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Microinsurance

A Case Study in Cambodia

Abstract

This thesis is the result of a minor field study undertaken during January through March 2008 in rural Cambodia. The study placed the microinsurance scheme operated by a French non-government organization in Cambodia under scrutiny. More specifically, the presence of a possible problem with asymmetric information, and in particular with adverse selection was investigated. In order to identify a possible problem with adverse selection the change in consumption patterns following an unexpected premium increase has been investigated. The data used for the analysis covers a ten month period where the last day of the fifth month marks the day for when the policy change was implemented. It was then the period prior to the policy change that was considered in relation to the period following the policy change. In order to ascertain that there are was no significant factors affecting the findings within the test group a control group was tested parallel throughout the work. The undertaken tests could not at a significant level be used as evidence of adverse selection; however, this is believed be mostly due to the limited time period for which data was available.

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1. Introduction

According to Pauly (1968) all individuals are utility maximisers that are risk averse with the occurrence of an illness being a random event that cannot be controlled when preventative medicines are excluded. Therefore, with uncertainty comes insurance as it can be used to cover for unexpected medical costs and hence provide protection against the element of uncertainty at a preset cost. However, insurance, in the sense that most westerners know it, has not been a readily available alternative for those living just above the poverty line in less developed countries. It is simply too costly in order to be feasible. This is a highly relevant issue since larger parts of the world's population live in poverty or on the verge of it. The situation at hand has caused the emergence of an alternative that can be used to improve the living standards of millions of people in the future, that is microinsurance within the health segment. Microinsurance is a fairly new means of alleviating the burden on the poor that suffer unexpected blows to their financial situation. Hence, microinsurance provides stability in these peoples everyday life in the same sense as a regular insurance scheme does to a person living in a more developed country. The insurance coverage will provide a safety net and effectively provide coverage from the otherwise possibility of falling into the poverty trap. Moreover, as with all insurance markets, microinsurance is exposed to a problem with asymmetric information between policy holders and the insurance company. That is, the policy holder knows more about his/her attitude towards risk than what the insurance company does, which causes a potential problem if the policy holders chooses to act upon this asymmetric information.

The aim of this study is to test if there is a problem with asymmetric information within microinsurance schemes and more specifically to look into a possible problem with adverse selection. Moreover, we wish to determine if the presence of asymmetric information causes the possibility of efficiently running a microinsurance scheme to collapse. Therefore, we aim to answer the following question with our thesis: *is there a problem with adverse selection within microinsurance?*

The reason to why we limit our investigation to only adverse selection and exclude the second part to asymmetric information, moral hazard, is because of the limitations to our data. The

data we have access to covers a specific microinsurance scheme in a province in Cambodia and is composed of consumption for members in the period January through October 2007. Hence, our findings will only be valid for such a scheme as this one.

Furthermore, a person that is a policy holder is more likely to consume health care than a non-policy holder. This is an example of asymmetric information between the policy holder and the insurance provider. Nonetheless, the simple fact that a policy holder consumes more health care than a non-policy holder cannot be used to separate between if it is a case of adverse selection or if it is moral hazard. However, we have been given the unique opportunity to look into the effects of a policy change and more specifically the effect of a premium increase. The premium increase is expected to cause the insurance to be less attractive to relatively healthy individuals and hence cause these to drop out. This should hopefully allow us to identify a possible problem with adverse selection by examining the consumption difference before and after the policy change and then relate this to a control group where no policy change was undertaken. In addition, we will be examining which individuals drop out as a result of the policy change, whether it is a bias in favour of the relatively healthy policy holders or not.

We will start by giving an introduction to the prevailing situation in Cambodia and what the health care situation at hand is like. This will be followed by an empirical and theoretical background where we discuss the different parts of asymmetric information. In addition, we will here give a brief introduction to microinsurance and health insurance. We will then outline the hypothesis that will be used in order to try to answer the posted question. Also, we will describe the method used in greater detail. After outlining our hypothesis and method a section on our actual empirical testing will follow and lastly will finish off by discussing our findings and provide some concluding remarks.

