions than have previous analyses: (1) the distributional impacts of publicly funded MSAs across individuals of differing health statuses, incomes, ages, and current expenditures; (2) the impact of differing degrees of risk adjustment for MSA contributions; and (3) the impact of MSA funding over multiple years, incorporating year-to-year variation in spending at the individual level. In addition, it analyses more plausible designs for publicly funded MSAs than the existing studies. Government uses information available from year $t-1$ to allocate its budget for year $t$ in a manner that is ex ante fiscally neutral for the public sector: the government first withholds funds equal to expected catastrophic insurance payments under the MSA plan, and then allocates only the balance to individual MSA accounts. The government captures the savings associated with reduced health-care utilization under MSAs and we examine deductibles that vary by income rather than by current health-care expenditures. The impacts on public expenditures under these designs are more modest than in the previous studies and under plausible assumptions MSAs are predicted to decrease public expenditures. MSAs, however, are also predicted to have unavoidable negative distributional consequences with respect to both public expenditures and out-of-pocket spending. Copyright © 2007 John Wiley & Sons, Ltd.

INTRODUCTION

Medical savings accounts (MSAs) continue to garner attention as an alternative method of health-care finance to traditional comprehensive health-care insurance. Debate persists about their effects in Singapore, which has used MSAs since 1984 (Reisman, 2006). China embraced MSAs as an integral part of its urban health insurance reform in the late 1990s, although their potential role in rural health reform is debated (World Health Organization, 2004; World Bank, 2005). The US government has changed its subsidy to and regulation of MSAs in an effort to expand their use within its pluralistic system of private finance; beginning in 2007 its public Medicare program included an MSA option. In
South Africa MSAs grew rapidly following deregulation of private insurance in the 1990s, but have been severely curtailed amid concerns regarding their detrimental effect on risk pooling and their high administrative costs (Department of Health, 2002). Advocates also press for MSAs within universal systems of public finance and social systems of finance. In Canada, publicly funded MSAs have been proposed as an alternative to the current system of public finance for physician and hospital services (Owens and Holle, 2000; Manzankowski, 2001; Skinner, 2002; Gratzer, 2002; Ramsey and Esmail, 2004); advocates have also called for the introduction of MSAs in the UK (see references in Maynard and Dixon, 2002), Australia (Allen Consulting Group, 2004; Australian Medical Association, 2005), and Germany (Spreemann, 2004).

MSA schemes include two essential features: (1) an individual (or household)-specific account whose funds are normally earmarked for health-care expenses and whose balances can accumulate over time and (2) a high-deductible, catastrophic insurance plan. An individual uses MSA funds (and personal resources if the MSA funds are not sufficient) to pay for health-care expenses below the deductible and, if required, for cost-sharing above the deductible. The catastrophic policy covers high-cost care. MSAs can be integrated into virtually any system of health-care finance, with myriad variations on this two-part design depending on the source of the contributions to individual MSAs (taxes, employers, individuals), the source of the catastrophic insurance (public, private), the extent of cost-sharing required by the catastrophic insurance, regulations specifying how the MSA balance can be spent (health care only; health care and other goods and services), the tax treatment of MSA contributions, withdrawals and interest earned, and the range of insurance choices individuals have alongside MSAs.

MSAs are intended to counter the incentive for increased health-care utilization (typically interpreted as moral hazard) associated with low-cost-sharing comprehensive insurance while mitigating some of the inequities associated with standard cost-sharing policies. They do this by forcing individuals to purchase care at full price while allowing individuals to accumulate funds in tax-preferred accounts to finance such purchases. Further, it is argued that under MSAs cost-conscious consumers will shop aggressively, inducing greater demand-side competition with an associated reduction in prices for health-care services and increased technical efficiency in production. MSAs are one type of increasingly popular ‘consumer directed’ health plan designed to give consumers incentive to make ‘financially responsible’ choices among alternative health-care services (Buntin et al., 2006).

MSAs remain highly controversial. Advocates argue that, compared with comprehensive insurance, MSAs will decrease health-care costs, improve system efficiency, expand choice, increase access to care, reduce wait times, and lead to better quality of care (Owens and Holle, 2000; Gratzer, 2002; Ramsey and Esmail, 2004; Cogan et al., 2005; Feldstein, 2006). Detractors, of course, argue the opposite: that MSAs will lead to higher costs, compromise equity of utilization and financing, and do little to improve quality or other aspects of system performance (Hsiao, 1995, 2001; Hurley, 2000; Hurley, 2002; Maynard and Dixon, 2002; Deber et al., 2004).

For all the debate, actual use of MSAs remains very limited and the evidence about their effects is remarkably thin (Hanvoravongchai, 2002; Hurley and Guindon, 2007). Indeed, rigorous empirical evidence regarding the effects of MSA financing is largely non-existent. Currently, MSAs are used meaningfully in only three settings: Singapore, China, and the US. Singapore’s MSA system has undergone more scrutiny than any other (Massaro and Wong, 1995; Hsiao, 1995, 2001; Nichols et al., 1997; Barr, 2001; Schreyogg and Lim, 2004; Reisman, 2006; Dong, 2006), but limited access to data has made evaluation difficult and the evidence remains limited to largely descriptive analyses. China’s experience with MSAs has matured sufficiently to allow an increasing number of studies (Liu et al., 1999; Yu and Gong, 2001; Meng et al., 2004), although generalizability to the health systems of developed countries remains a problem. Two pilot projects in the US during the 1990s (one targeting the self-employed and the other Medicare beneficiaries) failed to generate meaningful results because of insufficient enrolment (General Accounting Office, 1998). Health savings accounts (HSAs), a modified version of earlier MSAs, are heavily promoted by the current US policy, and although their uptake has
been growing rapidly since 2004, at this early stage there is still little evidence regarding the
effects of HSA financing (Government Accountability Office, 2006). Hence, the MSA literature from
the US consists primarily of analytic commentary and proposals (Pauly and Goodman, 1995;
Cogan et al., 2005; Feldstein, 2006; Physician Payment Review Commission, 2006; Cardon and
Showalter, 2006), reports of the experiences of private firms that have limited scientific validity and
generalizability (Buntin et al., 2005; Physician Payment Review Commission, 2006), or predictions
based on simulation models (American Academy of Actuaries, 1995; Ozanne, 1996; Nichols et al., 1996;
Kendix and Lubitz, 1999; Zabinski et al., 1999; Parente et al., 2004; Gruber, 2006; Cardon and
Showalter, 2006). Moreover, the US analyses emphasize issues specific to the introduction of MSAs into
its financing environment dominated by employer-provided private insurance, large numbers of
uninsured individuals, and a complex system of tax regulations regarding various health-care financing
instruments.

A particular gap remains with respect to evidence regarding the impact of replacing traditional public
health-care finance with publicly financed MSAs. Tax-financed MSAs are likely to generate a different
pattern of effects than the existing plans in Singapore, China, or the US, where contributions to an
individual’s MSA come from either employer/employee contributions proportional to an individual’s
earnings or (in the US) from freely chosen levels of individual contributions. In such plans those who
earn more contribute more and accumulate more in their MSAs. Proposed tax-financed MSAs,
however, break any link between an individual’s contributions to financing and the contribution to their
MSA.1 Individuals would continue to pay taxes to support health care as they currently do. However,
rather than allocate public funds to providers and programs of care, the government would distribute
the funds to individual MSAs on a risk-adjusted basis.

