Centre for Health Economics and Policy Analysis

CHEPA WORKING PAPER SERIES

Paper 07-01

Publicly Funded Medical Savings Accounts: Expenditures and Distributional Impacts

Jeremiah Hurley, PhD
G. Emmanuel Guindon, MA
Vicki Rynard, MSc
Steve Morgan, PhD

McMaster University

NOT FOR CITATION WITHOUT PERMISSION

Publicly Funded Medical Savings Accounts: Expenditures and Distributional Impacts

Jeremiah Hurley[1,2,3]
G. Emmanuel Guindon[2]
Vicki Rynard
Steve Morgan[4]

1. Department of Economics, McMaster University
2. Centre for Health Economics and Policy Analysis, McMaster University
3. Department of Clinical Epidemiology and Biostatistics, McMaster University
4. Centre for Health Services and Policy Research, University of British Columbia

Corresponding author:

Jeremiah Hurley
Department of Economics, KTH 430
McMaster University
1280 Main Street West
Hamilton, Ontario L8S 4M4
Tel: 905-525-9140, ext. 24593
Fax: 905-521-8232
e-mail: hurley@mcmaster.ca

JEL: I10, I11, I18
Keywords: Medical Savings Accounts, Health Care Financing, Health Care Funding, Cost-sharing

This research was supported by CIHR grant # MOP-64284. We also acknowledge funding from the Ontario Ministry of Health and Long-term Care to the Centre for Health Economics and Policy Analysis. The views expressed in this paper are those of the authors and do not represent the views of the above organizations. We thank Michel Grignon for helpful comments.

April 11, 2007

Abstract

This paper presents the findings from simulations of the introduction of publicly funded Medical Savings Accounts 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 than have previous analyses regarding: the distributional impacts of publicly funded MSAs across individuals of differing health statuses, incomes, ages and current expenditures; the impact of differing degrees of risk-adjustment for MSA contributions; and the impact of MSA funding over multiple years, incorporating year-to-year variation in spending at the individual level. In addition, it analyses designs for publicly funded MSAs than existing studies. Government uses information available from period t-1 to allocate its budget for year t between MSA contributions and catastrophic insurance in a manner that is actuarially fair 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 current health care expenditures. The impacts on public expenditures under these designs are more modest than existing studies and under plausible assumptions MSAs are predicted to decrease public expenditures. MSAs, however, are predicted to have unavoidable negative distributional consequences with respect to both public expenditures and out-of-pocket spending.

I. 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, though 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 regulations of MSAs in an effort to expand their use within its pluralistic system of private finance; beginning in 2007 it includes an MSA option within its public Medicare program. In South Africa MSAs grew rapidly following de-regulation 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) . And advocates press for MSAs within universal systems of public finance and social systems of finance. In Canada, for instance, a number of individuals and organizations have advocated for publicly financed MSAs to replace its current system of public finance for physician and hospital services (Owens and Holle 2000;Manzankowski 2001;Skinner 2002;Gratzer 2002;Ramsey and Esmail 2004), and advocates have 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 MSA accounts (taxes, employers, individuals), the source of the catastrophic insurance (public, private), the extent of cost-sharing required by the catastrophic insurance, regulations regarding 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 attempt to 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 plans designed to give consumers incentive to make "financially responsible" choices when considering alternative costly health care services (Buntin et. al. 2006).

MSAs remain highly controversial. Advocates argue that, compared to 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;Hurley 2000;Hsiao 2001;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 U.S. Singapore's MSA system has undergone more scrutiny than any other (Massaro and Wong 1995;Hsiao 1995;Nichols et. al. 1997;Hsiao 2001;e.g., 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 now matured sufficiently that an increasing number of studies are available (Liu et. al. 1999;Yu and Gong 2001;Meng et. al. 2004), but generalizability to the health systems of developed-countries is a problem. Two pilot projects in the US during the 1990s (one targeted at the self-employed and one at 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 current US policy, and although their uptake has been growing rapidly since 2004, at this early stage there is little evidence regarding the effects of HSA financing (Government Accountability Office 2006). Hence, the MSA literature from the U.S. consists mainly 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, 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 quite different pattern of effects than 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[a]. Individuals continue to pay taxes to support health care as they currently do. But rather than allocate public funds to providers and programs of care, the government distributes 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. 2002a;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.[b] 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* is expected to increase public expenditures; the government failed to capture any 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 system.[c]

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. It contributes to our understanding of the potential effects of publicly financed MSAs in two

important ways. First, it 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. These data allow us to examine a number of questions in greater detail than have previous analyses, particularly distributional impacts of different designs for publicly funded MSAs across individuals of differing health statuses, incomes, ages and current expenditures. Second, we simulate a more plausible design for publicly funded MSAs in which the government uses information available from period t-1 to allocate its budget for year t in a manner that is actuarially fair 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. We examine deductibles that vary by income rather than current health care expenditures. The designs are therefore more favourable for MSAs than existing analyses in the sense that, other things equal, they are less likely to increase expenditures over the current system of funding and they are less likely to generate undesirable distributional consequences.

The comparison of a variety of publicly funded MSA plans against the current system of public financing and funding in Canada finds 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 that carry a risk of out-of-pocket spending with annual deductibles of $500 or $1000 are predicted to reduce public expenditures by 5-12% depending on the utilization response assumed; (3) the MSA plans in general redistribute public funds toward those in excellent health, those with high income, low-users of care, and the young. The income-based deductibles and better risk adjustment of MSA contributions can ameliorate some of these distributional patterns, especially rich vs. poor, but cannot remove some of the undesirable distributional consequences.

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.

II. Data and Variables

The primary data source was the 1996/97 Ontario component of Canada's National Population Health Survey (NPHS). The NPHS was designed to be representative of Canada's non-institutionalized population aged 12 and over (Statistics Canada 1998). The 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 (i.e., single, couple with children < age 25, etc.). For each individual in the Ontario component of the 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. 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). The 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 refers to the year prior to the interview. Utilization data were linked for four years surrounding the interview period: 1995, 1996, 1997, and 1998.

