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**DEPARTMENT OF  
ECONOMICS**

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# The Demand for Private Health Insurance in Malawi \*

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**Abstract:** This study investigates the determinants of demand for private health insurance among formal sector employees in Malawi, a poor country with heavy pressure on under-funded free government health services. The study is based on membership in the Medical Aid Society of Malawi's (MASM), three schemes, namely: the VIP, the best; the Executive, the intermediate; and the Econoplan, the minimum. The results indicate that formal sector employees prefer to receive medical treatment from private fee-charging health facilities, where health insurance would be relevant. The study finds that the probability of enrolling in any of MASM's schemes increases with income and with age for the top and minimum schemes. More children and good health status reduce the probability of enrolling into the two lower schemes. The results suggest the potentially important roles that can be played by information and interventions that address the affordability factor such as through employer contributions that take into consideration income and family size.

## 1. Introduction

Although public health services are still free at the point of consumption in Malawi, the health sector faces the problems of a small resource envelope, and inefficient and inequitable service delivery. The challenge facing governments is that if services are to be provided for all, then not all services can be provided (WHO, 2000).<sup>1</sup> In Malawi, this has resulted in resource maldistribution,

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\* The article is based on the first author's MA (Economics) thesis submitted to the Department of Economics, University of Malawi, at which second and third authors are faculty members. The usual disclaimer applies.

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<sup>1</sup> In Malawi, it was noted that public finance has attempted to provide too broad a range of health services resulting in their being spread too thinly over many services (Malawi Government, 2001a).

geographically, between levels of facilities and service types. The problems faced have been in the areas of budgeting and finance operations, health personnel, drugs delivery, and operations. During the decade following democratic elections in 1994 the problems worsened and involved drug pilferage and demoralised health personnel. On the equity front, it has also been observed that the non-poor have been the main beneficiaries of subsidised higher-level services from public tertiary facilities and that all these inefficiencies have generally raised the “burden of disease” for the poor (Malawi Government, 2001a). Government services have not only become ineffective but the poor (and others) end up going to for-profit facilities and paying for drugs they would have accessed for free at public facilities.

In recent years, Malawi government’s expenditure on health has amounted to 8.4 percent of total expenditure compared to Southern Africa Development Community’s (SADCs) average of 13.7 percent (UNDP/SADC/SAPES, 2000). In per capita terms, government expenditure on health services was around US\$11 between 1997 and 2000 compared to US\$21 for low-income countries (World Bank, 2003). The physician/patient ratio is 1.1 to 100,000 and there are 1.3 beds per 1,000 patients (Malawi Government, 2001a). The modern health sector comprises three types of health service providers, namely: the public sector, non-profit private sector, and the private-for-profit sector. In 1998, these accounted for a total of 7 tertiary, 82 secondary and 417 primary facilities (Malawi Government, 2001a). The coverage of the sector in terms of the total number of facilities is therefore still quite limited for a population of 12 million and this partly accounts for Malawi’s poor record with health indicators.<sup>2</sup> The public sector, led by the Ministry of Health (MOH) accounts for 71 percent, 50 percent and 45 percent respectively, of the facilities at the tertiary, secondary and primary levels. It also dominates in service provision, accounting for 60 percent of all formal health care services followed by the not-for-profit Christian Health Association of Malawi (CHAM), which accounts for 37 percent and the private for-profit accounting for 3 percent. Health services in the public sector are currently provided free of charge apart from maternity care, private wards at central and district hospitals, paying

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<sup>2</sup> As at 1997 life expectancy at birth stood at 38.9 and 39.6 years for males and females respectively, compared to 47.3 and 50.7 years for the whole of the SADC region (UNDP/SADC/SAPES, 2000). In 1998, the infant mortality rate was 134 per 1,000 live births, compared to 54 for SADC (Government of Malawi, 2001a and Government of Malawi/World Bank, 2006 p133).

outpatient departments and the new hospital by-pass fee (Malawi Government, 2001b).

Over time and despite its dominance, state-service delivery failure, has been shifting the burden of access to effective health care to the private pocket. Estimated out-of-pocket expenditures by households on health services have been on the rise and involving a growing number and diverse range of private-for-profit players. From US\$9.1 million in 1995 private expenses increased to US\$ 37.1 in 2000 when the share of private expenditure on health to GDP was 4 percent compared to government's contribution of 3.6 percent (Malawi Government, 2001c; World Bank, 2003).