A limited set of analyses of such publicly funded MSAs has emerged in Canada in recent years in
response to growing calls for MSAs within its health-care system (Forget et al., 2002; Deber et al., 2004;
Zaric and Hoch, 2006). These analyses consistently predict that, even if individuals reduce utilization in
response to MSA incentives, publicly funded MSAs will increase public expenditures relative to the
current system of funding.2 MSAs can be fiscally neutral for the public sector only by introducing
substantial out-of-pocket spending or by having government claw back a large proportion (up to 85%) of
individuals’ accumulated MSA balances, effectively blunting the incentive to reduce utilization. The
plans examined in these simulations, however, were unnecessarily unfavourable to MSAs: the
government allocates funds between catastrophic insurance and MSA contributions in a manner that ex
ante would be expected to increase public expenditures; the government failed to capture savings from
MSA-induced reductions in health-care utilization; and the size of the corridor between an individual’s
public MSA contribution and the deductible (and therefore the burden of out-of-pocket spending) was
proportional to the individual’s level of health-care utilization under the current (non-MSA) system.3

This study simulates the impact of replacing Canada’s current system of public finance and funding
for physician and hospital services with a system of publicly financed MSAs. The study exploits a
unique data set that links, at the individual level for a representative sample of the population, health
survey information with four years of physician and hospital utilization information from the public
insurer. The analysis contributes to our understanding of the potential effects of publicly financed
MSAs in four ways. First, individual-level information on health status allows us to risk-adjust MSA

1 In reality, such MSA schemes are not about health-care financing (how the funds are raised to support the system) but health-
care funding (how the government allocates funds to support the provision of care).
2 The increase in public expenditure is driven primarily by the highly skewed distribution of health-care expenditures even within
age–sex risk categories. When public MSA contributions are based on mean expenditures within risk categories, the majority of
individuals receive MSA funds that exceed their current utilization, while the government still ends up covering the catastrophic
expenditures of the high users.
3 Ironically, the plans examined were based largely on proposals put forth by advocates of publicly funded MSAs in Canada.
contributions better than previous analyses. Second, we examine the distributional effects of publicly funded MSAs in greater detail than have previous analyses, and in particular the distributional impacts across individuals of differing health statuses, incomes, ages, and current expenditures. Third, the multi-year data provide insight into year-to-year dynamics under MSAs not possible in single-period studies (e.g. Deber et al., 2004). Finally, we simulate a more plausible design for publicly funded MSAs. Specifically, the government uses information available from period \( t - 1 \) to allocate its budget for year \( t \) between MSA contributions and catastrophic expenditures in a manner that is \textit{ex ante} fiscally neutral for the public sector; government captures the savings associated with reduced health-care utilization under MSAs; and deductibles are fixed or vary by income rather than current health-care expenditures. The designs are therefore more favourable for MSAs than for the existing analyses in the sense that, other things being equal, they are less likely to increase expenditures over the current system of funding and they are less likely to generate undesirable distributional consequences. Consequently, our analysis represents a conservative estimate of potential negative effects of publicly funded MSAs.

Comparing a variety of publicly funded MSA plans against the current system of public financing and funding in Canada, we find that (1) MSA plans that retain the current full coverage for physician and hospital services are predicted to increase public sector expenditures by 4–6%; (2) MSAs plans with annual deductibles of \$500–1000\ are predicted to reduce public expenditures by 4–12% depending on the utilization response assumed; (3) the MSA plans in general redistribute public funds towards those in excellent health, those with high income, low users of care, and the young. Income-based deductibles and improved risk adjustment of MSA contributions can ameliorate some of these distributional patterns, especially between the rich and poor, but cannot remove all of the undesirable distributional consequences. Hence, even under favourable assumptions, MSAs achieve at best modest costs savings to the public sector while generating negative distributional effects.

The next section describes the underlying data; we then explain the basic MSA designs we consider, present the results, and conclude with a discussion of the implications of our findings.

DATA AND VARIABLES

The primary data source was the 1996/1997 Ontario component of Canada’s National Population Health Survey (NPHS). NPHS was designed to be representative of Canada’s community-dwelling, non-institutionalized population aged 12 and over (Statistics Canada, 1998). NPHS includes, among other things, information on a respondent’s age, sex, marital status, self-assessed health status, household income, household size, and household type (e.g. single, couple with children under age 25, etc.). For each individual in the Ontario component of NPHS, survey information was linked (using the respondent’s public health insurance number) to government-held data regarding the utilization of publicly financed physician and hospital services.\textsuperscript{4} The government is the sole insurer for medically necessary physician and hospital services in Ontario: over 98% of all physician expenditures and over 93% of all hospital expenditures are publicly financed. The data effectively capture all such utilization except non-medically necessary services (e.g. cosmetic procedures). NPHS interviewed respondents between October 1996 and August 1997. Survey information relating to age, health status, and household characteristics pertain to the time of interview; income data pertain to the year prior to the interview. Utilization data were linked for four years surrounding the interview period: 1995, 1996, 1997, and 1998.

\textsuperscript{4}The sample weights used in this analysis are specific to the sub-sample of individuals who provided permission to link their utilization data to the survey data and hence are appropriate for making inferences to the full population.
Using these data, supplemented with additional data as described below, we constructed the following variables required by the simulation exercise.

Utilization measures

**Physician services.** An individual’s physician service utilization is measured by the annual dollar value of all physician services received. The vast majority of physician services in Ontario were paid on a fee-for-service basis according to a negotiated schedule of medical benefits. For each survey respondent, the utilization data include information on the number of times each service was received and the dollar value of those services. Services for a small proportion (3.1%) of individuals were paid via a capitation funding plan. Data for such individuals include a count of the number of visits to a capitation-funded physician, but do not include information on the dollar value of the services provided in the visit. We imputed a value for each visit equal to the mean cost per visit each year in the fee-for-service sector.\(^5\)

**Hospital services.** Hospital utilization data included, for both in-patient stays and day procedures, detailed information on the services provided, patient diagnoses, and related matters. However, it did not include the cost of individual services as hospitals in Canada are funded by global budgets. We assigned costs to each hospitalization using standard methods for Canadian data based on a case-mix classification system and information on costs per case-mix-adjusted case. All hospitalizations in Canada are classified using a grouper system called case-mix groups (CMGs). Each CMG has associated with it a resource-intensity weight (RIW) (day-procedure weight for day procedures), which reflects the relative cost of treating a patient in that CMG (day procedure).\(^6\) The average cost of treating a patient in a given CMG is simply the product of the CMG’s RIW and a province’s mean cost per weighted case. Mean cost per weighted case was obtained from Ontario’s hospital funding body regarding the number of weighted cases and actual costs per weighted case by hospital (Joint Policy and Planning Committee, 2000).\(^7\) Hospitalizations in all years were calibrated to the 1998 average cost information.\(^8\)

Individual characteristics

The analysis used the following individual characteristics.

**Age.** The respondent’s age at the time of the interview.

**Health status.** Health status is measured using a five-category self-assessed health status scale.

**Household income.** NPHS includes information on total household income in $15,000 bands. Each respondent was assigned the income value associated with the midpoint of the relevant band.\(^9\) This

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\(^5\)This may very slightly underestimate the true cost in the capitated sector because in a small proportion of encounters patients receive more than one service. The vast majority of encounters, however, involve a single provider who provides only a single service. The analysis also excludes services provided by salaried physicians working in Community Health Centres. Such care constitutes less than 2% of physician care in Ontario. In both cases, the measurement error should not bias the analysis. The analysis compares the difference in spending under the current system and under MSAs. If the measurement error is a fixed effect common to the expenditure estimates in each case, it drops out when the difference between the two is taken.