The available literature on microinsurance is much limited. Not many studies have been made of the phenomenon and what has been written is most often case studies that examine and evaluate certain schemes in different parts of the world rather than testing the effects of different alterations to the scheme in itself and hence finding weaknesses. On the other hand, we have encountered numerous studies looking into insurance markets in general and what

problems there are within such. To bring up a few examples; Chiappori and Salanié (2000) and Ma and Brown (2005) can be mentioned. However, we have not encountered any studies of asymmetric information applied on microinsurance markets, which is why we find it interesting to look into the problem of asymmetric information within the Cambodian microinsurance market.

2. Situation in Cambodia

2.1 Present situation

In 2007 the Cambodian economy was just shy of reaching double-digit growth fuelled by strong exports, consumption and private investment as GDP grew an estimated 9.6%.[1] The strongest sectors of the Cambodian economy were found within apparel, agriculture, construction and tourism, which is the now strongest growing sector. When looking at 2008 the outlook is almost as positive with expected growth at 7.5 percent and a continued increase in foreign direct investment. Just over the last three years foreign direct investment has averaged some 6 percent of GDP. In addition, Cambodia is on the verge of commencing underground resource extraction after findings of oil, gas and minerals; something that would provide an additional source of income propelling growth even further. These findings, in combination with sound macroeconomic policies, successful structural reforms and a constantly increasing worldwide interest in the former French colony, has provided a strong base for the emergence of a new successful South-East Asian economy. Moreover, the national poverty rate fell from 47 to 35 percent between 1994 and 2004 and the gross school enrolment rate increased by 124 percent, which is above the average of 104 percent for low-income countries. Also, the infant mortality rate has decreased considerably between 2000 and 2005 from 95 per thousand down to 66 per thousand amongst live births.

However, the completion and literacy rates still remain low in Cambodia despite the improvement in school enrolment and one indicator of development that still is lagging too much is the maternal mortality rate that is not yet on a steady reversal trend, but instead unchanged compared to the last millennium. Decades of war and internal conflict has caused Cambodia to become one of the poorest countries in the world despite its relative abundance

[1] East Asia Update, April 2008.

in natural resources. Also, the number of people in Cambodia living of less than 1USD a day is still very high. Thus, economic growth must not be confused with economic development but should rather be seen as a prerequisite for it. Moreover, in 2007 Transparency International for the first time included Cambodia in its Global Corruption Barometer and Cambodia being a newcomer placed second after Cameroon as most corrupt.[2] This self evidently is not a positive noting for the Cambodian government and it was reported that in 2007 72 percent of Cambodians had to pay a bribe in order to obtain a service. It should also be noted that those that are most likely to have to pay a bribe are the poorest rather than those more privileged. Nonetheless, the economic growth that Cambodia is experiencing should be seen as a key to unlocking the gates into development and effectively an improvement in the living standards for millions of people.

2.2 Health care

In 1996 the government in Cambodia spent only 16.6 million dollars on health care, which equals approximately 1.51 dollars per person and year. The quality of the health care was extremely low and could not cover for basic health care needs. In order to improve the at the time prevailing situation the Ministry of Health in Cambodia, together with the World Health Organization (WHO), started a reform process for the development of health care in Cambodia and since then the health care situation has improved. The main structure of the reform was to enable all people access to health care by ensuring that health facilities had the ability to cover the whole country.

Furthermore, three years after the reform, in 1999, the public spending had increased to 32.73 million dollars, equal to 2.80 dollars per person and year. This may not sound as much but still it is close to a doubling of the 1996 level. In 2003, after further improvements, the public spending was approximately 50 million dollars, equal to 3.50 dollars per person and year (Cambodian Ministry of Health 2003). Figures from the Cambodian Demographic and Health Survey show that child mortality decreased from 12.4 percent in 2000 to 8.3 percent in 2005. Also, the births in a health facility increased from 10 percent in 2000 to 22 percent in 2005 (National Forum on Social Health Protection 2006).

[2] Report on the Transparency International Global Corruption Barometer 2007.

Nonetheless, the current health care situation in Cambodia is still very inadequate, with an out of the pocket expenditure as high as 15 dollars per person and year. This figure should be related to an annual income of approximately 300 dollars per person. The total expenditure on health care in Cambodia is approximately 12 percent of GDP, which is actually double the average expenditure of other countries in the region such as Laos, Vietnam and Thailand. However, out of this expenditure only 17 percent originates from public funds while the remaining 63 percent are from out of pocket spending. Hence, the people in Cambodia carry a large burden of health care costs while having low governmental support. From the increase in public expenditure on health care, only 33 percent has been allocated to the provincial and district health facilities. Therefore, these facilities remain much underutilized, which result in the health professionals earning as little as 30 dollars per month. Since a household needs a minimum income of approximately 100 dollars per month in rural areas and 200 dollars per month in urban areas, the health professionals needs to get the income from a second job or from having a private practice (National Forum on Social Health Protection 2006).

