Synopsis of Healthcare Financing Studies

Medical Savings Accounts

Introduction

Medical savings accounts (MSA) are personalized accounts into which individuals regularly contribute a proportion of their income in order to save for future medical expenses. Savings in the account can be withdrawn to cover healthcare expenditures in due course, thus serving as a vehicle to spread the financial risk of poor health over the working period. The medical savings scheme alone is similar to any savings scheme in that there is no pooling of risk with other account holders. It may however be strengthened by the inclusion of medical insurance in its design so that better protection is offered against financial risk arising from catastrophic or chronic illnesses and serious injuries. The Food and Health Bureau commissioned a project team comprising members from the Department of Community Medicine and School of Public Health, Li Ka Shing Faculty of Medicine, The University of Hong Kong and the Department of Finance, Faculty of Business Administration, The Chinese University of Hong Kong to conduct an actuarial study on this subject.

Objective and Scope of Study

2. The objective of the actuarial study was to assess the extent of protection offered to working persons by MSA for their post-retirement healthcare spending.

3. Specifically, this study examined how MSA would fare if the user fees for public healthcare services were to be increased, assuming that the scheme had the following features:

(a) Participation was compulsory for the whole working population.

(b) Working persons from age 20 to 64 had to contribute a certain percentage of their monthly income to their individual accounts, but their employers were not required to match the contributions.

(c) Similar to the present arrangement with the Mandatory Provident Fund (MPF), individuals earning less than $5,000 per month were exempted from making the contributions, whereas those with a monthly income of $20,000 or more had their contributions capped at that level.

(d) The savings could not normally be withdrawn until the account holder had reached the age of 65 (or earlier in case of disability). However, during the contribution period of age 20 to 64, a maximum of 15% of the savings could be withdrawn concomitantly to cover specific medical expenses (including private medical insurance).

(e) The savings could only be used to pay for medical services at the public sector rates. If private services were utilized, the account holders had to settle the price differences using other means.

(f) When the account holder passed away, any unspent savings left in the account would be passed on to the surviving family.

Methodology

4. The actuarial model simulated the individual medical savings accounts of a closed cohort of individuals until death in the absence of migration flow. The cohort was a snapshot of the Hong Kong population captured by the 2001 Population Census.

5. The simulation consisted of two main components, as follows:

(a) **Contribution phase** – simulated the amount of savings that were accumulated in an individual's account during the contribution period, that is, before the account holder reached age 65. The simulation took into account changes in employment income and different labour force participation rates of males and females.

(b) **Withdrawal phase** – simulated the amount of savings that were left in an individual's account during the withdrawal period, that is, after the account holder had turned 65 and started withdrawing the accumulated savings to pay for medical expenses. The simulation

took into account different healthcare utilization rates of various age groups of elderly males and females. The simulation stopped when the account holder passed away and his/her lifetime account balance was tallied.

Data Source

6. The main data sources for the study were:

(a) Hong Kong Population Census 2001 conducted by the Census and Statistics Department

(b) Employment income data from Population Census and By-census 1981 – 2001

(c) Labour force participation rates from General Household Survey conducted by the Census and Statistics Department in 2005

(d) Public health services utilization data provided by the Hospital Authority and the Department of Health in 2001/02

(e) Private health services utilization data estimated from Thematic Household Surveys conducted by the Census and Statistics Department in 2002

Contribution Phase

7. Under the simulation model, the size of the accumulated savings in an individual's account during the contribution period was determined by the following factors:

(a) *Contribution rate* – The contribution rate was assumed to be 5% of monthly income. However, simulation was also conducted at 3% contribution rate for sensitivity analysis.

(b) *Beginning age of contribution* – The duration of the contribution period for each account depended on the age of individual account holders when the simulation began. The younger the age, the longer the duration and more savings would be accumulated.

(c) *Investment return rate* – The savings attracted investment returns, which were assumed to be at a real rate of 3% per annum.

(d) *Concomitant withdrawal during contribution period* – As mentioned earlier, this particular MSA scheme was designed to allow the account holders to withdraw a maximum of 15% of the savings during the contribution year to cover specific medical expenses. The simulation thus assumed that for each dollar deposited in the account, only 85 cents would be left in the savings as 15 cents would be withdrawn immediately.

(e) *Employment and projected personal income growth* – The savings contributions would be affected by periods that account holders might be temporarily unemployed for some reasons. They would also be affected by changes in the account holders' monthly income due to general price inflation, pay adjustment and career advancement etc.

Analysis showed that men's income grew faster than that of women and that men's labour force participation rates were significantly higher than those of women. Therefore, the simulation model explicitly took into account the lifetime income and labour force participation rates of males and females of different income and education groups at different ages. An overview of the age-gender-specific personal income growth and labour force participation rates is given in Box 1.

Box 1. Age-gender Personal Income Growth and Labour Force Participation Rates

Age-gender Personal Income Growth

Personal income data obtained from the past 5 census years (1981 Census, 1986 By-census, 1991 Census, 1996 By-census, and 2001 Census) were used to compile the personal income growth rates of males and females. Figure 1 illustrates the growth rate of a dollar income of a man and a woman over the years, starting from age 20. It is shown that their personal income grew at a different rate and the man's income consistently grew faster than that of the woman.