\(^6\)RIWs depend on CMG, complexity, age group, and typical vs atypical classification of the hospitalization. Hence, each CMG has associated with it a set of RIWs depending on the these other aspects of a hospitalization (which were included in the hospital data we received).

\(^7\)Hospital global budgets in Ontario are based in part on case-mix-adjusted patient censuses. The funding body bases this component of funding on costing data for a sample of hospitals. It is these data that provide the mean cost per weighted case in our calculations.

\(^8\)We slightly underestimate the total hospitalization costs for the Ontario population when we weight up the NPHS sample because: (1) the NPHS sample does not include newborn baby hospitalizations; (2) the household component of NPHS does not include the institutionalized population; and (3) about 3% of the in-patient records were missing the CMG and RIW and, therefore, could not be assigned a cost.

\(^9\)In separate research using the same data we experimented with assigning income values for the intervals (and the open-ended highest category) based on the actual distributions of within-interval incomes (derived from the census). The mid-points (and an assumed value of $95,000 for the open-ended category) closely approximated these values; hence, we used the simpler approach.
household income was then adjusted using the OECD equivalence scale\textsuperscript{10} to obtain a measure of adjusted household income.

### The sample

The analysis focuses on adults aged 18 or over. The full NPHS-linked data file includes 23 402 individuals. From this sample, we dropped 1853 individuals under age 18, 30 individuals who could not be matched to their utilization data, 176 individuals who had missing CMG or RIW data necessary to assign hospital costs, and 311 individuals who had missing values for income, marital status, or other required fields. This left an analysis sample of 21 032.

Table I presents descriptive statistics on the sample. The average age was 44 years; females constituted 52% of the sample; average adjusted household income was $29 000; the majority of the individuals were in good to excellent health, with approximately 10% reporting fair or poor health. The average annual health-care expenditures on physician and hospital services ranged from $800 to $1000 over the period.

### DESIGN OF THE PUBLICLY FUNDED MSA PLAN

#### MSA plan design

The simulated MSA plans can be characterized along the following dimensions: services included; enrolment policy; the government budgeting process; the deductible; the method for calculating public MSA contributions; the catastrophic insurance plan; and the rate of government claw back of accumulated MSA funds. Simulating the impact of MSA funding also requires that we specify the utilization response by individuals. We assess the impact of design parameters by systematically varying key assumptions both qualitatively (e.g. a deductible that is fixed and equal for all individuals vs an income-dependent deductible) and quantitatively (e.g. the level of the fixed deductible or the steepness of its relationship to income).

\textsuperscript{10} First adult in a household is given a weight of 1.0, all other adults given a weight of 0.4, and children under 12 are given a weight of 0.3. Information on households was derived from the NPHS variable on marital status, number of persons in the household, and household type.
We discuss our specific assumptions in detail below, but a few over-arching aspects of the design should be noted.

1. All MSA plans focus only on physician and hospital services. These services constitute the public ‘Medicare’ program in Canada that is subject to the regulations embodied in the Canada Health Act. Furthermore, as noted above, public utilization files capture the provision of all medically necessary physician and hospital services, which constitute over 98% of all physician services in Canada and over 93% of all hospital services.

2. All designs assume mandatory enrolment in a universal, publicly funded MSA scheme. Experience in the US and South Africa suggests that voluntary plans are subject to self-selection of relatively healthy, high-income individuals (Department of Health, 2002; Government Accountability Office, 2006). However, in the absence of good data, selection assumptions under voluntary enrolment would be largely arbitrary. Compared with mandatory enrolment, such selection would increase mean per capita costs in the population (because those with below-average costs join MSAs for which they receive a public MSA contribution that exceeds their expected utilization) and exacerbate concerns regarding distributional equity.

3. The government captures all of the financial savings from individuals’ decreased health-care utilization. Under MSAs the government budget in any year $t$ is equal to the value of covered health-care services consumed in year $t - 1$ (which differs from government expenditures in year $t - 1$).

4. We consider only designs that ex ante are fiscally neutral for government in the sense that expected government spending on both MSA contributions and catastrophic insurance equals the government budget for that year. Government first sets aside funds equal to the expected catastrophic expenditures and then distributes only the remaining funds to individual MSAs.

We now describe specific assumptions that vary across designs.

**Deductible.** We consider three basic deductible designs. First, in the free plan, the deductible is set equal to an individual’s public MSA contribution so that a person faces no out-of-pocket expenses for included services. Although there is a certain inconsistency to MSA plans in which individuals face no out-of-pocket spending, we examine this case because some advocates for publicly funded MSAs have argued that MSAs could save money and improve system performance while maintaining the equity of the current system of funding under which individuals face no out-of-pocket costs for physician and hospital services (Ramsey, 1998; Owens and Holle, 2000). Second, we consider plans in which the deductible is fixed and equal for all individuals, allowing the annual deductible to vary between $500 and $2000 across simulations. Third, we consider two variants of deductibles that depend on income: the deductible as a constant proportion of income up to a maximum dollar amount and a hybrid blend of the free plan for individuals in the first income quintile and a fixed $500 deductible for those in higher-income quintiles.

**MSA contributions.** MSA contributions are risk-adjusted by age (14 categories), sex (2 categories), and self-assessed health status (5 categories), creating 140 risk groups. We assess the impact of risk selection by comparing simulations with no risk adjustment, age and sex adjustment only, and age, sex, and health status adjustment.

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11 For comparison, HSAs in the US currently require a minimum deductible of $1550 for individuals and $2500 for families. This, however, applies to a broader range of services and reflects much higher prices in the US (especially compared with the Canadian prices in the mid-1990s). As a proportion of mean spending, a $1500 deductible for all care in 2007 in the US roughly corresponds to a deductible of $500 for physician and hospital services in our data. Hence, the plan with a $500 deductible serves as our base case in our presentation of results.
Catastrophic coverage. Individuals have full catastrophic coverage in all simulations; once a person reaches the deductible, they incur no further out-of-pocket spending in that year.

Corridor (out-of-pocket spending). All out-of-pocket spending arises from the gap (called ‘the corridor’) between a person’s annual MSA contribution and the deductible. In the free plans the corridor is $0; in other plans, the corridor depends on a person’s risk status, which determines their MSA contribution and their deductible, which may depend on their income.

MSA accumulation. Unspent MSA funds accumulate year to year, subject to government claw back, if any. We do not include interest earned on MSA balances.

Government claw back of unspent MSA balances. The default assumption is no government claw back, although for MSA plans that increase public expenditures we determine the rate of claw back required to make them MSA plans fiscally neutral for the public sector relative to the current system of funding.

Utilization response. There are two factors to consider in specifying the utilization response: who responds and how much they respond. Individuals whose current spending is well above the deductible are unlikely to reduce consumption because, at the margin, care is free under the catastrophic coverage. They are also more likely to be suffering from a serious condition that reduces their price elasticity. Hence, we classified an individual as a non-responder under the MSA plan if the individual’s actual utilization in that year was sufficiently high that, even if they did respond at the assumed rate, their post-response utilization would still be above the deductible. All others were classified as ‘responders’ and assumed to reduce utilization at a specified rate. Every individual was classified annually as a responder or non-responder; hence, a person could be a responder one year but a non-responder the next. We performed a sensitivity analysis in which both high users (as above) and low users (use equalled one-half or less of the deductible) are assumed to be non-responders.