Using these data, supplemented with additional data as described below, we constructed the following variables required by the simulation exercise.

II.1 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 includes a count of the number of visits to a capitation-funded physician, but does 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.

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 (CMG). 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).[d] The average cost of treating a patient in a given CMG is simply the product of the CMG's resource-intensity weight 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).[e] Hospitalizations in all years were calibrated to the 1998 average cost information.[f]

II.2 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. The 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.[g] This household income was then adjusted using the OECD equivalence scale[h] to obtain a measure of adjusted household income.

II.3 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 311individuals who had income, marital status or other data required. This left an analysis sample of 21,032.

Table 1 presents descriptive statistics on the sample. The average age was 44 years old; 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. Annual health care expenditures on physician and hospital services ranged from $800 to $1000 over the period.

III. Design of the Publicly Funded MSA Plan

III.1 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 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).

We discuss our specific assumptions in detail below, but a few over-arching aspects of design should be noted.

1. All MSA plans focus on physician and hospital services only. 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). But in the absence of good data, selection assumptions under voluntary enrolment would be largely arbitrary. Compared to 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 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 actuarially 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 logical 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 deducible to vary between $500 and $2000 across simulations.[i] 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 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.

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. For plans that increase public expenditures we determine the rate of claw back required to make some MSA plans fiscally neutral for the public sector compared 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. Individual's 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, so a person could be a responder one year but a non-responder the next.

We based the assumed rates of response on the results of the Rand 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 1993, Table 3.2, 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 provide a logical baseline; we performed sensitivity analyses assuming rates one-half of this and twice this level. We also ran simulations in which the utilization response varied by income, with the rate of reduction for high-income individuals (top two quintiles) assumed to be only one-half as large as for individuals in the bottom two quintiles.

Table 2 summarizes our design and behavioural assumptions.

III.2 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.

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 rate of reduction in utilization under MSAs, and d be the deductible. Then

      if $x_{i,t-1}(1-r) < d$, individual i is a responder in t-1: $z_{i,t-1} = x_{i,t-1}(1-r)$
      if $x_{i,t-1}(1-r) > d$, individual i is a non-responder in t-1: $z_{i,t-1} = x_{i,t-1}$.

   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 equals the catastrophic payments in year t-1.

$$CATPRED_t = \sum_i (z_{i,t-1} - d)*e_{i,t-1}, \text{ where } e_{i,t-1} = 1 \text{ if } z_{i,t-1} > d \text{ and 0 otherwise.}$$

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

$$MSA_t = GB_t - CATPRED_t$$

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, . . . 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,

$$S_{k,t-1} = [\sum_{i \text{ in } k} (z_{i,t-1})]/[\sum_i (z_{i,t-1})]$$

For each individual in k, the MSA contribution in year t is simply:

$$msa_{k,t} = (S_{k,t-1})(MSA_t)/N_k,$$

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:

if $x_{i,t}(1-r) < d$, individual i is a responder in year t: $z_{i,t} = x_{i,t}(1-r)$
if $x_{i,t}(1-r) > d$, individual i is a non-responder in year t: $z_{i,t} = x_{i,t}$

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:

$$msaavail_{i,t} = msabal_{i,t-1} + msa_{i,t}$$

$$msaspend_{i,t} = z_{i,t} \quad \text{if } z_{i,t} \le msaavail_{i,t}$$

$$msaspend_{i,t} = msaavail_{i,t} \quad \text{if } z_{i,t} > msaavail_{i,t}$$

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.

$$oops_{i,t} = 0 \quad \text{if } z_{i,t} \leq msaavail_{i,t}$$
$$oops_{i,t} = z_{i,t} - msaavail_{i,t} \quad \text{if } msaavail_{i,t} < z_{i,t} \leq d$$
$$oops_{i,t} = d - msaavail_{i,t} \quad \text{if } z_{i,t} > d$$

c. Catastrophic payments: The government funds catastrophic expenditures above the deductible.

$$cat_{i,t} = 0 \quad \text{if } z_{i,t} \leq d$$
$$cat_{i,t} = (z_{i,t} - d) \quad \text{if } z_{i,t} > d$$

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

   a. $msabal_{i,t} = (msabal_{i,t-1} + msa_{i,t}) - msaspend_{i,t}$

   b. $pubspend_{i,t} = msa_{i,t} + cat_{i,t}$

8. *Aggregate outcomes across individual 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 t-1 values 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.

The simulations are intended to provide "first-order" estimates of the effects of MSA funding on these outcomes. The simulations do not explicitly incorporate a range of possible second-order effects (e.g., price changes induced by competition) that may accompany publicly funded MSAs. For a number of such possible factors, however, the potential impact on the level of the outcomes of interest can implicitly be incorporated by adjusting the assumed response.[j] For example, competition that lowers physician fees can be reflected through larger assumed utilization response; similarly, if one believes that either supplier-induced demand or pent-up

unmet need will reduce observed utilization changes, this can be reflected through smaller assumed utilization responses. We return to this point below in the discussion.

IV. Results

All analyses have been weighted by the survey population weights and therefore represent estimates for the 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:. We begin with an examination of the mean levels of public expenditures, health care utilization, MSA contributions, catastrophic spending, out-of-pocket spending and MSA accumulations under alternative MSA plans and the current system of financing and funding (status quo). 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. Due to space constraints, the discussion compares individuals in the highest and lowest categories for each of these (e.g., excellent health vs. poor health; richest quintile vs. poorest quintile).

IV.1 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 3). Under the default utilization response (40% decrease for physician services and 23% decrease for hospital services), health care utilization falls an average of 3.2% among both responders and non-responders (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 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, the claw back mutes utilization responses, the claw-back rate would have to be higher to make the plan fiscally neutral.