Against this background, health insurance can provide an additional source of health care financing, albeit on a self-selection basis. It offers a number of economy-wide or public benefits, including: private sector cost-sharing that relieves government of the burden of providing services for those willing and able to pay and allowing more effective targeting of public health care resources towards the needy, i.e. equity effects, and; further increasing efficiency through increased competition in health service provision. To the potential participants in health insurance schemes there would also be private benefits from improved scheme performance, better value for money and the relief from inconveniencing out-of-pocket expenditures (Conn and Walford, 1998; Abel-Smith, 1992). But these potential benefits notwithstanding, the effective demand for such schemes in Malawi has never been assessed.

This paper assesses the determinants of demand for private health insurance among formal sector employees in Malawi. This entails taking into consideration: a) the extent to which formal sector employees prefer to receive treatment from private health facilities where health insurance would be relevant, b) for those with no insurance, whether this was because of income or lack of information, and c) the factors that determine an individual's specific participation in three schemes offered by Malawi's oldest and largest health insurance provider, Medical Aid Society of Malawi.

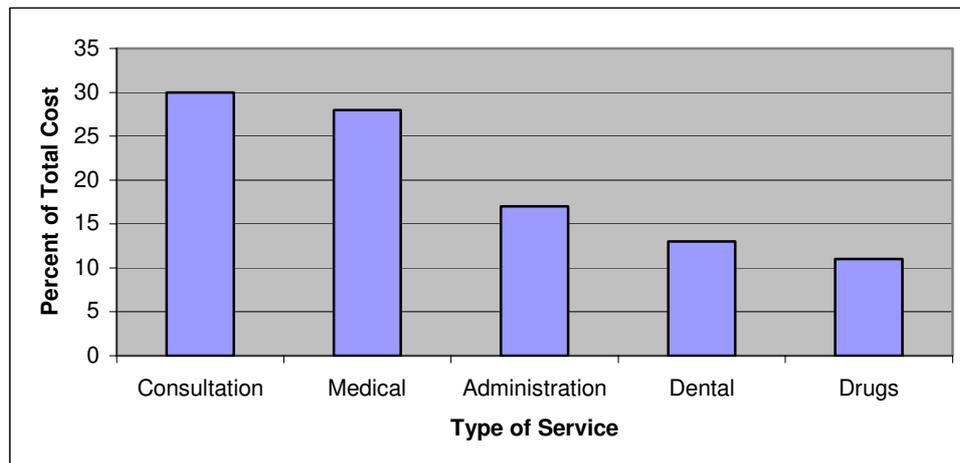
## **2. The Health Insurance Industry**

The health insurance industry in Malawi is underdeveloped. There is no compulsory health insurance even for those in public formal sector employment. Before the establishment of OASIZ Medical Aid in 2003, the MASM was the only third party institution in the health insurance industry. Some parastatals and some firms have small schemes of their own which they operate themselves or contract MASM to administer on their behalf (Malawi Government, 2001a).

The MASM is a non-profit-making organization, which assists its members to access medical support and services through three schemes. The most comprehensive scheme is the VIP scheme, with a monthly premium of MK 1,500 and catering for treatment in any country in the Southern African region. The Executive Scheme requires a lower monthly contribution of MK 700 per person. It covers payments for medical treatment up to MK 300,000 per annum from government, mission, and private hospitals and clinics registered with the Society. The last scheme, Econoplan which caters for low-income individuals, has a monthly premium of MK 300 for treatment as in the Executive Scheme but with a much lower annual limit of MK 50,000. Contributions to MASM are payable monthly, quarterly or annually. MASM reimburses the costs of consultations, prescriptions and treatment at a rate dependent on the type of coverage chosen.

In the period 2004-05 there were 56,269 people insured with MASM. However, in a country with a population of over ten million people, the number of those who have health insurance is still very insignificant. The insured involved 1,116 groups or company schemes and 1,957 individual or family schemes. Out of total expenditure of MK719 million in 2004-05, 93 percent was accounted for by the groups or company schemes. The actual orientation of the expenditures was dominated by consultation (about 30 percent) followed by medicals, accounting for 28 percent (Figure 1).