We based the assumed rates of response on the results of the Rand health insurance experiment (HIE). Our baseline assumption was a 40% reduction for physician services and a 23% reduction for hospital utilization, which corresponds to the difference in utilization observed between those in the free plan and those in the 95% cost-sharing plan in the Rand HIE (Newhouse and the Health Insurance Experiment Group, 1993, Table III.2, p. 41). The actual response we would observe under MSAs may differ for a number of reasons (Deber et al., 2004), but the Rand findings for the 95% cost-sharing plan provide a baseline. We performed sensitivity analyses assuming response rates equal to one-half the baseline assumption, twice the baseline assumption, and with an income-dependent response whereby the assumed response by high-income individuals (top two quintiles) was one-half as large as that assumed for low-income individuals.

Table II summarizes our design and behavioural assumptions.

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12 This plan mimics more closely the incentive structure of MSAs than do the other Rand HIE plans or cost-sharing designs commonly found in public and private insurance plans, which often impose cost sharing of 20–25%. Deber et al. (2004) note that the Rand HIE estimates apply to a relatively healthy, working age population while MSA cover the whole population. While a valid concern, de facto, in our simulations high user, non-responders are disproportionately in poor health, elderly, and low income. Hence, in the simulations, much of the utilization response arises from relatively healthy, working age individuals. Because in the Rand experiment individuals facing the deductible had to spend personal income, adoption of the Rand as baseline also implicitly assumes that individuals treat MSA funds as equivalent to personal funds. If this is not true, observed utilization responses may be less than implied by the Rand estimates.
The simulations

We describe the key components of the simulation in reference to the calculations of a single year $t$; these are repeated for each of the three years and the various outcomes are aggregated across the three years. The simulation proceeds as follows:

1. **Set parameter values**: Set the parameter values for the deductible, risk-adjustment method, rate of government claw back, and utilization response.
2. **Determine the government’s health-care budget for year $t$**: Under MSAs the government’s budget in year $t$ is equal to the value of health-care utilization in year $t - 1$. This is calculated in two steps.
   a. Calculate each individual’s predicted utilization under the MSA plan for $t - 1$, which is the observed utilization in year $t - 1$ adjusted for the assumed utilization response. This requires first classifying individuals as responders or non-responders. Let $x_{i,t-1}$ be individual $i$’s actual health-care expenditure in year $t - 1$ under the current system of finance, $z_{i,t-1}$ be individual $i$’s predicted health-care expenditure in year $t - 1$ under MSAs, $r$ be the assumed...

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### Table II. Key simulation assumptions

<table>
<thead>
<tr>
<th>Design feature</th>
<th>Assumptions</th>
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<tbody>
<tr>
<td><strong>MSA plan design</strong></td>
<td></td>
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<tr>
<td>Services funded</td>
<td>● Physician and hospital services in all simulations</td>
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<tr>
<td>Enrolment</td>
<td>● Mandatory in all simulations</td>
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<tr>
<td>Government budget</td>
<td>● The total government health-care budget in year $t$ is equal to the spending on covered health-care services in year $t - 1$</td>
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<td></td>
<td>● The government budget is allocated to two purposes: (1) public MSA contributions and (2) catastrophic insurance expenditures</td>
</tr>
<tr>
<td>Deductible</td>
<td>We consider three basic deductible designs, with variations on each:</td>
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<tr>
<td></td>
<td>● Everyone faces the same deductible (e.g. $500)</td>
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<td></td>
<td>● The deductible is an increasing function of adjusted household income (e.g. 2% of household income)</td>
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<td></td>
<td>● For the free plan, a person’s deductible simply equals their MSA contribution</td>
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<tr>
<td>MSA contribution</td>
<td>● The default assumption is that government contributions to individual MSAs are risk adjusted according to a person’s age, sex and health status</td>
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<tr>
<td>Catastrophic coverage</td>
<td>● We examine the impact of varying degrees of risk adjustment</td>
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<tr>
<td>Corridor (out-of-pocket liability)</td>
<td>● The government provides full coverage above the deductible, i.e. there is no cost-sharing above the deductible</td>
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<tr>
<td>Government claw back of unspent MSA contributions</td>
<td>● Corridor depends on risk category and/or income in other plans</td>
</tr>
<tr>
<td></td>
<td>● The default assumption is no government claw back</td>
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<td></td>
<td>● Where appropriate we examine the claw-back rate necessary to make some plans fiscally neutral compared with the status quo</td>
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<tr>
<td>Behavioural assumptions</td>
<td>There are two parts to this: who responds and how much they respond</td>
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<tr>
<td>Utilization response</td>
<td>● An individual is classified as a non-responder in year $t$ if their predicted post-response utilization that year would remain above the deductible. All others are classified as responders</td>
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<td></td>
<td>● Assumed utilization reductions are based on estimates from the Rand HIE regarding differences in utilization between those on the free plan and those on the 95% cost-sharing plan. The baseline assumption is 40% reduction in the utilization of physician services and 23% for hospital services</td>
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<td>○ In a sensitivity analysis, we allow these values to equal to one-half and twice this base assumption</td>
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<td></td>
<td>○ We also examine variations in which response depends on income, with high-income individuals reducing utilization by only half as much as others</td>
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rate of reduction in utilization under MSAs, and \( d \) be the deductible. Then

\[
\begin{align*}
\text{if } x_{i,t-1}(1 - r) < d, \text{ individual } i \text{ is a responder in } t - 1, \quad z_{i,t-1} &= x_{i,t-1}(1 - r) \\
\text{if } x_{i,t-1}(1 - r) > d, \text{ individual } i \text{ is a non-responder in } t - 1, \quad z_{i,t-1} &= x_{i,t-1}
\end{align*}
\]

(b) The government budget in \( t \) equals the sum across individuals of the dollar value of \( t - 1 \) utilization under MSAs:

\[
GB_t = \sum_i z_{i,t-1}
\]

3. Divide the government budget for \( t \) between expected catastrophic payments and the MSA funds to be allocated to individual MSAs.

(a) For a given deductible, expected catastrophic payments in \( t \) equal the catastrophic payments in year \( t - 1 \):

\[
\text{CATPRED}_t = \sum_i (z_{i,t-1} - d) \cdot e_{i,t-1}, \quad \text{where } e_{i,t-1} = 1 \text{ if } z_{i,t-1} > d \text{ and } 0 \text{ otherwise}
\]

(b) The MSA budget in \( t \) is the residual funds available after predicted catastrophic payments have been subtracted from the total government budget:

\[
\text{MSA}_t = GB_t - \text{CATPRED}_t
\]

4. Determine the public MSA contribution to each individual given the government’s MSA budget. The method for determining risk-adjusted contributions to individual MSAs corresponds to an approach commonly used to allocate a fixed budget among individuals or regions on the basis of relative need (Smith et al., 2001; Hurley et al., 2004):

(a) Classify each individual into the relevant risk category based on one or all of their age, sex, and self-assessed health status. Denote the risk categories \( k = 1, \ldots, K \).

(b) Determine the share of the budget, based on predicted utilization patterns in \( t - 1 \), that should be allocated to individuals in each risk category. For each \( k \),

\[
S_{k,t-1} = \frac{\left[ \sum_{i \in k} (z_{i,t-1}) \right]}{\sum_i (z_{i,t-1})}
\]

For each individual in \( k \), the MSA contribution in year \( t \) is simply

\[
\text{msa}_{k,t} = (S_{k,t-1})(\text{MSA}_t)/N_k
\]

where \( N_k \) is the number of individuals in risk category \( k \).