Table 1 shows the annualized net growth of personal income of males and females of different income groups at different age. It is observed that for individuals belonging to the top 20% of income earners at age 20-24 and for the rest of their working life, the annual growth of their income would be higher than those of other income groups. The Table also illustrates the fact that males enjoyed a higher income growth rate as compared to females across all income groups during the early working years. However, the pattern seems to reverse when age passed 35-39.

Figure 1. Personal Income Growth Profile by Gender

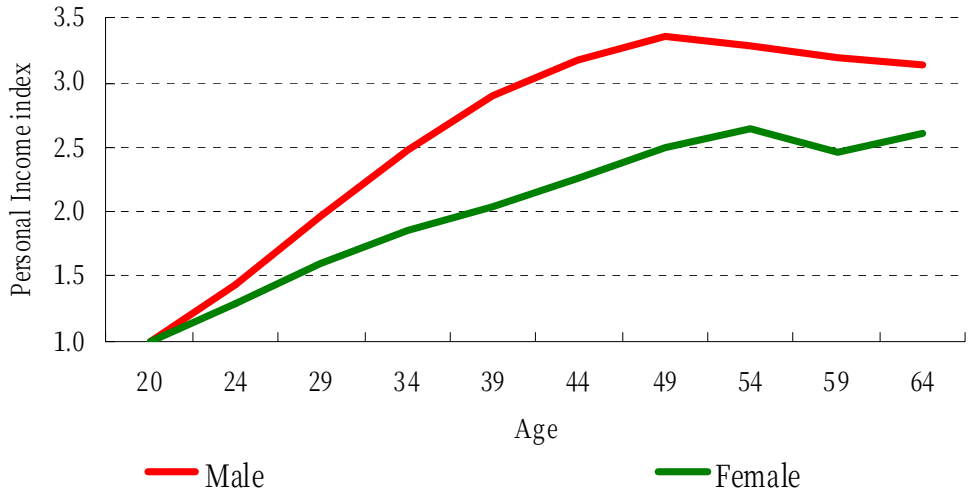


Table 1. Annualized growth of real wage in percentage from 1985 to 2005

Male									
Income group	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Lowest 30% of income earners	8.63	3.91	3.47	2.74	2.69	0.41	1.01	-0.36	-2.51
30th to 80th percentile of income earners	8.68	6.44	5.11	3.24	2.73	1.50	0.58	-0.08	-1.07
Highest 20% of income earners	12.94	11.23	8.70	5.37	3.75	3.47	0.99	0.78	3.33
Female									
Income group	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Lowest 30% of income earners	0.61	-0.60	2.57	3.87	4.53	4.22	0.52	0.97	-1.15
30th to 80th percentile of income earners	8.27	4.90	2.68	2.41	3.79	2.56	2.46	0.60	-0.26
Highest 20% of income earners	12.84	9.19	5.26	3.25	3.16	3.98	2.62	0.79	3.35

Age-gender Labour Force Participation Rates

In addition to the difference in income growth rates for men and women, their labour force participation rates were also found to be significantly different. Analysis was carried out on labour force participation data obtained from the General Household Survey in 2005. Figure 2 illustrates that men's labour force participation rates were significantly higher than those of women for all ages after 25.

Based on the different labour force participation rates, adjustment factors, which were expressed as the proportion of units of work (maximum of which was 1) engaged by an individual from the age when he/she started contribution and until age 65, were derived for males and females of different age groups and educational levels (Table 2). The lifetime contributions of the account holders were subject to the adjustment factors to take into account gender differences in labour force participation rates. The adjustment factors for females were lower than those of males, reflecting the fact that men's labour force participation rate was higher than women's.

Figure 2. Labour participation rates by gender in 2005

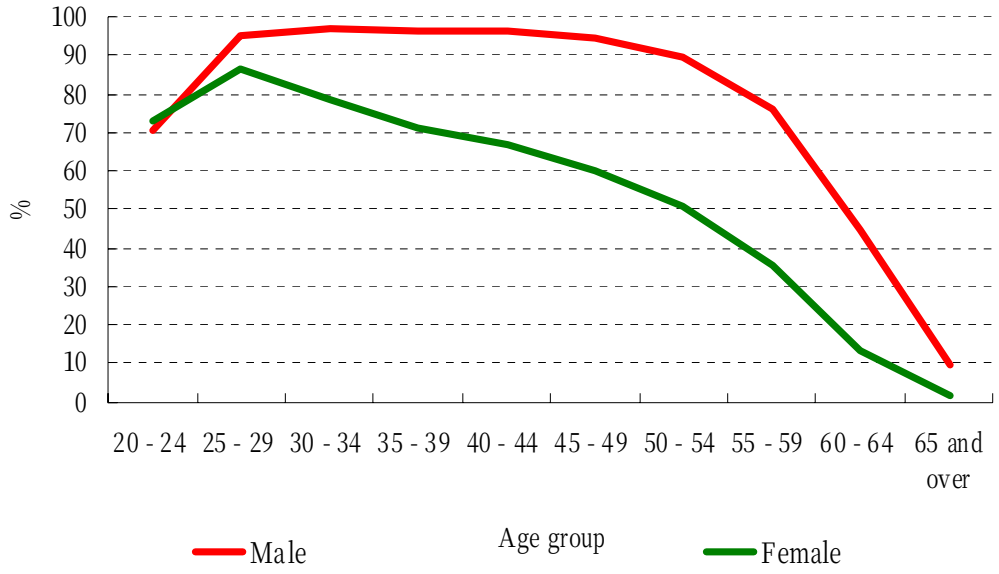


Table 2. Contribution adjustment by gender and educational level

Adjustment factors of lifetime contribution by gender (derived from labour participation rates)