Figure 1 Health Insurance Service Expenditure 2004-05



### 3. Earlier Empirical Studies

There are two major contending theories about what motivates people to take out insurance, including health insurance. One espouses the maximisation of expected utility of income when there is a possibility of loss that can be insured against.<sup>3</sup> An alternative theory is called prospect theory and it suggests that the demand for health insurance is demand for income transfer from the healthy state, when medical care is an irrelevant good, to the ill state, when medical care becomes a substitute for other goods and services (Tversky and Kahneman, 1986a and 1986b). Some observers have argued that the two theories have a major weakness in the sense that they rely on people comparing the expected gains from insurance over the costs of premium and costs from future prospects of illness if not insured (Nyman, 1998 and 2001). Regardless of the details about how these two perspectives matter, and there are sceptics. The factors that drive the decision to take out health insurance would likely be the same, from the demand side such as ability and willingness to pay, and supply side such as supplier barriers.

Empirically, the United States of America's long history with healthcare provision based on private health insurance provides a vast empirical literature on the subject of demand for health insurance. Of more relevance and interest here however would be studies based on contexts where the experiences cater for state and private provision of insurance and/or health care. These include some Western, Asian, transition East-European and African studies whose objectives have been as varied though insightful. These have ranged from seeking views about expectations from health insurance as a means of financing health care, whether it represents value for money, whether there should be equity considerations, to the role of possible demand-side factors (income, education, sex, marital status, age, health status, and dependents) and supply side factors (service quality, risk).

A study on people's views about health sector and insurance reforms in Croatia between 1999 and 2000 found that 31 percent said that access to services should reflect payment and 39 percent said that what they contributed in insurance corresponded to the service they received (Mastilica and Babic-Bosanac, 2002). A majority, 60 percent, expected insurance contributions to reflect equity considerations i.e. be progressive and increase with income.

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<sup>3</sup> This theory was originated by von Nuemann and Morgenstern (1964) and was further elaborated by Friedman and Savage (1988).

Two studies have examined the demand for private health insurance as an alternative to government or statutory schemes in Taiwan and Germany. In Taiwan, the key findings were that income and education had a positive impact on the demand for private insurance, whether the respondent was a married female and working in a state-run enterprise (Liu and Chen, 2002). The German study finds that the alternative voluntary health scheme attracted a minority who had incomes above a minimum threshold and that the marginal benefits did not outweigh the costs in terms of choice of service provider or services provided. Furthermore, voluntary health schemes penalised those with dependents, the elderly and those in poor health (Thomson et al, 2002). In the Catalonia region of Spain a study identified a quality gap between public and private health insurance as a key determinant of the rising demand for private health insurance and attendant health services (Costa and Garcia, 1999).

A study on the strengths and limitations of rural community-based health insurance schemes in Kenya, Uganda and Tanzania found that despite the great need for decentralised and effective health care at this level, financing through insurance faced the problems of limited household resources which placed enormous strain on scheme design and implementation (Musau, 1999).

#### **4. Methodology and Data**

The study is based on primary data collected in two urban centres of southern Malawi of Blantyre and Zomba<sup>4</sup> between March and April 2003. A structured questionnaire was used to gather information from formal sector employees. 221 respondents were randomly selected, 42 percent of whom were female. Data collected included: respondents' socio-economic characteristics, individual's self assessment of health status, health care utilisation, their attitudes towards private health insurance and their status regarding their holding private health insurance with MASM.

In the study, demand for MASM health insurance is analysed using a logistic regression model due to the categorical nature of the response variable. In particular, a multinomial logit model (MNL) is employed by deriving the MNL as a probability mode (Long, 1997). Let  $y$  be the dependent variable, demand for health insurance, with  $J$  nominal outcomes or types of schemes. Although the categories are numbered 1 to  $J$ , they are not assumed to be ordered. This assumption is based on the following argument: even though

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<sup>4</sup> Blantyre and Zomba are respectively the second largest and fourth largest urban centres in Malawi.

the schemes have a nominal preference ordering from VIP down to Econoplan and No Scheme, they are means-bound in which case the means or affordability operates as weighting factors. The study adopts the multinomial logit model as presented in equation 3 in the Appendix.