5. Calculate the predicted year \( t \) utilization under MSAs for each individual

(a) Predicted utilization in \( t \) is actual utilization in \( t \) under the current system adjusted for the assumed utilization response:

\[
\begin{align*}
\text{if } x_{i,t}(1 - r) < d, \text{ individual } i \text{ is a responder in } t, \quad z_{i,t} &= x_{i,t}(1 - r) \\
\text{if } x_{i,t}(1 - r) > d, \text{ individual } i \text{ is a non-responder in } t, \quad z_{i,t} &= x_{i,t}
\end{align*}
\]

13 Although many insurance plans and capitation systems adjust for risk beyond age and sex, most do not employ a direct measure of health status such as self-assessed health status. To the extent that actual systems are less able to risk adjust for health status, our simulations again make a favourable assumption for MSAs.
6. Determine the source of funds to pay for predicted utilization.

(a) **MSA funds**: The individual first draws on available MSA funds, which equal unused MSA balances from \( t - 1 \) plus the MSA contribution for \( t \):

\[
\text{msaavail}_{i,t} = \text{msabal}_{i,t-1} + \text{msa}_{i,t}
\]

\[
\text{msaspend}_{i,t} = z_{i,t} \quad \text{if } z_{i,t} \leq \text{msaavail}_{i,t}
\]

\[
\text{msaspend}_{i,t} = \text{msaavail}_{i,t} \quad \text{if } z_{i,t} > \text{msaavail}_{i,t}
\]

(b) **Out-of-pocket spending**: If period \( t \) utilization (\( z_{i,t} \)) exceeds available MSA funds, the individual must pay out-of-pocket until the deductible is reached:

\[
\text{oops}_{i,t} = 0 \quad \text{if } z_{i,t} \leq \text{msaavail}_{i,t}
\]

\[
\text{oops}_{i,t} = z_{i,t} - \text{msaavail}_{i,t} \quad \text{if } \text{msaavail}_{i,t} < z_{i,t} \leq d
\]

\[
\text{oops}_{i,t} = d - \text{msaavail}_{i,t} \quad \text{if } z_{i,t} > d
\]

(c) **Catastrophic payments**: The government funds catastrophic expenditures above the deductible:

\[
\text{cat}_{i,t} = 0 \quad \text{if } z_{i,t} \leq d
\]

\[
\text{cat}_{i,t} = (z_{i,t} - d) \quad \text{if } z_{i,t} > d
\]

7. Determine end of year MSA balances and total public spending on each individual:

\[
\text{msabal}_{i,t} = (\text{msabal}_{i,t-1} + \text{msa}_{i,t}) - \text{msaspend}_{i,t}
\]

\[
\text{pubspend}_{i,t} = \text{msa}_{i,t} + \text{cat}_{i,t}
\]

8. Aggregate outcomes across individuals by health status, income level, pre-MSA spending, and age as is appropriate to examine the impact of MSAs on both the overall level of each outcome and its distribution across individuals categorized along these dimensions.

This process is repeated for each year. We have four years of data. However, because we must know values from year \( t - 1 \) to run the simulation for year \( t \), 1995 serves only as the base year \((t - 1)\) for 1996, and the simulations run the MSA plan for three years, 1996, 1997, and 1998.

**RESULTS**

All analyses have been weighted by the survey population weights and therefore represent estimates for the community-dwelling, non-institutionalized population of Ontario. Except where otherwise noted, all figures discussed below and presented in the associated tables represent values accumulated across three years (1996, 1997, and 1998) of running an MSA plan under the default assumption of a utilization decrease of 40% for physician services and 23% for hospital services among responders, mandatory enrolment, and age–sex–health status risk adjustment. We begin with a comparison of the mean levels of public expenditures, health-care utilization, MSA contributions, catastrophic spending, out-of-pocket spending, and MSA accumulations under the current system of financing and funding (status quo) and alternative MSA plans. We then examine the distributional impacts of alternative MSA designs with respect to public spending, out-of-pocket spending, and MSA accumulations. The distributional analysis
examines these outcomes by health status, income, pre-MSA spending, and age. Owing to space constraints, the discussion compares individuals in only the highest and lowest categories (e.g. excellent health vs poor health; richest quintile vs poorest quintile) in each of these dimensions.

**Impact on the level of spending, health-care utilization and MSA accumulations**

MSAs that do not include cost-sharing (the ‘free plan’) increase public expenditure even though health-care utilization is assumed to fall (Table III). Health-care utilization falls an average of 3.2% (the majority of expenditures are incurred by a small proportion of non-responders whose expenditures are well above the deductible), but public expenditures increase 4.2%. The difference between the decrease in utilization and the increased public expenditures is accounted for by the accumulation of unused MSA funds ($206 on average). The free plan would be fiscally neutral for the public sector with a government claw-back rate of 57% assuming that the introduction of a government claw back did not affect utilization responses. If, as is more likely, a claw back mutes utilization responses, the claw-back rate would have to be higher to make the plan fiscally neutral.

Among plans with a positive corridor (and therefore positive out-of-pocket spending), we take as the baseline a plan with a $500 fixed deductible identical across all individuals. This plan is predicted to reduce health-care utilization by 7.5% and public expenditure by 7.9% (Table III). Public expenditure falls by more than utilization because patients pay out of pocket for some of their care (on average, $191), although this effect is largely offset by the fact that many individuals do not spend all of their public MSA contribution, accumulating an average MSA balance of $178.

Raising the fixed deductible while holding other aspects of the plan constant causes both health-care utilization and public expenditures to fall because the number of responders increases with the deductible (Table III). The net effect on public spending of increasing the deductible reflects three tendencies: increasing the deductible reduces overall health-care spending and catastrophic spending; the reduction in health-care utilization causes the government budget to fall over time as the government captures these savings, but the reduction in catastrophic spending frees up a larger share of the budget to be allocated to MSAs, some of which is not spent. As the deductible increases, on net, we observe decreasing health-care utilization, total government spending, and catastrophic spending, but increasing average public MSA contributions, MSA accumulations, and out-of-pocket expenditures. Increasing the deductible therefore simultaneously increases the costs imposed on high users and the accumulation of public MSA funds by low users. Indeed, the proportion of public spending that represents a pure transfer rises from 6.8% ($178/$2591) with a $500 deductible to over 16% ($390/$2406) with a $1500 deductible.