The base case we consider among plans with a positive corridor (and therefore positive out-of-pocket spending) includes a $500 fixed deductible identical across individuals. Under the default utilization response and age-sex-health status risk adjustment, this plan is predicted to reduce health care utilization by 7.5% and public expenditure by 7.9% (Table 3). Public expenditure falls by more than utilization because patients now pay out-of-pocket for some of their care (on average, $191), though this effect is partially offset by the fact that many individuals do not spend all of their public MSA contribution. On average, individuals accumulate $178 in their MSAs.

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 3). The net effect on public spending of increasing the deductible reflects three tendencies: increasing the deductible causes overall health care spending and catastrophic spending to fall; the decrease in health care utilization causes the government budget to fall over time; but the decrease in catastrophic spending frees up a larger share of the budget to be allocated to MSAs. As the deductible increases, on net, we observe decreasing health care utilization, decreasing total government spending, decreasing catastrophic spending but increasing average public MSA contributions and increasing out-of-pocket expenditures. The increased MSA contributions generate a larger average MSA accumulation at the same time that average out-of-pocket spending rises. 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 (1.7%) 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 to 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 health care utilization ($2629 vs. $2603) because more low-income individuals are non-responders, exactly the same level of out-of-pocket spending ($191), but lower average MSA accumulations (due to higher catastrophic spending and lower MSA contributions on average). Comparing the two income-based deductibles, health care utilization is roughly equal ($2629 vs. 2622), but public spending is higher in the hybrid plan. Indeed, public spending 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 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).

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. 2002b;Deber et. al. 2004) has suggested; furthermore, under plausible assumptions a number of publicly funded MSA plans are predicted to modestly reduce public expenditure. The reduction comes as the price of increased cost-sharing. The levels of cost-

sharing are not trivial in the Canadian context under consideration. 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).

IV.2 The Distributional Impacts of Publicly Funded MSAs

Table 4 provides insight into the distributional effects of the MSAs plans by health status, income, pre-MSA spending and age. Except for one or two cases (e.g., income distribution under $500 fixed deductible), there is a consistent pattern for the free plan and the fixed deductible plans whereby, compared to the current arrangements (status quo), the MSA plans redistribute funds such that the gains (losses) to those in excellent health, with high-income, high pre-MSA spending and the elderly exceed (are less than) those for individuals in poor health, low-income, low pre-MSA spending, and the young (Table 4). Compared to 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 $80 less while those with low-income receive $99 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 4). 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 to the status quo, both income-based plans reduce public expenditures for those in the top income quintile and increase public expenditures on those in the lowest income quintile. A constant-proportion deductible equal to 1.7% of income, however, reduces public spending equally for those in excellent and poor health status, reduces public

expenditures for high users by almost twice as much as low users (-$596 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 toward those in excellent health compared to those in poor health, and again from high-spenders to low-spenders and from elderly to young.

The burden of out-of-pocket spending under plan with a fixed $500 deductible is 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, the disparity is not surprisingly 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 -- now out-of-pocket payments for those with high income exceed those of individuals with low income – but the pattern remains with respect to health status, pre-MSA spending, and age.

The pattern of MSA accumulations is more complicated. For both the free plan and all the fixed deductible plans, on average those in poor health accumulate more MSA funds than do 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 pattern of accumulations differs, however, for the plans with income-dependent deductibles: although low-income individuals continue to accumulate more than high-income individuals and low-users continue to accumulate more than high-users, now those in excellent health accumulate more than those in poor health and the young accumulate more than the elderly.

The figures in Table 4, which are mean values within each category, 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), so the majority of such individual incur none or very small out-of-pocket expenses while a small number of individual incur large expenditures. 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 (though it is less-pronounced) and for the young and elderly (where it is 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 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 leaves the disparity between those who accumulate zero intact, but ameliorates the disparity for high accumulators (i.e., the proportions that accumulate over 75% of the MSA contribution are more equal across health statuses, spending levels and age).

The patterns of accumulation also provide insight into persistence in utilization. Overall, under the $500 fixed deductible plan 33% of individuals spend all of their MSA contributions over the three years (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% such individual 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 very real sense, their feasible choice has shrunk under MSAs: they now have fewer personal funds available to purchase non-covered services.

IV.3 Risk-Adjustment

In a mandatory plan such as we consider, risk-adjustment is needed primarily for reasons of equity; voluntary enrolment would raise a host of additional selection, efficiency and expenditure concerns as those who find it most attractive 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 has only distributional implications. Table 4 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 both lowers average out-of-pocket spending overall and lowers it particularly 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.

V. 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 some 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 the MSA plan fiscally neutral for the public sector required deductibles as high as $8000 for the elderly. In contrast, while 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 from our assumptions that government can capture the financial savings associated with reduced utilization and that government budgets in an *ex ante* fiscally neutral way.

Our results reinforce and expand our understanding of the distributional impacts of MSAs. Compared to the existing method of public funding, MSAs generate a number of undesirable distributional impacts across those of differing health statuses, incomes, utilization, and age, 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.

Our baseline assumptions are generally favourable toward 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 Health insurance experiment and that in doing so they treat MSA dollars and personal funds as equivalent; 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 optimistic regarding MSAs. There are good reasons, for example, for believing that utilization (and the associated expenditure) reductions under MSAs will be less than we have assumed, including possible counteracting 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, and so forth. Our simulations 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. 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. As noted earlier, the Government of South Africa has restricted use of MSA in part because of high administrative costs (Department of Health 2002).

Simulating MSAs under generally favourable assumptions, however, helps focus attention on fundamental, unavoidable features of publicly funded MSAs. Foremost among these are the distributional effects of MSAs. MSAs that include meaningful cost-sharing, as their underlying rationale calls for, will quite dramatically 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.