The present study builds on several earlier studies. Of particular interest is a study undertaken in Denmark (Christiansen et al, 2002). However, the nature of the present study is organised with due consideration to the specific features of the health insurance industry in Malawi and the availability of data. Demand for private health insurance should be understood as a predictor of enrolment for membership with MASM, depending on a number of explanatory variables. Based on the models by Long (1997) and Christiansen et al. (2002), Table 2 provides a list of variables that are expected to influence demand along with their expected signs.

Table 2 Description of Independent Variables

Variable	Description	Expected Sign
Gender	Sex of the individual	+
Age	Age of the individual	+
AgeSquared	Age of the individual squared	-
Schoolyears	Length of schooling for the individual	+
Children	Number of children the individual has	+
HealthStatus1	Excellent self reported health status of the individual	+
HealthStatus2	Fair self reported health status of the individual	+
HealthStatus3	Poor self reported health status of the individual	-
Income	Total monthly income	+

*Response Variable (Membership into MASM)*

- Group 1 = VIP Scheme
- Group 2 = Executive Scheme
- Group 3 = Econoplan
- Group 4 = Not member

It is expected that the probability of a person to be insured is likely to increase with age because of an increased need for health care. However, the share of the insured above the age of 55 is expected to decrease with increasing age because of the age limitation in MASM and therefore the age-squared variable is expected to have a negative sign. To see how this effect materialises, one needs to relate the decision to take out health insurance to an investment where one needs to calculate the discounted net benefits

over the period of investment, which in this case might be smaller the closer one is to the age limit.

Length of schooling was used as a proxy for general knowledge of the benefits of being healthy at least cost, and expected to affect the attitude towards health insurance positively. Self-assessed health status was included in the study with three categories, excellent, fair and poor. Owing to enrolment criteria at MASM, members are expected to be in good health with poor health being negatively associated with barriers from the supply-side but observable as low demand. Both excellent and fair health statuses are expected to positively affect the probability of a person to be insured.

Since MASM registers children as dependents, it gives an incentive for families with children to enrol. The study therefore expects the probability of being insured to increase with the number of children. Furthermore, based on earlier studies that have shown that the distribution of health insurance premiums is progressive with respect to income, the present study expects the probability of being insured to increase with an individual's total income. The theory of demand for health care stipulates that female individuals demand more health care than their male counterparts. As a result, the study expects gender to positively influence the probability of having health insurance.

## 5. Empirical Results

In order to test the hypotheses on the choice of health facility, which makes health insurance relevant or irrelevant, and on the reasons for not having insurance, a binomial test was used. The test compares the observed frequencies of the two categories of a dichotomous variable to the frequencies expected under a binomial distribution with a specified probability parameter, which in this case was assumed to be 0.5, representing a 50/50 outcome.

Table 1 Binomial Tests on Choice of Health Facility and on Reasons for not Having Insurance

Test	Category	Observed Proportion	Test Proportion	Asymptotic Significance (2 Tailed) <sup>a</sup>
On Choice of Health Facility	Paying	0.98	0.5	0.000***
	Non-paying	0.02		
On Reasons for not Having Insurance	Lack of knowledge	0.68	0.5	0.004***
	Lack of income	0.32		

Note: a Based on Z approximation

In order to run the binomial test on the choice of a health facility, we have restricted our choice of health facility to two, paying and non-paying. The results show that the observed asymptotic significance level based on Z approximation is very high. We therefore reject the hypothesis that the proportion of each category is equal (0.5), at 1 percent level of significance and conclude that the proportions of the two categories are statistically different at 1 percent level. As many as 98 percent of the respondents preferred paying health services which are private health facilities where health insurance is relevant.

The results of the binomial test on the reasons for not having insurance indicate that the proportions for lack of knowledge and lack of income are also statistically different, at 1 percent level of significance. The results show that the majority, 68 percent, of the respondents with no insurance cited lack of knowledge as the reason rather than low income, implying that information and marketing would be a crucial part in extending the outreach of the health insurance initiative.

Table 3 presents results of the multinomial logit regression showing variables which were important for determining demand for the various schemes. The importance of each of the variables in the multinomial system was tested, i.e. whether all the variables have a significant effect on choosing a particular type of scheme, against the baseline choice (no insurance scheme). The results show that at 1 percent level of significance all the nine variables have a significant joint impact on the probability of choosing each of the three schemes.