We present two plans in which the deductible varies with income. In the first plan the deductible is a constant proportion of adjusted household income. We present the case for a deductible equal to 1.7% of income because at this proportion mean public expenditures equal those with a fixed $500 deductible ($2591), thereby facilitating a comparison of the distributional impact of an income-dependent deductible compared with a fixed deductible. The second plan is a hybrid in which individuals in the lowest income quintile face no out-of-pocket costs, while those with higher incomes face a fixed $500 deductible. Although public expenditure under the plan in which the deductible is 1.7% of income equals that with a fixed $500 deductible, the plan predicts: higher average health-care utilization ($2629 vs $2603) because more low-income individuals are non-responders, exactly the same level of out-of-pocket spending ($191), and lower average MSA accumulations ($152 vs $178, due to higher catastrophic spending and lower MSA contributions on average). Comparing the two plans with income-based deductibles, health-care utilization is roughly equal ($2629 vs $2622), but public spending is higher in the hybrid plan. In fact, public spending under the hybrid plan is only 2% less than the status quo; if the free component is extended to those in the bottom two quintiles, the hybrid plans becomes more expensive to the public sector than the status quo (results not presented). The increased
Table III. Comparison of status quo and MSA plans: utilization, expenditure, out-of-pocket spending, MSA contributions and accumulations

<table>
<thead>
<tr>
<th>MSA plans</th>
<th>Status quo</th>
<th>Free plan</th>
<th>Annual deductible</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>$500 Diff.</td>
<td>$1000 Diff.</td>
</tr>
<tr>
<td>Mean value of HC utilization</td>
<td>2814</td>
<td>2725</td>
<td>-3.2</td>
</tr>
<tr>
<td>Mean public expenditure</td>
<td>2814</td>
<td>2931</td>
<td>4.2</td>
</tr>
<tr>
<td>Mean MSA contribution</td>
<td>622</td>
<td>622</td>
<td>857</td>
</tr>
<tr>
<td>Mean catastrophic expenditure</td>
<td>2309</td>
<td>1969</td>
<td>1619</td>
</tr>
<tr>
<td>Mean out-of-pocket spending</td>
<td>0</td>
<td>191</td>
<td>318</td>
</tr>
<tr>
<td>Mean MSA accumulation</td>
<td>206</td>
<td>178</td>
<td>299</td>
</tr>
</tbody>
</table>

All figures are mean values aggregated across three years of data for the full sample. Simulations assume: physician and hospital services are included; mandatory enrolment, age-sex-health-status-adjusted MSA contributions; utilization reductions (among responders) of 40% for physician services and 23% for hospital services. The free plan assumes a deductible specific to a person's risk category; the MSA contribution is set equal to this deductible, so that the corridor equals $0 and no individual is at risk for out-of-pocket spending. The hybrid plan assumes free care for those in the lowest income quintile and $500 fixed deductible for all others.
public expenditure primarily takes the form of higher MSA contributions (mean of $780 vs $538) and consequently results in substantially increased average MSA accumulations ($278 vs $152). Mean out-of-pocket spending is lower in the hybrid plan than in the constant proportion plan ($151 vs $191).

Table IV presents the results of sensitivity analyses around our default utilization assumptions. As expected, halving the assumed rate of response approximately halves public cost savings while doubling the assumed rate of response approximately doubles the public cost savings (the effects are not exactly one-half or double because the set of non-responders changes slightly with the differing response assumptions). Expanding the set of non-responders to include both high and low users (while retaining the baseline assumption regarding response rates) approximately halves the public savings compared with when only high users are classified as non-responders. Finally, under the income-dependent response rates public savings fall slightly less (−6.4% vs −7.9%) than when we assume a constant response rate across income levels.

In summary, although a publicly funded MSA plan with no out-of-pocket spending is predicted to increase public expenditure, the increase is considerably less than previous work (Forget et al., 2002; Deber et al., 2004) has suggested. Further, under a range of assumptions regarding both MSA design and behavioural responses, publicly funded MSA plans that impose out-of-pocket spending are predicted to modestly reduce public expenditure. These plans, however, increase cost-sharing to levels that are not trivial in the Canadian context. Mean per capita out-of-pocket spending was approximately $425 in 1996 (the year of the survey), so that the annual out-of-pocket spending implied by the simulations represents increases of approximately 12% for the hybrid plan to 33% for the plan with a fixed deductible of $1500 (recall that the figures in the tables are 3-year totals).

The distributional impacts of publicly funded MSAs

Table V provides insight into the distributional effects of the MSAs plans by health status, income, pre-MSA spending, and age. There is a consistent pattern for the free plan and the fixed-deductible plans whereby, compared with the current arrangements, the MSA plans redistribute public funds such that the gains (losses) for those in excellent health, with high-income, low pre-MSA spending, and the young exceed (are less than) those for individuals in poor health, low-income, high pre-MSA spending, and the elderly (Table V).14 Compared with the current system, for example, under the free plan those in excellent health on average receive $116 more in public funds ($1795–$1679), while those in poor health receive only $90 more ($9691–$9601); those with high household income receive $139 more, while those with low income receive $91 less; those with high pre-MSA spending receive $16 more, but those with low pre-MSA spending receive $335 more; and the young receive $103 more, while the elderly receive $92 more (Table V). Among plans with a fixed deductible, the disparities grow with increases in the deductible. Not surprisingly given that MSAs are based on cost-sharing, the most dramatic redistribution occurs between high users and low users.

The redistribution of public funds is more complex under the plans with income-dependent deductibles. Compared with the status quo, both income-based plans reduce public expenditures for those in the top income quintile; under the constant-proportion plan public expenditures on low-income individuals also fall, while public expenditures on low-income individuals increase under the hybrid plan. The constant-proportion plan reduces public spending roughly equally for those in excellent and poor health status ($209 vs $203), reduces public expenditures for high users while increasing public expenditure for low users (−$566 vs $296), and reduces public spending on the elderly almost 70% more than the young (−$252 vs −$156). The hybrid plan redistributes public expenditure slightly towards

14The impact on net incidence, not just public expenditures, is also of interest. Net incidence would consider the difference between total contributions (taxes and out of pocket) and the value of publicly financed services received. It is not possible, however, given the data available to do a full net incidence analysis.
Table IV. Impact of alternative assumptions regarding utilization responses

<table>
<thead>
<tr>
<th></th>
<th>Status quo</th>
<th>Base case: MD: -40%</th>
<th>One-half base case: MD: -20%</th>
<th>Twice base case: MD: -80%</th>
<th>Non-responders include low users</th>
<th>Income-dependent response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(a)</td>
<td>hosp.: -23% % Diff.</td>
<td>hosp.: -11% % Diff.</td>
<td>hosp.: -46% % Diff.</td>
<td>% Diff.</td>
<td>% Diff.</td>
</tr>
<tr>
<td>Mean value of HC utilization</td>
<td>2814</td>
<td>2603 -7.5</td>
<td>2709 -3.7</td>
<td>2392 -15.0</td>
<td>2711 -3.7</td>
<td>2645 -6.0</td>
</tr>
<tr>
<td>Mean public expenditure</td>
<td>2814</td>
<td>2591 -7.9</td>
<td>2606 -4.2</td>
<td>2382 -15.4</td>
<td>2700 -4.1</td>
<td>2633 -6.4</td>
</tr>
<tr>
<td>Mean MSA contribution</td>
<td>622</td>
<td>716 413</td>
<td>732</td>
<td></td>
<td></td>
<td>660</td>
</tr>
<tr>
<td>Mean out-of-pocket spending</td>
<td>191</td>
<td>200 181</td>
<td>185</td>
<td>185</td>
<td>198</td>
<td>198</td>
</tr>
<tr>
<td>Mean MSA accumulation</td>
<td>178</td>
<td>187 171</td>
<td>174</td>
<td>185</td>
<td></td>
<td>185</td>
</tr>
</tbody>
</table>

All figures based on plan with $500 fixed-deductible, age-sex-health status risk adjustment, mandatory enrolment, non-response by high users with expenditures that exceed the deductible.

* A low-user is classified as a non-responder if utilization in $t$ is less than or equal to $\frac{1}{4}$ the deductible.