The ultimate assessment of MSAs depends on the objectives against which they are judged. 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. MSAs are attractive primarily 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.

Finally, while simulation-based evidence can play an important role in establishing certain impacts associated with MSAs, in the end it must remain silent on some of the most fundamental issues that divide proponents and opponents of MSAs. Simulations can identify, for instance, the consequences for expenditures of differing assumptions regarding utilization reductions, but they can say nothing about whether those reductions are welfare-improving or welfare-decreasing. That interpretation will always depend largely on the views of the reader: if one believes that a major problem of modern health care systems is over-insurance, that consumers have sufficient information to make good decisions, and that willingness-to-pay is the appropriate ethical basis for valuation, then imputed utilization reductions are *de facto* welfare-improving. In contrast, if one believes that informational asymmetries are sufficiently important as to lead to poor choices by individuals and/or that willingness-to-pay is not the appropriate basis for normative assessments in the health sector, utilization reductions induced by cost-sharing (or the desire to accumulate MSA balances) are welfare-decreasing. Similarly, simulations themselves will never be able to bridge the differing beliefs in the efficacy of demand-side, consumer-based competition in health care. Those who believe in the efficacy of such competition will argue that our simulations have understated the benefits of MSAs by ignoring such effects; those who believe that such competition will lead to higher prices and less efficiency will argue that our simulations have over-stated the potential benefits of MSAs by ignoring these deleterious consequences. Simulations, however, can help define better the context for debating these deeper issues as they bear on MSAs.

VI. References

Allen Consulting Group. 2004. *Medical Savings Accounts: A Discussion Paper*. Allen Consulting Group: Report to Medicines Australia.

American Academy of Actuaries. 1995. *Medical Savings Accounts: Cost Implications and Design Issues*. Washington, D.C.: American Academy of Actuaries.

Australian Medical Association. 2005. *A Submission to the House of Representatives Standing Committee on Health and Aging Inquiry into Health Funding*. Canberra: Australian Medical Association.

Barr, M. D. 2001. "Medical savings accounts in Singapore: a critical inquiry." *J.Health Polit.Policy Law*. Vol. 26(4): 709-726.

Buntin, M. B., C. Damberg, A. Haviland, et al. 2005. *"Consumer-Directed" Health Plans: Implications for Health Care Quality and Cost*. Santa Monica, CA: RAND Corp and California Health Care Foundation.

Buntin, MB, C. Damberg, A. Haviland, K. Kapur, N. Lurie, R. McDevitt, and S. Marquis. 2006. "Consumer-Directed Health Care: Early Evidence about Effects on Cost and Quality." *Health Affairs*. Vol. 25(October 24): W516-W530.

Cardon, J. and M. Showalter. 2006. "Insurance Choice and Tax-preferred Health Savings Accounts." *Journal of Health Economics*. Vol. **26**(2): 373-399.

Cogan, J. F., R. G. Hubbard, and D. P. Kessler. 2005. "Making markets work: five steps to a better health care system." *Health Aff (Millwood.)*. Vol. 24(6): 1447-1457.

Deber, R. B., E. L. Forget, and L. L. Roos. 2004. "Medical savings accounts in a universal system: wishful thinking meets evidence." *Health Policy*. Vol. 70(1): 49-66.

Department of Health. 2002. *Inquiry into the various social security aspects of the South African health system*. Pretoria: Department of Health.

Dong, W. 2006. "Can health care financing policy be emulated? The Singaporean medical savings accounts model and its Shanghai replica." *J Public Health (Oxf)*. Vol. 28(3): 209-214.

Feldstein, Martin. 2006. *Balancing the Goals of Health Care Provision*. National Bureau of Economic Research, NBER Working Paper 12279.

Forget, E, R. Deber, and L. Roos. 2002a. "Medical Savings Accounts: Will They Reduce Costs?" *Canadian Medical Association Journal*. Vol. 167(2): 143-147.

Forget, E. L., R. Deber, and L. L. Roos. 23-7-2002b. "Medical Savings Accounts: will they reduce costs?" *CMAJ.* Vol. 167(2): 143-147.

General Accounting Office. 1998. *Medical Savings Accounts: Results from Surveys of Insurers*. Washington, D.C.: U.S.General Accounting Office, Report GAO/HEHS-99-34.

Government Accountability Office. 2006. *Consumer-Directed Health Plans -Early Enrollee Experiences with Health Savings Accounts and Eligible Health Plans.* Washington, DC: United States Government Accountability Office, Report GAO-06-798.

Gratzer, D. 23-7-2002. "It's time to consider Medical Savings Accounts." *CMAJ.* Vol. 167(2): 151-152.

Gruber, J. 2006. *The Cost and Coverage Impact of the President's Health Insurance Budget Proposals*. Center on Budget and Policy Priorities.

Hanvoravongchai, P. 2002. *Medical Savings Accounts: Lesson Learned from International Experience*. Geneva: World Health Organization, EIP Discussion Paper No 52.

Hsiao, W. C. 1995. "Medical savings accounts: lessons from Singapore." *Health Aff.(Millwood.)*. Vol. 14(2): 260-266.

Hsiao, W. C. 2001. "Behind the ideology and theory: what is the empirical evidence for medical savings accounts?" *J.Health Polit.Policy Law*. Vol. 26(4): 733-737.

Hurley, J. 2002. "Medical Savings Accounts will not Advance Canadian Health Care Objectives." *Canadian Medical Association Journal*. Vol. 167(2): 152-153.

Hurley, J. and E. Guindon. 2007. "Medical Savings Accounts: Promises and Pitfalls." In, M. Lu, Ed., *Paying for Health Care: Options for a Changing Society*. Wiley.