Starting age of contribution		20-25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	Overall
Male											
Education level	Low	0.94	0.92	0.87	0.87	0.83	0.80	0.76	0.78	1.00	0.87
	Middle	0.93	0.90	0.89	0.87	0.85	0.82	0.80	0.82	1.00	0.88
	High	1.00	0.93	0.90	0.88	0.86	0.84	0.81	0.81	1.00	0.90
Female											
Education level	Low	0.55	0.66	0.79	0.79	0.73	0.69	0.66	0.69	1.00	0.70
	Middle	0.70	0.69	0.72	0.74	0.71	0.68	0.65	0.68	1.00	0.71
	High	0.92	0.77	0.75	0.75	0.73	0.69	0.71	0.75	1.00	0.78

Note: Education level: Low: Primary or below, Middle: secondary and matriculate, High: University or above

Withdrawal Phase

8. Under the simulation model, the account balance in an individual's account during the withdrawal phase was determined by the following factors:

(a) *Service coverage and utilization* – In the simulation, the savings could only be used to pay for in-patient services. However, for sensitivity analysis, simulation was also conducted under which both in-patient and out-patient services were covered. The amount of medical services utilized by the individuals was simulated using age-gender-specific health service utilization rates.

(b) *Public medical fee schedule* – Withdrawal from the account was linked to the public sector rates regardless of whether private or public medical services were utilized. In the simulation, it was assumed that in-patient public fees would increase from the present cost recovery rate of 3% to 20% in 15 years while the cost recovery rate of out-patient services (if covered) would also increase from the current average of 15% to 20% in 15 years.

(c) *Medical inflation* – Apart from increased cost recovery rates, public fees also increased in line with medical inflation, which was assumed to be at a real rate of 3% per annum.

(d) *Spousal coverage* – The savings could only be used to pay for post-65 medical expenses of the account holders only. However, for sensitivity analysis, simulation was also conducted under which the post-65 medical expenses of a dependent spouse were covered as well. If the spouse of an account holder were working, then the working spouse has his or her own MSA account. On the other hand, if the spouse was not working and did not have an MSA account, he/she would share the savings with the account holder after both of them had reached age 65, which would significantly affect the account balance.

The Simulation Model

9. The actuarial model simulated the MSA account balance of individual account holders over their lifetime with different initial income levels and starting

ages of contribution. During the contribution period of age 20 to 64, individuals with monthly income above $5,000 deposited 5% of their income into their personal MSA accounts. However, 15% of the deposited amount were immediately withdrawn and only 85% remained with the savings. No further withdrawal was allowed in the contribution phase. During the period, the account holders' income changed according to age-gender projected income growth. Their lifetime contributions were also subjected to adjustments based on age-gender labour force participation rates. The accumulated savings had an annual investment return of 3%.

10. The contributions stopped when the account holder reached age 65, although the savings continued to attract 3% investment returns. The 15% concomitant withdrawal for the contribution phase was also terminated at age 65. Debits from the account in the withdrawal phase were simulated based on health services utilization of the account holder and his/her dependent spouse (if any), incorporating age-gender factors. Debits were made according to public fee schedules regardless of whether private or public services were utilized. Public fees for in-patient services were at 20% cost recovery rate in 15 years and grew annually with a 3% medical inflation rate. In sensitivity analysis where out-patient services were covered, the public fees for out-patient services were also at 20% cost recovery rate in 15 years.

11. The simulation also made an assumption that if an individual account were exhausted before death, then the account holder would have to borrow at 3% interest rate to finance further debits from the account, which were reflected as deficits in the account balance.

Sensitivity Analysis

12. The purpose of the sensitivity analysis was to assess how the account balance would be affected with changes in some of the scheme parameters, such as:

(a) If the MSA savings could be used to pay for both in-patient and out-patient services;

(b) If spousal coverage were included in the design;

(c) If the contribution rate were decreased from 5% to 3%, and MSA savings could be used to pay for both in-patient and out-patient

services.

13. The scheme parameters mentioned in scenarios (a) and (b) would have no effect on the lifetime contributions of an account but would affect the lifetime deductions in the withdrawal phase, while the scheme parameter mentioned in scenario (c) would affect both the lifetime contributions and the lifetime deductions significantly. During the sensitivity simulation, those parameters not mentioned in scenarios (a) – (c) would remain the same as originally designed.

Simulation Results

Main Findings

14. The results show that in the closed cohort of simulated population, around 62% had sufficient savings in their MSA to cover their entire post-65 public in-patient expenses, while 38% of them did not have sufficient savings. Deficits first appeared at around age 81 on average, meaning that the average number of years that the savings could last was 16 years.

15. The situation was understandably better for those who started young as they had a longer contribution period. For those who started at age 20-29, 75% of them had positive account balance, compared with 36% for those who started at age 50 or above. This shows that the earlier the contribution began, the better was the protection offered by MSA.

16. Similarly, significantly higher proportion of the top 20% income earners had positive account balance than the lowest 30% income earners (76% vs. 47%). As expected, those in the higher income group could save more than the lower income group. For instance, the top 20% income earners could on average accrue $335,900 at age 65, compared with $138,800 for the lowest 30% income earners.