* Assume that individuals in the top two income quintiles respond only half as much as individuals in the bottom three income quintiles.
Table V. Distributional impacts of publicly funded MSAs

<table>
<thead>
<tr>
<th>Status quo</th>
<th>Annual deductible</th>
<th>Impact of risk adjustmenta</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public expenditure</td>
<td>Hybrid: free/$500 fixed</td>
</tr>
<tr>
<td></td>
<td>SAHS</td>
<td>None</td>
</tr>
<tr>
<td>Excellent</td>
<td>$500 $1000 $1500</td>
<td>Age–sex–HS Diff.</td>
</tr>
<tr>
<td>Poor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest quintile</td>
<td>2136</td>
<td>2275</td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>3676</td>
<td>3585</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest quintile</td>
<td>10 976</td>
<td>10 992</td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>141 476</td>
<td>469 615</td>
</tr>
<tr>
<td>Pre-MSA utilization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest quintile</td>
<td>10 976</td>
<td>10 992</td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>141 476</td>
<td>469 615</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>1295 1398 1115 1067 1037 1139</td>
<td>1299 1115</td>
</tr>
<tr>
<td>&gt;65</td>
<td>6303 6395 6063 5802 5654 6051 6185</td>
<td>5722 6063</td>
</tr>
<tr>
<td>Pre-MSA utilization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest quintile</td>
<td>10 976</td>
<td>10 992</td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>141 476</td>
<td>469 615</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>1295 1398 1115 1067 1037 1139</td>
<td>1299 1115</td>
</tr>
<tr>
<td>&gt;65</td>
<td>6303 6395 6063 5802 5654 6051 6185</td>
<td>5722 6063</td>
</tr>
<tr>
<td>MSA accumulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAHS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>206 178 299 390</td>
<td>152 278</td>
</tr>
<tr>
<td>Poor</td>
<td>217 191 440 659</td>
<td>65 254</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest quintile</td>
<td>206 178 299 390</td>
<td>152 278</td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>217 191 440 659</td>
<td>65 254</td>
</tr>
<tr>
<td>Pre-MSA utilization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest quintile</td>
<td>206 178 299 390</td>
<td>152 278</td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>217 191 440 659</td>
<td>65 254</td>
</tr>
</tbody>
</table>

All figures are mean values for relevant categories aggregated across three years of data. Simulations assume: physician and hospital services are included; mandatory enrolment, age–sex–health status risk-adjusted MSA contributions except where noted; utilization reductions (among responders) of 40% for physician services and 23% for hospital services. See notes to Table III for definition of hybrid plan.

a Both the risk-adjusted and non-risk-adjusted plans assume a $500 fixed-deductible and the default utilization responses noted above.

those in poor health compared those in excellent health, towards those with low income from those with high, and again from high spenders to low spenders and from elderly to young.

The burden of out-of-pocket spending under fixed-deductible plans is essentially equal or larger for those in poor health vs excellent health, low income vs high income, high users vs low users, and elderly.
vs young, with the disparity growing notably with increases in the deductible. Again, not surprisingly, the disparity is greatest between high and low users: on average, the lowest 20% of users incur no out-of-pocket costs, while high users incur average out-of-pocket expenditures of $464 under a $500 annual deductible and over $1500 when the annual deductible is $1500. Changing to an income-based deductible reverses this pattern for income and health status (for example, out-of-pocket payments for those with high income now exceed those of individuals with low income), but the pattern remains with respect to pre-MSA spending and age.

The pattern of MSA accumulations is more complicated. Because public MSA contributions are risk adjusted, the mean contribution is larger for those in poor health, with low income, high use and elderly. For both the free plan and all the fixed-deductible plans, on average this leads those in poor health to accumulate more MSA funds than those in excellent health, low-income individuals accumulate more than high-income individuals, and the elderly accumulate more than the young. Low-users, however, accumulate far more on average than do high-users. The patterns of accumulations differ, however, for the plans with income-dependent deductibles. When the deductible is 1.7% of income, for example, those in excellent health now accumulate more than those in poor health and those with high income accumulate more than those with low income. It is still the case that low users accumulate far more than high users and the elderly accumulate slightly more than the young. This changed pattern arises in large part because the MSA contributions to those with low income are smaller than in fixed-deductible plans (because the MSA contribution cannot exceed the deductible, which is now a function of income).

The results in Table V are mean values within each category, which mask important distributional issues within categories. For the fixed, $500 deductible plan, for example, although the mean out-of-pocket spending for those in excellent and poor health was $172 and $171, respectively, the distribution for those in excellent health is far more right skewed (mean = $172, median = $16); hence, the majority of such individuals incur none or very small out-of-pocket expenses, while a small number of individuals incur large expenditures (Table VI). In contrast, out-of-pocket expenditures among those in poor health are more evenly distributed, with the majority incurring non-trivial out-of-pocket expenditures. Similar patterns hold for high- and low-income individuals (although they are less pronounced) and for the

<table>
<thead>
<tr>
<th>Table VI. The distribution of out-of-pocket spending by health status, income, pre-MSA spending and age</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Out-of-pocket spending</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>$500 Fixed deductible</strong></td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>25th</td>
</tr>
<tr>
<td>50th</td>
</tr>
<tr>
<td>75th</td>
</tr>
<tr>
<td>99th</td>
</tr>
<tr>
<td><strong>Deductible 1.7% of income</strong></td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>25th</td>
</tr>
<tr>
<td>50th</td>
</tr>
<tr>
<td>75th</td>
</tr>
<tr>
<td>99th</td>
</tr>
</tbody>
</table>

All figures are mean values for relevant categories aggregated across three years of data. Simulations assume: physician and hospital services are included; mandatory enrolment, age–sex–health status risk-adjusted MSA contributions except where noted; utilization reductions (among responders) of 40% for physician services and 23% for hospital services.

young and elderly (where they are more pronounced). The distribution across pre-MSA spending levels highlights the large variation in out-of-pocket spending across individuals.

Figure 1 illustrates the large variation across groups in the proportion of public MSA contributions they accumulate. While we saw above that under the fixed $500 deductible, on average, those in poor health accumulate slightly more of the public MSA contribution than those in excellent health, Figure 1(b) highlights that 46% of those in poor health accumulate nothing over the three years, while only 28% of those in excellent health do so; furthermore, only 3% of those in poor health accumulate more than 75% of the MSA contribution, while 16% of those in excellent health do so. The pattern is more pronounced between high and low users and between young and old. The distributions are most equal between the rich and the poor. Changing to a deductible equal to 1.7% of household income lowers the mean public MSA contribution and average proportion of the contribution that is accumulated. In general, therefore we see a shift towards lower levels of accumulation. This shift is greater for those in poor health than in excellent health (the proportion who accumulate zero increases from 46 to 63% among those in poor health but is unchanged for those in excellent health); for high users compared with low users (the proportion who accumulate zero increases from 74 to 76% among high users and is unchanged among low users); and for the elderly compared with the young (the proportion of elderly who accumulate zero increases from 45 to 50%, while the proportion of the young increases from 25 to 27%). The distributions among those in high- and low-incomes are little changed (Figure 1(c)).

The patterns of accumulation also provide insight into year-to-year persistence in utilization. Overall, under the $500 fixed-deductible plan 33% of individuals spend all of their MSA contributions over the three-year period (i.e. have zero MSA balances at the end of year three); under the fixed proportion of income plan 35% do so. For the former, 60% of such individuals spend the whole MSA contribution every year; for the latter, over 67% do so. These people are chronic high users who represent close to 25% of the population and who will likely never accumulate meaningful MSA balances. This fact bears particularly on the argument that MSAs increase choice. Although MSA funding may allow greater flexibility in using public funds across providers and services, these individuals spend all their MSA funds plus out-of-pocket funds for services they currently get for free. In a very real sense, MSAs reduce their feasible choices: they now have fewer personal funds available to purchase non-covered services.