Hurley, J., B. Hutchison, G. Buckely, and C. Woodward 2004. *Developing Needs-based Funding Formulae Using Individual-level Linked Survey and Utilization Data: An Application to Home Care Services in Ontario*. Hamilton, ON: McMaster University Centre for Health Economics and Policy Analysis Working Paper 04-03.

Hurley, Jeremiah. 2000. "Medical savings accounts: approach with caution." *J.Health Serv.Res.Policy*. Vol. 5(3): 130-132.

Joint Policy and Planning Committee. 2000. *Methodology Used to Calculate Adjustment Factors Model and Small Hospital Funding Model*. Toronto, ON: Ontario Ministry of Health and Long-term Care and Ontario Hospital Association, Reference Document RD#9-7.

Kendix, M. and J. D. Lubitz. 1999. "The impact of medical savings accounts on Medicare program costs." *Inquiry*. Vol. 36(3): 280-290.

Liu, Y., W. C. Hsiao, and K. Eggleston. 1999. "Equity in health and health care: the Chinese experience." *Soc.Sci.Med.* Vol. 49(10): 1349-1356.

Manzankowski, D. 2001. *A Framework for Reform*. Edmonton: Government of Alberta.

Massaro, T. A. and Y. N. Wong. 1995. "Positive experience with medical savings accounts in Singapore." *Health Aff.(Millwood.)*. Vol. 14(2): 267-272.

Maynard, Alan and Anna Dixon. 2002. "Private health insurance and medical savings accounts: theory and experience." In, Elias Mossialos, Anna Dixon, Josep Figueras and

others, Eds., *Funding Health Care: Options for Europe*. Buckingham: Open University Press.

Meng, Q., C. Rehnberg, N. Zhuang, Y. Bian, G. Tomson, and S. Tang. 2004. "The impact of urban health insurance reform on hospital charges: a case study from two cities in China." *Health Policy*. Vol. 68(2): 197-209.

Newhouse, J. and the Health Insurance Experiment Group 1993. *Free for All? Lessons from the RAND Health Insurance Experiment*. Cambridge, MA: Harvard University Press.

Nichols, L., PK. Hong, and N. Prescott. 1997. *Medical Savings Accounts for Developing Countries*. Washington, DC: The World Bank.

Nichols, L., M. Moon, and S. Wall. 1996. *Tax-Preferred Medical Savings Accounts and Catastrophic Health Insurance Plans: A Numerical Analysis of Winners and Losers*. Washington, D.C.: Urban Institute, Working Paper 06571-002.

Owens, D. and P. Holle. 2000. *Universal Medical Savings Accounts: Consumerizing Medicare to End Waiting Lists and Improve Service*. Frontier Centre for Public Policy.

Ozanne, L. 1996. "How will medical savings accounts affect medical spending?" *Inquiry*. Vol. 33(3): 225-236.

Parente, S. T., R. Feldman, and J. B. Christianson. 2004. "Evaluation of the effect of a consumer-driven health plan on medical care expenditures and utilization." *Health Serv.Res.* Vol. 39(4 Pt 2): 1189-1210.

Pauly, M. V. and J. C. Goodman. 1995. "Tax credits for health insurance and medical savings accounts." *Health Aff (Millwood.)*. Vol. 14(1): 126-139.

Physician Payment Review Commission. 2006. "Medical Savings Accounts."*Annual Report to Congress*. Washington, D.C.: Physician Payment Review Commission., 113-133.

Ramsey, C 1998. *Medical Savings Accounts*. Vancouver: Fraser Institute.

Ramsey, C. and N. Esmail. 2004. *The Alberta health care advantage: an accessible, high quality, and sustainable system*. Vancouver: Fraser Institute. 81.

Reisman, David. 2006. "Payment for Health in Singapore." *International Journal of Social Economics*. Vol. 33(1-2): 132-159.

Schreyogg, Jonas and M. K. Lim. 2004. "Health Care Reforms in Singapore—Twenty Years of Medical Savings Accounts." *Dice-Report-Journal for Institutional Comparisons*. Vol. 2(3): 55-60.

Skinner, B. J. 2002. *Improving Canadian Health Care: Better Ways To Finance Medicare*. Halifax, Nova Scotia: Atlantic Institute for Market Studies, Background Paper #12.

Smith, P., N. Rice, and R. A. Carr-Hill. 2001. "Capitation Funding in the Public Sector." *Journal of the Royal Statistical Society*. Vol.

Spreemann, B. 2004. ""The 'Personal Health Account' - A New Financing Model for Covering Health Expenses in Germany." *Gesundheitsokonomie und Qualittatsmanagement*. Vol. 9(1): 49-53.

Statistics Canada 1998. *National Population Health Survey 1996-97*. Ottawa: Statistics Canada.

World Bank. 2005. "Rural Health Insurance–Rising to the Challenge." *Rural Health in China: Briefing Notes Series*. Vol.

World Health Organization. 2004. *Implementing the New Cooperative Medical Schemes in rapidly changing China -Issues and Options*. Beijing: Office of the World Health Organization Representative in China.

Yu, H. and Y. Gong. 2001. "Lessons from a Health Insurance Experiment in China." *Abstr.Acad.Health Serv.Res.Health Policy Meet.* Vol. 1890.

Zabinski, D., T. M. Selden, J. F. Moeller, and J. S. Banthin. 1999. "Medical savings accounts: microsimulation results from a model with adverse selection." *J.Health Econ.* Vol. 18(2): 195-218.

Zaric, G. S. and J. Hoch. 2006. "Medical Savings Accounts: Opportunities for Cost Savings?" *International Transactions in Operational Research*. Vol. 13(6): 493-513.