17. These and other results are summarized in Table 3. It illustrates the extent of protection the MSA might offer to account holders of different income levels and starting ages of contribution. In the table, average lifetime contribution refers to the average accrued savings at age 65, whereas average lifetime deduction refers to the average post-65 medical expenses. For those with a positive account balance, their average lifetime surplus was $259,000. However, the average

lifetime deficit was $361,200 for those who had exhausted their account.

Gender Differences

18. Tables 4 and 5 illustrate the simulation results for males and females respectively. Significant gender differences were observed in the proportion of account holders with positive account balance and the size of the account balance. The situation for women was significantly worse off than that of men due to lower rates of income growth and labour force participation but longer life expectancy. The situation was especially undesirable for low-income women, particularly for those who started contribution after age 40, in that none of them could have adequate MSA savings. On average, female saved $9,100 less than male in the account but spent $141,800 more on medical expenses, rendering that only 55% of the female account holders could save enough for their post-65 in-patient expenses, compared with 68% for male account holders.

19. If contributions began at age 20-29, the MSA savings could be adequate for 83% of the male account holders and 67% of the female account holders. Men could accumulate a surplus of $443,900 on average, compared with $361,700 for women. However, the savings could last longer for women, with deficits first appearing at an average age of around 84, compared with around 83 for men. This could be due to the fact that generally the bulk of medical expenses were expended just before death, and women usually live longer than men. The longer life expectancy of women also helped to explain why for those with a deficit account balance, women's average lifetime deficit was $672,900, compared to men's $535,800. The differences in account balance between male and female are summarized in Table 6.

Table 3. Results of actuarial simulation for all account holders

Starting age	Income group (by income distribution)	% with a positive MSA balance	Age of 1st deficit	Average lifetime contribution	Average lifetime deduction	Average lifetime surplus	Average lifetime deficit	Pooled Account balance
				HK$ 000s				
20-29	Lowest 30%	60.1	81.4	252.4	406.4	226.5	527.2	-74.6
	30th to 80th percentile	73.4	84.3	393.0	446.7	364.5	633.5	99.4
	Highest 20%	87.0	86.5	582.9	451.0	567.1	788.5	391.3
	ALL	74.7	83.8	418.9	441.2	407.1	626.6	146.1
30-39	Lowest 30%	51.8	80.3	151.4	303.5	128.0	369.1	-111.5
	30th to 80th percentile	70.6	83.2	277.9	328.9	265.1	451.0	54.5
	Highest 20%	82.3	85.3	371.4	335.3	346.4	518.8	193.2
	ALL	70.9	82.9	283.7	327.0	274.6	443.0	66.0
40-49	Lowest 30%	42.8	78.4	81.2	205.1	67.4	237.9	-107.2
	30th to 80th percentile	54.0	80.8	136.2	246.2	134.7	309.8	-69.6
	Highest 20%	72.8	84.0	206.6	245.6	182.0	340.8	40.0
	ALL	56.9	80.8	145.0	240.1	141.7	300.6	-49.0
50-64	Lowest 30%	26.7	76.7	29.4	149.2	24.9	174.7	-121.3
	30th to 80th percentile	32.6	78.3	45.3	169.9	45.6	201.3	-120.8
	Highest 20%	49.0	80.6	79.2	168.6	70.7	201.0	-67.9
	ALL	35.6	78.4	50.9	166.4	51.3	196.5	-108.3
Cohort	Lowest 30%	47.4	79.1	138.8	278.3	136.7	317.1	-102.0
	30th to 80th percentile	60.6	81.3	227.8	307.7	241.2	366.1	2.1
	Highest 20%	75.9	83.5	335.9	315.0	340.7	399.3	162.1
	ALL	62.4	81.2	241.0	305.2	259.0	361.2	25.8

Table 4. Results of actuarial simulation for male account holders

Starting age	Income group (by income distribution)	% with a positive MSA balance	Age of 1st deficit	Average lifetime contribution	Average lifetime deduction	Average lifetime surplus	Average lifetime deficit	Pooled Account balance
				HK$ 000s				
20-29	Lowest 30%	69.9	81.7	291.3	359.2	248.1	468.1	32.2
	30th to 80th percentile	84.5	83.2	466.2	367.7	434.6	564.3	279.8
	Highest 20%	92.4	85.2	626.7	360.4	622.1	668.5	523.9
	ALL	82.9	82.8	461.0	364.2	443.9	535.8	276.1
30-39	Lowest 30%	57.0	80.1	162.1	276.3	134.0	333.3	-66.9
	30th to 80th percentile	81.2	82.7	320.9	273.5	299.9	392.7	169.8
	Highest 20%	87.9	83.7	394.7	272.1	376.8	422.9	280.0
	ALL	78.1	81.9	306.8	273.7	295.6	374.5	148.9
40-49	Lowest 30%	42.8	78.4	81.2	205.1	67.4	237.9	-107.1
	30th to 80th percentile	68.1	81.0	170.6	209.5	152.8	265.0	19.4
	Highest 20%	79.2	82.8	219.0	208.5	194.1	296.4	92.1
	ALL	64.8	80.3	160.9	208.3	151.0	259.1	6.6
50-64	Lowest 30%	26.7	76.7	29.4	149.2	24.9	174.7	-121.3
	30th to 80th percentile	38.7	78.0	52.1	146.4	49.9	169.6	-84.7
	Highest 20%	54.0	80.0	82.0	145.4	72.6	171.2	-39.5
	ALL	39.5	78.0	53.9	146.8	53.1	171.2	-82.5
Cohort	Lowest 30%	49.4	78.7	138.4	246.7	139.0	271.5	-68.9
	30th to 80th percentile	69.8	80.4	253.3	248.7	262.6	283.4	98.0
	Highest 20%	79.5	81.9	326.4	245.6	338.2	291.1	209.0
	ALL	67.6	80.1	244.7	247.6	262.6	280.5	86.6