Risk adjustment

In mandatory plans such as those considered here, risk adjustment is needed primarily for reasons of equity; voluntary enrolment would raise a host of additional selection, efficiency, and expenditure concerns as only those who find it most attractive would join an MSA plan. Risk adjustment in our MSA framework has no impact on the level of public expenditures; it affects only the distribution of the MSA budget among individuals. It therefore has only distributional implications. Table V illustrates these distributional effects by comparing the plan with a $500 fixed-deductible and age–sex–health status risk adjustment to the same plan with no risk adjustment (i.e. each person’s MSA contribution is the simple per capita amount in the government’s MSA budget). As noted, total public spending is identical in the two plans, but with risk adjustment a higher proportion of public funding goes to those in poor health, those with low income, high users of care, and the elderly. This redistribution has important effects on out-of-pocket spending. Risk adjustment lowers average out-of-pocket spending overall and in particular for those in poor health, those with low income, high users, and the elderly. Similarly, it decreases average accumulation of MSA funds and again results in a distribution more favourable to those in poor health, those with low income, high users, and the elderly. The ability of an MSA plan to risk adjust, therefore, has important consequences for the distributional effects of publicly funded MSAs.
Figure 1. Proportion of public MSA contributions accumulated by health status, income, pre-MSA spending and age. MSA accumulation: (a) $500 free plan; (b) $500 fixed deductible; and (c) 1.7% of income.
DISCUSSION

Our simulations examine the impact of universal, publicly funded MSAs on the level of public expenditures and on distributional equity. Our results differ importantly in certain respects from existing analyses of publicly funded MSAs. Deber et al. (2004), for example, concluded that publicly funded MSAs would increase public expenditures substantially even under the extreme assumption that health-care utilization falls to zero for all individuals whose pre-MSA utilization was less than their deductible. Making such a plan fiscally neutral for the public sector under this strong assumption required deductibles as high as $6700 for the elderly. In contrast, under more modest assumptions regarding utilization responses, we find that MSA plans that impose no cost sharing modestly increase public expenditures and that plans with deductibles typical of MSAs found today modestly reduce public expenditures. These differences between the two studies derive primarily from plan designs: the design in Deber et al. withheld too small a proportion of government spending to finance catastrophic expenditures from the current budget, while we assume that government withholds sufficient funds so that its catastrophic insurance program is ex ante fiscally neutral; Deber et al. required no financial cross-subsidization among age–sex cells, even ex post, while our design pools catastrophic expenditures across all members of society; and Deber et al. simulate a one-period model in which government can only recover a portion of reduced utilization via a claw back while we assume that over time government captures the financial savings associated with reduced utilization.

Our results reinforce and expand our understanding of the distributional impacts of MSAs. Compared with the existing method of public funding, MSAs generate a number of undesirable distributional impacts across those of differing health statuses, incomes, utilization levels, and ages, both with respect to the distribution of public funds and the distribution of out-of-pocket payments. Making deductibles income dependent only partially ameliorates these distributional effects.

As noted earlier, our baseline assumptions are generally favourable towards MSAs: we assume that government captures all of the financial savings associated with reduced utilization under MSAs; that government distributes to MSAs only funds available after withholding monies necessary to finance catastrophic insurance spending; that people respond to MSA incentives by reducing utilization in line with estimates from the Rand HIE and that in doing so they treat MSA dollars and personal funds as equivalent; we adjust MSA contributions for age, sex, and health status; and because enrolment is mandatory there is no favourable risk selection into MSAs. Furthermore, under our design risk adjustment (or the lack thereof) does not affect overall public expenditures; it affects only the distribution of public monies among individuals. Consequently, the highly skewed distribution of health-care expenditures and still rudimentary methods of risk adjustment do not automatically condemn all MSA plans to be expenditure increasing.

Some might argue that our assumptions are too favourable regarding MSAs. There are good reasons, for example, for believing that utilization reductions (and the associated expenditure reductions) under MSAs will be less than our baseline assumption, including possible countering demand inducement by providers who see visit rates fall, the expression of currently unmet needs, possible price increases (if prices are unregulated) in a market following the loss of government monopsony negotiating power, etc. Our simulations also ignore the information and administrative costs associated with MSAs, which would be considerably higher than the current methods of financing and funding given the need to create and maintain infrastructure to track, at an individual level, balances, transactions, interest payments, and so forth. (The Government of South Africa has restricted use of MSA in part because of high administrative costs (Department of Health, 2002).) Increased provider advertising and patient search costs associated with a more ‘competitive’ market for medical and hospital service will also affect the overall cost of an MSA-based system.
Simulating MSAs under generally favourable assumptions, however, reveals that even under these conditions publicly funded MSAs generate at best modest public savings while generating important distributional effects. MSAs that include meaningful cost-sharing, as their underlying rationale calls for, will redistribute public resources from those who are sick and require care to those who are well and do not. This holds true even for MSAs with income-dependent deductibles.

Although a formal welfare analysis based on the simulations would require strong, in the end arbitrary assumptions regarding the structure of preferences and a social welfare function, we can identify issues crucial to such an assessment and how MSAs may fare qualitatively with respect of some of these issues. The ultimate welfare assessment of MSAs depends, of course, on the objectives for a given health-care system. MSAs do not fare well when compared against the core objectives of most publicly financed health-care systems, which stress equity in finance, allocation according to need, equitable access, risk reduction, efficiency, and health gains, or broader social policy that generally endorses redistribution from high income to low income rather than vice versa. MSAs would be more attractive only in settings that stress autonomy, market choice, and related principles. How MSAs are judged in a given context will depend on the weight given to competing objectives.

The simulations document a clear trade-off between cost savings and negative distributional consequences, so that a welfare assessment of MSAs would depend in part on the weight given to cost control vs distributional objectives and other potential negative effects. This welfare analysis of the trade-off between cost savings and distributional concerns, however, is complicated by the fact that MSAs achieve cost savings primarily through reduced utilization, which generates a number of additional welfare effects. The fall in utilization is welfare enhancing only if it has minimal health consequences. Evidence, however, documents important negative health effects of cost-sharing-induced drops in utilization (Newhouse, 1993; Tamblyn et al., 2001). Evidence therefore suggests that a substantial portion of the reduced utilization would be welfare decreasing. Further, the costs of treating these adverse health effects would mitigate at least a portion of any predicted cost savings. It is possible that once these effects are taken into account, MSAs could simultaneously increase expenditures and generate negative distributional consequences.

A full welfare analysis should also incorporate the value to individual of increased choice and the potential benefits of increased competition in health-care markets. Our simulations, however, indicate that for those whom increased choice would presumably be most valuable (chronic high users of care), MSAs may well reduce their choice set. MSA funds are exhausted paying for care and the increased out-of-pocket costs actually reduce the ability of such individuals to finance services currently not covered. Finally, while the evidence is not unequivocal, we would argue that the evidence regarding the cost and efficiency effects of individual-level, demand-side competition offers little prospect that such competition would have beneficial effects (Hurley and Guindon, 2007).

On balance, for public systems of finance that emphasize equity in finance and utilization, allocation according to need, cost control, and overall system efficiency, the sum of these considerations suggests that publicly funded MSAs are unlikely to advance overall system performance.

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