Table 1: Population-weighted Descriptive Statistics for the Sample

Variable	Mean	Stand Dev	Minimum	Maximum
Age	44.1	16.81	18	102
Female	0.52	0.50	0	1
Adjusted Household Income	29,013	15,456	0	95,000
Self-Assessed Health Status				
Excellent	0.25		0	1
Very Good	0.39		0	1
Good	0.25		0	1
Fair	0.09		0	1
Poor	0.03		0	1
Physician and Hospital Spending				
1995	802	2397	0	128,075
1996	837	2284	0	80318
1997	1001	3374	0	203166
1998	976	2977	0	118090

Table 2: Key Simulation Assumptions

MSA Plan Design	
Design Feature	**Assumptions**
Services funded	• Physician and hospital services in all simulations
Enrolment	• Mandatory in all simulations
Government Budget	• The total government health care budget in year t is equal to the spending on covered health care services in year t-1. • The government budget is allocated to two purposes: (1) public MSA contributions; and (2) catastrophic insurance expenditures.
Deductible	We consider three basic deductible designs, with variations on each: • Everyone faces the same deductible (e.g., $500) • The deductible is an increasing function of adjusted household income (e.g., 2% of household income) • For the free plan, a person's deductible simple equals their MSA contribution
MSA Contribution	• The default assumption is that government contributions to individual MSAs are risk-adjusted according to a person's age, sex, and health status • We examine the impact of varying degrees of risk adjustment
Catastrophic Coverage	• The government provides full coverage above the deductible, i.e., there is no cost-sharing above the deductible
Corridor (out of-pocket liability)	• Corridor equals 0 for free plan • Corridor depends on risk category and/or income in other plans
Government Claw back	• The default assumption is no government claw back • Where appropriate we examine the claw back rate necessary to make some plans fiscally neutral compared to the status quo.
Behavioral Assumptions	
Utilization Response	There are two parts to this: who responds; how much they respond. • 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 • 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. o Insensitivity analysis we allow this to equal to one-half and twice this base assumption. o We also examine variations in which response depends on income, with high-income individuals reducing utilization by only half as much as others.

Table 3: Impact of Alternative MSA Deductibles

	Status Quo	MSA Plans											
		Free Plan		Alternative Deductibles									
			%Diff	$500	% Diff	$1,000	% Diff	$1,500	% Diff	1.7% of HH Income	% Diff	IQ1: Free IQ2,3,4,5: $500 deductible	% Diff
Mean Value of HC Utilization	2814	2725	-3.2%	2603	-7.5%	2495	-11.3%	2430	-13.6%	2629	-6.6%	2622	-6.8%
Mean Public Expenditure	2814	2931	4.2%	2591	-7.9%	2476	-12.0%	2406	-14.5%	2591	-7.9%	2750	-2.3%
Mean MSA Contribution		622		622		857		1013		538		780	
Mean Catastophic Expenditure		2309		1969		1619		1393		2052		1970	
Mean Out-of-Pocket Spending		0		191		318		414		191		151	
Mean MSA Accumulation		206		178		299		390		152		278	

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. IQ1 = income quintile 1; IQ2,3,4,5 equal income quintiles 2, 3, 4 and 5

Table 4: Distributional Impacts of Publicly Funded MSAs

	Status Quo	MSA Plans									
		Free	Alternative Deductibles						Impact of Risk Adjustment*		
			$500	$1,000	$1,500	$2,000	1.7% of HH Income	IQ1,2: Free IQ3,4,5: $500 deductible	None	Age-Sex_HS	% diff
Public Expenditure	**2814**	**2931**	**2591**	**2476**	**2406**	**2347**	**2590**	**2750**	**2591**	**2591**	**0.0%**
SAHS:											
Excellent	1679	1795	1487	1424	1366	1325	1470	1605	1622	1487	-8.3%
Poor	9601	9691	9406	9158	9046	8919	9398	9601	8910	9406	5.6%
Income											
Highest Quintile	2136	2056	1897	1800	1736	1691	1636	1909	1973	1897	-3.9%
Lowest Quintile	3676	3577	3465	3334	3252	3179	3718	4272	3382	3465	2.5%
Pre-MSA Utilization											
Highest Quintile	10976	10992	10401	9681	9028	8423	10410	10566	622	469	-24.6%
Lowest Quintile	141	476	469	615	710	778	437	643	10216	10401	1.8%
Age											
< 25	1295	1398	1115	1067	1037	1004	1139	1387	1299	1115	-14.2%
> 65	6303	6395	6063	5802	5654	5666	6051	6185	5722	6063	6.0%
Out-of-Pocket Spending	**0**	**0**	**191**	**318**	**414**	**493**	**191**	**151**	**226**	**197**	**-12.8%**
SAHS											
Excellent	0	0	172	266	335	390	182	148	136	172	26.5%
Poor	0	0	171	396	611	810	170	75	560	171	-69.5%
Income											
Highest Quintile	0	0	190	299	376	438	367	184	183	190	3.8%
Lowest Quintile	0	0	189	399	458	562	15	0	274	189	-31.0%
Pre-MSA Utilization											
Highest Quintile	0	0	464	1029	1538	1988	469	350	633	464	-26.7%
Lowest Quintile	0	0	0	0	0	0	0	0	0	0	0.0%
Age											
< 25	0	0	150	227	285	332	126	103	113	150	32.7%
> 65	0	0	216	431	616	778	199	155	427	216	-49.4%

Table 4: Distributional Impacts of Publicly Funded MSAs (cont'd)

	Status Quo	MSA Plans									
		Free	Alternative Deductibles							Impact of Risk Adjustment*	
			$500	$1,000	$1,500	$2,000	1.7% of HH Income	IQ1,2: Free IQ3,4,5: $500 deductible	None	Age-Sex_HS	% diff
MSA Accumulation		**206**	**178**	**299**	**390**	**463**	**152**	**278**	**197**	**178**	**-9.6%**
SAHS											
Excellent	-	187	161	249	315	368	157	256	271	161	-40.6%
Poor	-	217	191	440	659	856	65	254	65	191	193.8%
Income											
Highest Quintile	-	189	162	261	333	390	153	169	232	162	-30.2%
Lowest Quintile	-	216	189	333	445	537	121	701	191	189	-1.0%
Pre-MSA Utilization											
Highest Quintile	-	386	385	83	120	153	32	78	27	43	59.3%
Lowest Quintile	-	76	43	531	626	694	353	554	538	385	-28.4%
Age											
< 25	-	174	152	231	290	334	116	353	298	152	-49.0%
> 65	-	218	183	359	504	628	122	248	87	183	110.3%

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 adjusted MSA contributions except where noted; utilization reductions (among responders) of 40% for physician services and 23% for hospital services.