Table 3 Factors Affecting Demand for Various Insurance Scheme

Variable	VIP Scheme		Executive Scheme		Econoplan Scheme	
	$\beta$	P>z	$\beta$	P>z	$\beta$	P>z
Gender	-1.041	0.107	-0.0732	0.865	-0.4489	0.865
Age	1.317	0.030**	0.4089	0.233	0.6722	0.233*
AgeSquared	-0.018	0.024**	-0.0055	0.218	-0.0089	0.218*
Children	-0.052	0.871	-0.3849	0.057*	-0.6312	0.057*
Income	0.0004	0.000***	0.00038	0.000***	0.00032	0.000***
Schoolyears	-0.385	0.013**	-0.1083	0.353	-0.0617	0.353
HealthStatus1	-13.818	0.219	-14.8050	0.020**	-14.9894	0.020**
HealthStatus2	-13.170	0.237	-14.9755	0.018**	-15.7949	0.018**

Note: Hstatus3 was dropped to avoid the problem of matrix singularity. \* denotes significance at 10 percent level, \*\* denotes significance at 5 percent level, \*\*\* denotes significance at 1 percent level

Next we tested whether the direct impact of monthly income has the same impact on an individual's choice of a particular scheme as

it does for another scheme. The results indicate that the impact of total monthly income on an individual's choice of the VIP Scheme and the Executive Scheme was not equal, at 1 percent level of significance. At the same significance level of 1 percent, we also reject the hypothesis that the impact of total monthly income on the VIP and the Econoplan Scheme is equal. However, for the Executive and the Econoplan Schemes, the null hypothesis can only be rejected at 10 percent level of significance.

The results in Table 3 show that under the VIP Scheme, Age, AgeSquared, and Income were significant with the expected signs at the 5 percent or 1 percent levels. Schoolyears is significant at 5 percent level with a negative sign, contrary to expectations. Thus, age positively influences the probability of VIP scheme membership up to 55 years and becomes a negative influence thereafter, while income also has a positive influence on this more expensive but better scheme. Schoolyears was used in the study as a proxy for the general knowledge of the benefits of being healthy. But there is a strong possibility in Malawi that for the VIP scheme this variable could be picking up other effects, such as job category, income and insurance entitlements by type of employer (private sector versus public sector), where the prospects for insurance would be better for private even with less schooling. In the sample, 38 percent of the respondents had post-secondary education.

For the Executive Scheme, only Income was significant with the expected sign at 1 percent level. Children is significant at 10 percent level with a negative sign while HealthStatus1 and HealthStatus2 are also significant at 5 percent level and with a negative sign. Age, AgeSquared, and Schoolyears which are important variables in explaining the probability of having a VIP Scheme, did not influence an individual's probability of having an Executive Scheme. These findings show that respondents demanding the Executive Scheme tended to be influenced positively by their income levels, negatively by household size which restricts ability and /or willingness to pay, and also negatively by whether they were in excellent or fair health. Compared to the demand for the VIP Scheme, these findings give Executive scheme the hallmark of a necessity. This would still be out of reach for those with more children who might have greater need for an intermediate scheme to moderate premium payments and out-of-pocket expenses.

The results suggest that there is a potential moral hazard problem in people demanding the Executive Scheme, whereby respondents would like to enrol when they suspect they will need health services. Where they self assess to be fit or fairly fit, then they are not likely to enrol for the Executive Scheme. In case of

unexpected illness, these would be likely candidates for government health facilities.

The demand for the Econoplan shares the same characteristics as that for the Executive scheme except that this time both Age and AgeSquared were significant at 10 percent level and they had the expected sign. Below the age restrictions, age is a motivating factor for this cheaper or minimum scheme.

## **6. Conclusion**

Results from the statistical analysis have revealed that, at demand for health service level, formal sector employees prefer to receive treatment from private health facilities where health insurance would be relevant and important. Although some formal sector employees do not possess an insurance scheme with MASM due to financial constraints, the major reason why most employees do not have a scheme with MASM is lack of knowledge. If formal sector employees became more knowledgeable on health insurance procedures in general, and the operation of MASM in particular, the numbers of people with private health insurance among these employees would increase. Information is therefore an important factor in increasing outreach.

Although different variables influence the probability of having different schemes differently, the study establishes income as the common most significant factor that positively affects an individual's probability of having any of the three types of schemes with MASM. This implies that the affordability factor imposes a constraint on demand for health insurance. The success of the introduction of social health insurance for those in formal public sector employment would need to take into account this income or affordability factor, possibly through a suitable approach to its design like employer contributions.