Table 5. Results of actuarial simulation for female account holders

Starting age	Income group (by income distribution)	% with a positive MSA balance	Age of 1st deficit	Average lifetime contribution	Average lifetime deduction	Average lifetime surplus	Average lifetime deficit	Pooled Account balance
				HK$ 000s				
20-29	Lowest 30%	37.7	81.2	163.4	514.3	135.0	592.5	-318.4
	30th to 80th percentile	63.3	84.7	325.9	519.0	279.0	660.2	-65.7
	Highest 20%	83.2	86.9	551.5	516.2	523.2	827.6	295.9
	ALL	66.7	84.4	377.1	517.7	361.7	672.9	17.1
30-39	Lowest 30%	33.8	80.8	114.2	397.8	93.1	449.8	-266.1
	30th to 80th percentile	58.4	83.5	228.6	392.3	209.5	481.3	-77.8
	Highest 20%	77.1	86.0	349.6	394.1	314.2	565.9	112.5
	ALL	62.0	83.6	255.0	393.2	241.8	492.0	-36.8
40-49	Lowest 30%	-	-	-	-	-	-	-
	30th to 80th percentile	34.4	80.6	88.1	297.7	84.4	340.3	-194.4
	Highest 20%	63.9	84.8	189.2	297.5	161.0	376.6	-33.1
	ALL	42.6	81.3	116.2	297.7	116.3	346.6	-149.6
50-64	Lowest 30%	-	-	-	-	-	-	-
	30th to 80th percentile	19.1	78.7	30.2	222.0	26.1	254.6	-200.9
	Highest 20%	38.0	81.5	73.1	219.4	64.9	249.1	-129.8
	ALL	24.5	79.3	42.4	221.3	43.2	253.3	-180.7
Cohort	Lowest 30%	36.0	81.0	141.7	462.8	117.6	527.3	-295.3
	30th to 80th percentile	48.9	81.9	195.4	382.7	202.3	428.1	-119.6
	Highest 20%	71.9	84.8	346.4	391.5	343.7	486.5	110.5
	ALL	54.8	82.3	235.6	389.4	252.3	445.9	-63.2

Table 6. Comparison of account balance between male and female

Starting Age: 20-29	**Male**	**Female**	**Difference**
(HK$ 000s)	**[1]**	**[2]**	**[2]-[1]**
Average Lifetime Contribution	461.0	377.1	-83.9
Average Lifetime Deduction	364.2	517.7	153.5
Average Lifetime Surplus	443.9	361.7	-82.2
Average Lifetime Deficit	535.8	672.9	137.1
Average Years to 1st Deficit	17.8	19.4	1.6
Positive Accounts (% of total)	82.9	66.7	-16.2

Cohort	**Male**	**Female**	**Difference**
(HK$ 000s)	**[1]**	**[2]**	**[2]-[1]**
Average Lifetime Contribution	244.7	235.6	-9.1
Average Lifetime Deduction	247.6	389.4	141.8
Average Lifetime Surplus	262.6	252.3	-10.3
Average Lifetime Deficit	280.5	445.9	165.4
Average Years to 1st Deficit	15.1	17.3	2.2
Positive Accounts (% of total)	67.6	54.8	-12.8

Results of Sensitivity Analysis

Inclusion of Out-Patient Services

20. Table 7 shows the detailed simulation results for the scenario under which other than in-patient services, the savings could also be used to pay for out-patient services at the public sector rates, while Table 8 shows the results for the changes in the account balance. The public fees for out-patient services were assumed to be at 20% cost recovery rate in 15 years.

21. If out-patient medical expenses were covered, an additional $86,700 would be expended on average and an additional 12% of the account holders would not have adequate MSA savings for their post-65 medical expenses.

Table 7. Results of actuarial simulation for all account holders at 5% contribution rate with both in-patient and out-patient coverage