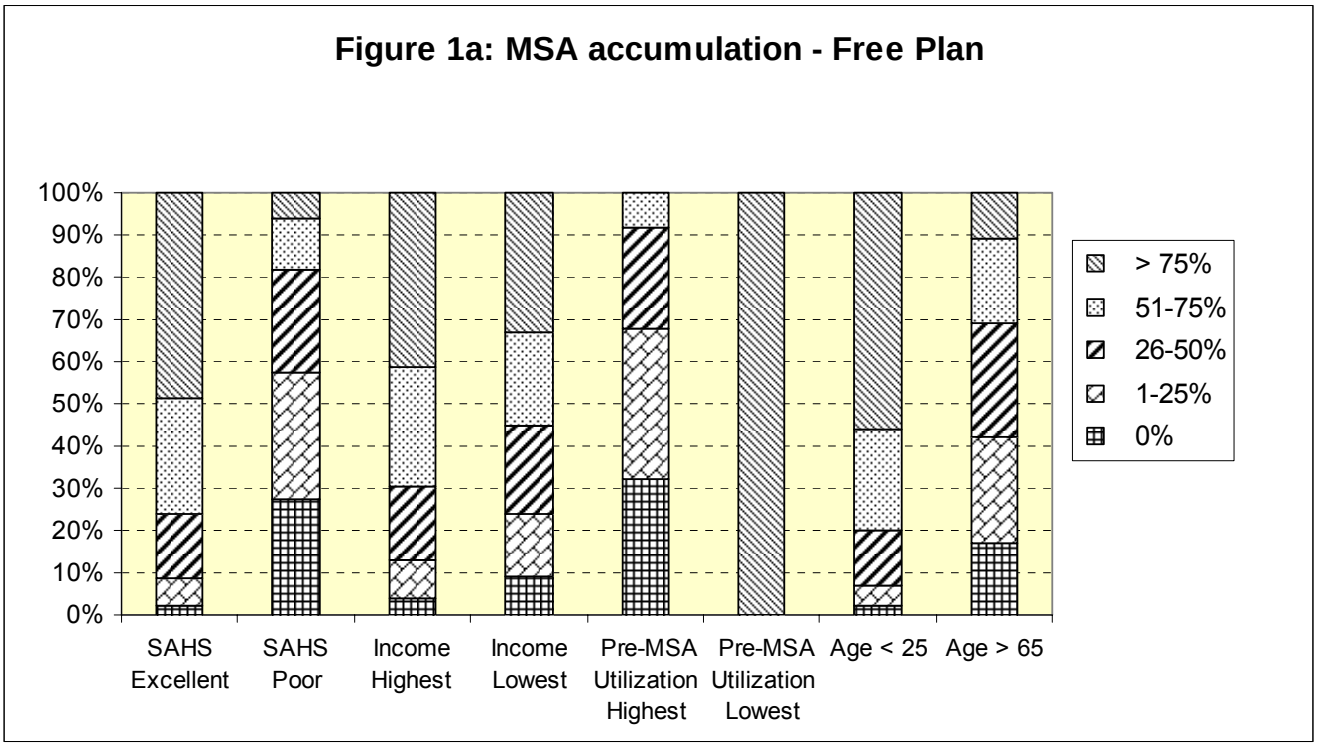
* Both the risk-adjusted and non-risk-adjusted plans assume a $500 fixed deductible and the default utilization responses noted above

Table 5: The Distribution of Out-of-Pocket Spending by Health Status, Income, Pre-MSA Spending and Age

		Out-of-Pocket Spending							
	Overall	SAHS		Income		Pre-MSA Utilization		Age	
		Excellent	Poor	Highest	Lowest	Highest	Lowest	< 25	> 65
$500 Fixed Deductible									
Mean	178	172	171	190	189	464	0	150	216
25th	0	0	0	0	0	284	0	0	0
50th	62	16	151	53	85	449	0	0	173
75th	334	294	265	317	330	639	0	243	376
99th	937	953	644	979	888	1132	12	947	752
Deductible 1.7% of Income									
Mean	191	182	170	367	15	469	0	126	199
25th	0	0	0	0	0	18	0	0	0
50th	5	1	7	76	0	318	0	0	25
75th	256	251	232	628	0	717	0	157	261
99th	1530	1450	1439	2072	248	2118	13	1004	1780

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 adjusted MSA contributions except where noted; utilization reductions (among responders) of 40% for physician services and 23% for hospital services.