The age of the individual increases the probability of a person enrolling in the VIP and Econoplan schemes because of the potential need for health care. However, the age squared variable negatively affects the probability of enrolment, such that the probability of enrolling decreases with increasing age because of the age limitation. Therefore, in the decisions regarding health insurance, government implementation of social health insurance would likely benefit older employees more than younger ones. For the intermediate, Executive scheme and the minimum Econoplan, which would likely be attractive for the lower-income, the probability of being insured decreases with the number of children, suggesting problems with effective demand. This has adverse welfare implications in the case

of poor service at government facilities because of the burden of out-of-pocket expenses at paying facilities.

Again with reference to the two lower level schemes, good self-reported health status reduces the probability of having a scheme with MASM because it reduces the incentive to enrol in the schemes. Since poor health is a ground for barred entry, good health now probably also reduces the perceived discounted net benefits and/or raises faith in the free services at government facilities. Overall, the results of this study suggest that health insurance would become attractive with more information and in the event of further declines in the performance of the free public health system or if these services also become user-charged. Presently, those marginalized appear to be those likely to need the schemes most i.e. those with lower incomes and those with larger families, and especially including young children. As an anti-poverty measure in the face of resource constraints, the government has the choice of improving its own service delivery, which will reduce the incentive for insurance by those able to pay, and introducing statutory insurance schemes, like the German one, starting with its own employees.

## References

- Abel-Smith, B. (1992) 'Health Insurance in Developing Countries: Lessons from Experience', **Health Policy Plan**, **7 (3)** pp. 215-26
- Christiansen, T., Lauridsen, J. and Kamper-Jorgensen, F. (2002) 'Demand for Private Health Insurance and Demand for Health Care by Privately And Non-privately Insured in Denmark,' University of Southern Denmark, Health Economics Paper 2002:1.
- Conn, C.P. and Walford, V. (1998) 'An Introduction to Health Insurance for Low Income Countries,' London: Institute for Health Sector Development.
- Costa, J. and Garcia, J. (1999) 'Demand for Private Health Insurance: Is there a Quality Gap?' Department de Teoria Economica, Universitat de Barcelona, Working Paper.
- Friedman, M. and Savage, J. (1988) 'The Utility Analysis of Choices Involving Risk,' **Journal of Political Economy**, **66 (4)**, pp 279 – 301
- Liu, T. C. and Chen, C. S. (2002) 'An Analysis of Private Health Insurance Purchasing Decisions with National Health Insurance in Taiwan,' **Social Science and Medicine**, **55 (5)**, 755-74.

- Long, S. J. (1997) **Regression Models for Categorical and Limited Dependent Variables**, California: SAGE Publications, Inc.
- Malawi Government (2001a) 'Malawi 2000 Public Expenditure Review,' Lilongwe: Ministry of Finance and Economic Planning.
- Malawi Government (2001b) 'The Malawi Essential Health Package (EHP), Lilongwe:
- Malawi Government (2001c) 'Malawi National Health Accounts (NHA): A Broader Perspective of the Malawian Health Sector,' Lilongwe: Ministry of Health.
- Malawi Government/World Bank (2006), 'Malawi Poverty and Vulnerability Assessment: Investing in our Future,'
- Mastilica, M. and Babic-Bosanac, S. (2002) 'Citizen's Views on Health Insurance in Croatia,' **Croatian Medical Journal**, **43(4)**, 417-24.
- Musau, N. M. (1999) 'Community-Based Health Insurance: Experiences and Lessons from East and Southern Africa,' Partnership for Health Reform, Technical Report No. 34.
- Nyman, J. A. (1998) 'Theory of Health Insurance,' **Journal of Health Administration Education** **16 (1)**, 41 – 66.
- Nyman, J. A. (2001) 'The Demand for Insurance: Expected Utility Theory from a Gain Perspective,' University of Minnesota, Working Paper.
- Thomson, S., Busse, R. and Mossialos, E. (2002) 'Low Demand for Substitutive Voluntary Health Insurance in Germany,' **Croatian Medical Journal**, **43 (4)**, 425-32.
- Tversky, A. and Kahneman, D. (1986a) 'The Framing of Decisions and the Psychology of Choice', **Science** **211**, p453-458.
- Tversky, A. and Kahneman, D. (1986b) 'The Framing of Decisions and the Psychology of Choice,' in Jon Elster (Ed), **Rational Choice**, New York: New York University Press.
- UNDP/SADC/SAPES (2000) **SADC Regional Human Development Report**, Harare: SAPES Books.
- von Nuemann J. and Morgenstern, O. (1964) **Theory of Games and Economic Behaviour**, New York: John Wiley
- World Bank (2003) **World Development Report**, Washington D.C.: World Bank/Oxford University Press.
- WHO (World Health Organisation) 2000, **World Health Report 2000**, Geneva: WHO.