Starting age	Income group (by income distribution)	% with a positive MSA balance	Age of 1st deficit	Average lifetime contribution	Average lifetime deduction	Average lifetime surplus	Average lifetime deficit	Pooled Account balance
				HK$ 000s				
20-29	Lowest 30%	46.9	80.6	252.4	520.1	184.2	558.7	-210.6
	30th to 80th percentile	61.9	83.7	393.0	575.1	303.2	637.6	-55.2
	Highest 20%	80.1	87.0	582.9	581.6	471.8	724.1	233.9
	ALL	64.1	83.4	418.9	567.8	343.2	630.9	-6.2
30-39	Lowest 30%	37.8	79.5	151.4	386.9	98.5	398.9	-211.0
	30th to 80th percentile	59.1	82.7	277.9	422.8	222.6	464.1	-58.4
	Highest 20%	73.5	85.8	371.4	431.9	283.6	497.2	76.9
	ALL	59.7	82.5	283.7	420.2	230.3	456.0	-45.9
40-49	Lowest 30%	28.6	77.7	81.2	259.4	47.6	259.1	-171.3
	30th to 80th percentile	40.7	79.5	136.2	315.9	114.1	337.1	-153.2
	Highest 20%	60.9	83.5	206.6	315.2	146.7	340.0	-43.7
	ALL	43.8	79.9	145.0	307.6	118.6	323.3	-129.9
50-64	Lowest 30%	12.2	74.4	29.4	189.0	16.7	194.0	-168.4
	30th to 80th percentile	18.7	75.8	45.3	217.6	37.6	227.1	-177.8
	Highest 20%	34.8	79.3	79.2	216.3	54.5	220.7	-124.8
	ALL	21.5	76.2	50.9	212.8	42.2	220.1	-163.7
Cohort	Lowest 30%	33.5	78.1	138.8	354.6	113.7	346.9	-192.8
	30th to 80th percentile	48.2	80.2	227.8	395.5	209.0	394.3	-103.4
	Highest 20%	65.9	83.4	335.9	405.4	288.8	401.7	53.3
	ALL	50.4	80.3	241.0	391.9	225.1	386.2	-78.3

Table 8. Comparison of account balance with and without out-patient coverage

Starting Age: 20-29 (HK$ 000s)	In-patient only [1]	In-patient and Out-patient [2]	Difference [2]-[1]
Average Lifetime Deduction	441.2	567.8	126.6
Average Lifetime Surplus	407.1	343.2	-63.9
Average Lifetime Deficit	626.6	630.9	4.3
Average Years to 1st Deficit	18.8	18.4	-0.4
Positive Accounts (% of total)	74.7	64.1	-10.6

Cohort (HK$ 000s)	**In-patient only [1]**	**In-patient and Out-patient [2]**	**Difference [2]-[1]**
Average Lifetime Deduction	305.2	391.9	86.7
Average Lifetime Surplus	259.0	225.1	-33.9
Average Lifetime Deficit	361.2	386.2	25.0
Average Years to 1st Deficit	16.2	15.3	-0.9
Positive Accounts (% of total)	62.4	50.4	-12.0

Inclusion of Spousal Coverage

22. Table 9 shows the changes in the account balance if the MSA scheme were to include spousal coverage. It shows that the situation would get worse if the account holders had to share their savings with a dependent spouse. On average, a dependent spouse expended an additional $40,300 from the account. If dependent spouse were included, 57% of the account holders would have adequate savings to cover post-65 in-patient expenses, compared with 62% if spouse were not covered. The account would also last one and half year shorter on average with spousal coverage.

Table 9. Comparison of account balance with and without spousal coverage

Starting Age: 20-29	**Spouse not covered**	**Spouse covered**	**Difference**
(HK$ 000s)	**[1]**	**[2]**	**[2]-[1]**
Average Lifetime Deduction	441.2	503.4	62.2
Average Lifetime Surplus	407.1	393.4	-13.7
Average Lifetime Deficit	626.6	666.5	39.9
Average Years to 1st Deficit	18.8	17.1	-1.7
Positive accounts (% of total)	74.7	69.2	-5.5

Cohort	**Spouse not covered**	**Spouse covered**	**Difference**
(HK$ 000s)	**[1]**	**[2]**	**[2]-[1]**
Average Lifetime Deduction	305.2	345.5	40.3
Average Lifetime Surplus	259.0	252.7	-6.3
Average Lifetime Deficit	361.2	398.1	36.9
Average Years to 1st Deficit	16.2	14.7	-1.5
Positive accounts (% of total)	62.4	57.2	-5.2

Inclusion of Out-Patient Services and Lowering of Contribution Rate to 3%

23. Table 10 shows the detailed simulation results for the scenario under which the contribution rate was set at 3% of monthly income, both in-patient and out-patient medical expenses could be covered by the MSA account, and spousal coverage was excluded. Table 11 presents the differences in the account balance when compared with the contribution rate at 5% under the same set of assumptions. At 3% contribution rate, the savings would accumulate $96,400 less on average and would last two years shorter. Compared to the 50% who had positive account balance at 5% contribution rate, only 32% of the account holders would have adequate MSA savings to cover their post-65 medical expenses at 3% contribution rate.

Table 10. Results of actuarial simulation for all account holders at 3% contribution rate with both in-patient and out-patient coverage