Figure 1: Proportion of Public MSA Contributions Accumulated by Health Status, Income, Pre-MSA Spending and Age



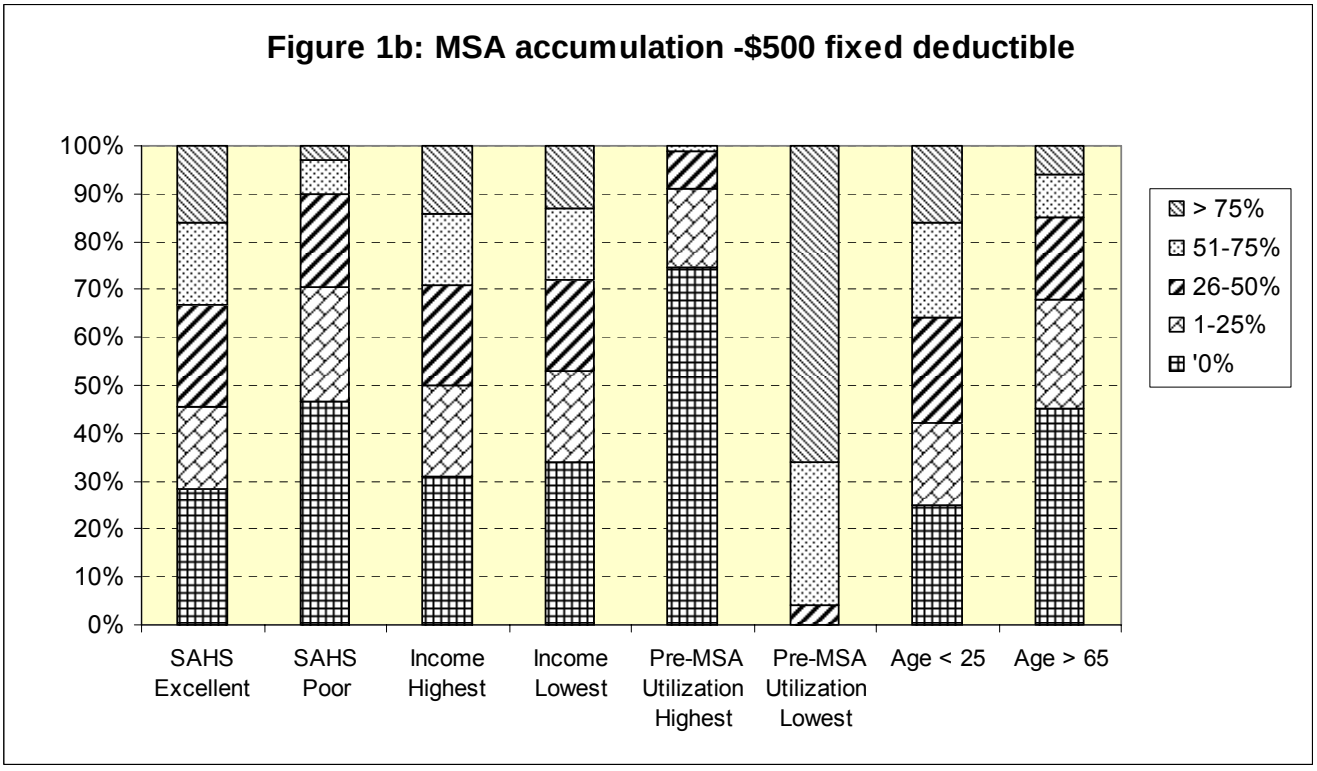
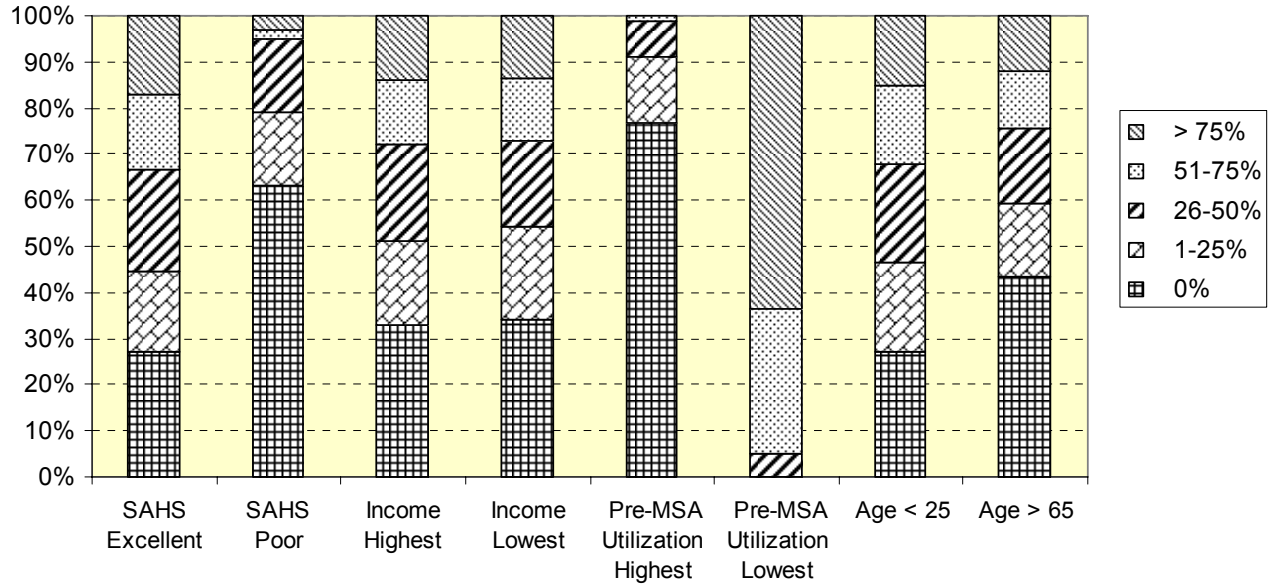


Figure 1c: MSA accumulation -1.7% of HH income



Endnotes

[a] 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).

[b] 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.

[c] Ironically, the plans examined were based largely on proposals put forth by advocates of publicly funded MSAs in Canada.

[d] RIWs depend on case-mix group (CMG), complexity, age group and typical versus 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)

[e] 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 the provide the mean-cost-per-weighted case in our calculations.

[f] 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 the 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.

[g] 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 and so we used the much simpler approach.

[h] First adult 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.

[i] For comparison, Health Savings Accounts 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 US (especially compared to 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 below.

[j] Note that this cannot identify distributional impacts given that such price effects or inducement effects are likely to be unevenly distributed in the population.