**Appendix**  
**Technical Note on the Multinomial Logit Model**

Let  $pr(y = m | x)$  be the probability of observing a particular outcome  $m$  given  $x$ , a vector of independent variables. The probability model for  $y$  can now be constructed as follows:

- Assume that  $pr(y = m | x)$  is a function of the linear combination  $x\beta_m$ . The vector  $\beta_m = (\beta_{0m} \dots \beta_{km} \dots \beta_{Km})'$  includes the intercept  $\beta_{0m}$  and coefficients  $\beta_{km}$  for the effect of  $x_k$  on outcome  $m$
- To ensure that the probabilities are nonnegative, we take the exponential of  $x\beta_m : \exp(x\beta_m)$ . Although the result is nonnegative, the sum  $\sum_{j=1}^J \exp(x\beta_j)$  does not equal 1, which it must for probabilities.
- The third step, therefore, involves restrictions to make the probabilities sum to 1. We thus divide  $\exp(x\beta_m)$  by

$$\sum_{j=1}^J \exp(x\beta_j):$$

$$pr(y_i = m | x_i) = \frac{\exp(x_i \beta_m)}{\sum_{j=1}^J \exp(x_i \beta_j)} \dots\dots\dots$$

(1)

This normalization ensures that  $\sum_{m=1}^J pr(y = m | x) = 1$

- However, the model is unidentified since more than one set of parameters generates the same probabilities of the observed. By multiplying expression 1 by  $\frac{\exp(x_i \xi)}{\exp(x_i \xi)}$  it can be shown that the model is not identified. Since the operation is the same as multiplying by 1, the value of the probability remains the same:

$$pr(y_i = m | x_i) = \frac{\exp(x_i \beta_m)}{\sum_{j=1}^J \exp(x_i \beta_j)} \times \frac{\exp(x_i \xi)}{\exp(x_i \xi)}$$

$$\begin{aligned}
&= \frac{\exp(x_i \beta_m + x_i \xi)}{\sum_{j=1}^J \exp(x_i \beta_j + x_i \xi)} \\
&= \frac{\exp(x_i [\beta_m + \xi])}{\sum_{j=1}^J \exp(x_i [\beta_j + \xi])} \dots\dots\dots(2)
\end{aligned}$$

- Although the values of the probabilities have not changed, the original parameters  $\beta_m$  have been replaced by  $\beta_m + \xi$ . Thus, for every  $\xi \neq 0$  there is a different set of parameters that results in the same predictions. Clearly, the model is not identified.
- In order to make the model identified, restrictions are imposed on the  $\beta$ 's, such that for any nonzero  $\xi$  the constraints are violated. This is achieved by constraining one of the  $\beta$ 's to equal 0, such as  $\beta_1 = 0$ , or  $\beta_2 = 0$ , or  $\beta_j = 0$ . The choice is arbitrary. In the study we set  $\beta_j = 0$ . Clearly, if a nonzero  $\xi$  is added to  $\beta_j$ , the assumption that  $\beta_j = 0$  is violated.
- Adding this constraint to the model results in the probability equation given as:

$$pr(y_i = m | x_i) = \frac{\exp(x_i \beta_m)}{\sum_{j=1}^J \exp(x_i \beta_j)} \quad \text{where } \beta_j = 0. \quad (3)$$

$$pr(y_i = m | x_i) = \frac{\exp(x_i \beta_m)}{\sum_{j=1}^4 \exp(x_i \beta_j)} \quad \text{where } \beta_4 = 0 \quad \dots\dots\dots(4)$$

which is used in the study, where:

$x_i$  = the vector of covariates for respondent i

$\beta_m$  = the coefficient vector for choice of membership into MASM

J = the number of choices.