Starting age	Income group (by income distribution)	% with a positive MSA balance	Age of 1st deficit	Average lifetime contribution	Average lifetime deduction	Average lifetime surplus	Average lifetime deficit	Pooled Account balance
				HK$ 000s				
20-29	Lowest 30%	28.1	78.0	151.4	520.1	98.8	541.5	-361.6
	30th to 80th percentile	40.1	80.8	235.8	575.1	160.3	599.2	-294.6
	Highest 20%	58.0	83.9	349.7	581.6	235.1	620.7	-124.3
	ALL	42.8	80.8	251.3	567.8	179.8	591.4	-261.7
30-39	Lowest 30%	21.6	77.1	90.8	386.9	52.1	398.5	-301.4
	30th to 80th percentile	38.3	80.1	166.7	422.8	117.6	441.2	-227.0
	Highest 20%	50.3	82.6	222.8	431.9	143.8	447.8	-150.1
	ALL	39.0	80.1	170.2	420.2	121.0	435.2	-218.3
40-49	Lowest 30%	15.2	75.5	48.7	259.4	25.1	263.0	-219.1
	30th to 80th percentile	24.4	77.1	81.7	315.9	62.3	331.0	-235.2
	Highest 20%	38.1	80.3	124.0	315.2	76.8	320.2	-169.1
	ALL	26.3	77.5	87.0	307.6	64.1	317.5	-217.2
50-64	Lowest 30%	5.8	72.1	17.6	189.0	9.0	197.6	-185.6
	30th to 80th percentile	9.9	73.5	27.2	217.6	20.6	229.6	-204.9
	Highest 20%	19.5	76.9	47.5	216.3	29.4	221.3	-172.5
	ALL	11.5	74.0	30.5	212.8	23.2	222.5	-194.2
Cohort	Lowest 30%	19.0	75.9	83.3	354.6	62.5	354.6	-275.6
	30th to 80th percentile	30.3	78.0	136.7	395.5	112.9	395.9	-241.5
	Highest 20%	44.2	80.9	201.5	405.4	150.9	392.6	-152.1
	ALL	32.1	78.2	144.6	391.9	121.3	388.0	-224.7

Table 11. Comparison of account balance at 5% and 3% contribution rates and covering both in-patient and out-patient services

Starting Age: 20-29	**5%**	**3%**	**Difference**
(HK$ 000s)	**[1]**	**[2]**	**[2]-[1]**
Average Lifetime Contribution	418.9	251.3	-167.6
Average Lifetime Deductions	567.8	567.8	0
Average Lifetime Surplus	343.2	179.8	-163.4
Average Lifetime Deficit	630.9	591.4	-39.5
Average Years to 1st Deficit	18.4	15.8	-2.6
Positive Accounts (% of total)	64.1	42.8	-21.3

Cohort	**5%**	**3%**	**Difference**
(HK$ 000s)	**[1]**	**[2]**	**[2]-[1]**
Average Lifetime Contribution	241.0	144.6	-96.4
Average Lifetime Deductions	391.9	391.9	0
Average Lifetime Surplus	225.1	121.3	-103.8
Average Lifetime Deficit	386.2	388.0	1.8
Average Years to 1st Deficit	15.3	13.2	-2.1
Positive Accounts (% of total)	50.4	32.1	-18.3

Evolution of Account Balance

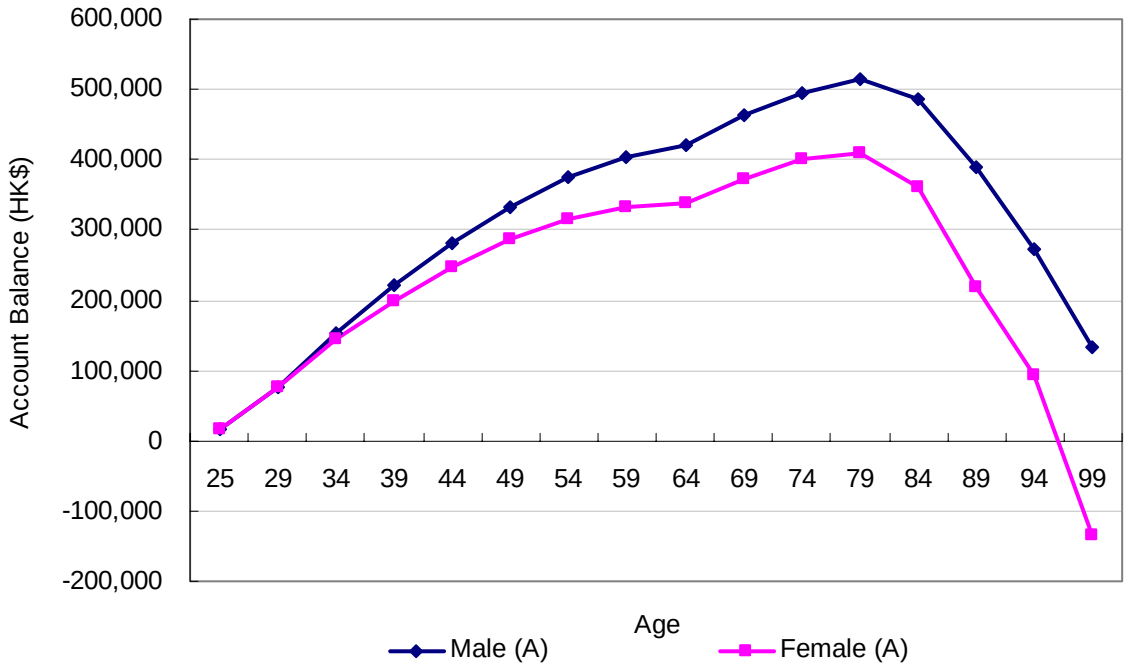
In-Patient Coverage Only

24. Figure 3 illustrates the evolution of account balance for a man and a woman with monthly income between $10,000 and 10,999 who began making MSA contributions at age 25 with contribution rate at 5% of monthly income, under the scenario that covered in-patient services only and excluding spousal coverage. The man's account balance was consistently higher than that of the woman throughout the contribution and withdrawal periods. Nevertheless, the two curves showed the same evolution pattern.

25. The accumulation slowed nearer to age 65, indicating a slower rate of income growth as age increased. There was a sudden upturn in the accumulated savings at age 65 that continued until around age 79 for both the woman and the man even though contributions stopped at age 65 and thereafter. This might be due to the fact that the rate of in-patient service utilization was not high during this

time and that the 15% concomitant withdrawal had been terminated at age 65. In other words, investment returns on the accumulated savings coupled with low in-patient utilization could have accounted for the savings upturn. The account balance started to shrink and continued on a downward trend after this period, when in-patient utilization increased as the man and woman aged further.

Figure 3. Evolution of account balance (MSA covers in-patient services only)

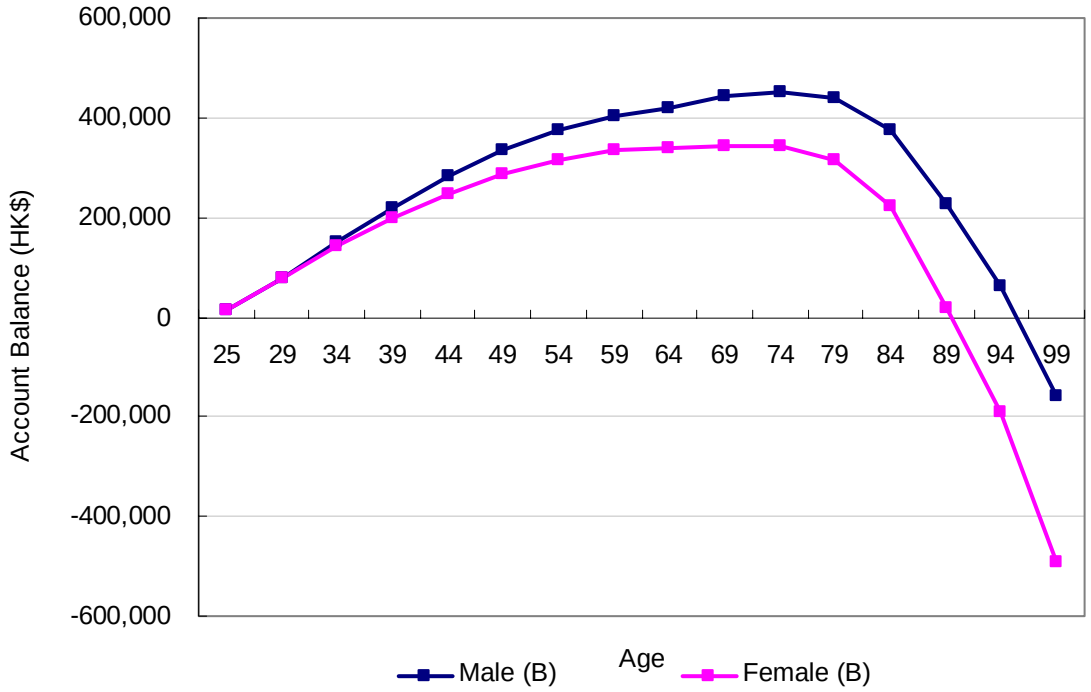


In-Patient and Out-Patient Coverage

26. Figure 4 illustrates the evolution of account balance with the same aforementioned assumptions, except that the savings could be used to cover both in-patient and out-patient services. The man's account balance was consistently higher than that of the woman throughout the contribution and withdrawal periods though the two curves showed the same evolution pattern.

27. Contrary to the evolution pattern under the scenario that covered in-patient services only, the accumulated savings did not show a sudden upturn at age 65. However, the account balance still showed a slow increase after age 65 for the man while it reached a plateau for the woman, and the account balance started on a downward trend after age 79. This was due to the fact that with the inclusion of out-patient coverage, more withdrawals were made from the savings since out-patient utilization rate was generally quite high compared to in-patient.

Figure 4. Evolution of account balance (MSA covers in-patient and out-patient services)



Caveats

28. It should be noted that the simulation had been conducted on a closed cohort of individuals in the absence of migration flow and population growth. In reality, there would be a sizable number of young people who would turn 20 and join the MSA scheme in any given year. This means that the pool of account holders, particularly those with positive account balance, would grow in reality. With an expanded pool, the proportion of account holders with deficits would be less.

29. Furthermore, the working population in this closed cohort had different starting age of contribution when the simulation began, with the majority of them beyond age 20-29. This means that the majority of the simulated accounts did not enjoy a full contribution period. In a mature scheme, the majority of the accounts would have a full/nearly full contribution period, which would result in a healthier account balance. In other words, the high proportion of deficit accounts illustrated in this simulation of a closed cohort had represented the worst-case scenario.

Conclusions

30. In the absence of risk pooling among account holders, the MSA scheme at a contribution rate of 5% monthly income could offer adequate protection to around 60% of the working population in covering their post-65 in-patient expenses. Extending the coverage to out-patient services, inclusion of spousal coverage, or lowering the contribution rate would all render a lower proportion of the working population having adequate MSA savings to cover their post-65 medical expenses.

31. It should be noted that the range of individual account balance was very wide, particularly for account holders who started contributing at age 20-29. While some of the account holders could accumulate on average a surplus of over $400,000 in their account, there were others who chalked up on average a deficit of over $600,000.

32. The results of the actuarial simulation highlighted the importance of risk pooling among the account holders, which could be achieved by including medical insurance as a supplementary feature of the MSA scheme.

Food and Health Bureau
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