Moreover, as a part of the health reform in Cambodia, the Ministry of Health has started to implement a user fee system to be able to prevent under-the-table payments and also to improve the accountability among the health care providers. In accordance with the introduction of user fees, 99 percent of the revenues shall be kept in the health facility with 50 percent used for operational costs and 49 percent used for salaries. The last 1 percent is being channeled to the National Treasury. The user fees have resulted in increasing health care utilization from an increase in staff attendance as well as through better availability of unexpired medicines. However, problems occur with health professionals being motivated to irrational prescription of drugs which is available at the health centre at the same time as being perceived as ”good care” by the people. The user fee system was introduced without safety nets and with very specific guidelines for exemptions. Also, the health facilities are not given any public remuneration from the exempted patients. Hence, evaluations have shown that the poor are more rarely granted access to health care. The high user fees often result in families being forced to sell productive assets or to be indebted, which increases their vulnerability even further (Cambodian Ministry of Health 2003).

3. Sky - Cambodia

This thesis is based on a minor field study in Cambodia that looked more closely at the microinsurance operations run by Sky-Cambodia (Sky[3]), which is a part of the non-government organization GRET.

GRET is a French non-government organization founded in 1976 and today it undertakes 200 programs among 40 countries in Asia, Africa, Latin America and Europe. The organization employs approximately 500 people that are concerned with the access to essential services, sustainable food and agriculture, institution building, information and communication building, microfinance and small enterprises as well as with public policies and international regulators. GRET has a large number of financial partners, including UNICEF, EU, The World Bank, IFC, USAID, from which they collect an annual budget of 13 million Euros. In 1987 GRET started its operations in Cambodia. One of the first projects implemented was the setting up of a microfinance program and since then the Cambodian office in Phnom Penh has grown to employ roughly 120 people working with the development of agriculture, water sanitation and microinsurance.

Sky was founded in 1998 after findings that a community based health insurance product would be beneficial to protect poor rural families against unexpected health expenses. Cambodia is suffering from being one of the countries in the world where health conditions are the worst and at the same time people spend a large share of their income on health care.[4] The program has two focus points being to secure the incomes of Cambodian households by limiting the economic consequences of large health expenditures (illness and accidents etc.) and to facilitate and encourage these households access to appropriate health care. The microinsurance program was formed to limit the impoverishing effect of health care expenditures, though it will not be able to improve the care for the poorest families since these do not have the possibility to pay a premium even if set at very low levels. However, the Ministry of Health, with support from international donors, have implemented equity funds in order to improve access to affordable health care for the poorest families and in this case Sky will try to build efficient complementarities between the equity funds and their own

[3] Sky is a Khmer acronym for "Sokapheap Krousat Yeugn" which means “Health for our families”.
[4] A caesarean section costs close to 100 USD in Cambodia.

operations when active in the same area. The equity funds could help the pre-identified poorest to pay the premiums instead of cover the whole cost for the health care and in this case they would be able to enhance its outreach considerably.

Within the Sky scheme activity is undertaken in four out of the 24 provinces in Cambodia and also within the capital, Phnom Penh. Each province is divided into operational districts that contain around 100,000 people within each district including nine to 20 health centres. These health centres are each responsible for approximately 10,000 people. However, it should be noted that not all of these are actually Sky members and hence under the protection of the microinsurance scheme. The treatment capacity at the health centres is limited to the most basic injuries, including for example viral deceases. Also, the heath centres are responsible for educating patients about how to recognize symptoms of common illnesses, such as fever. The size of the workforce at each health centres varies; however, roughly three people work at each health centre and their salaries is partially dependent upon the number of patients receiving treatment. All patients that cannot be treated at the local health centre will be referred to the district referral hospital. The district referral hospitals each have the ability to perform either at CPA 1, 2, or 3. CPA 1, or Complementary Package of Activities level 1, is the lowest level of treatment where there are no surgical possibilities whilst at CPA 2 the hospital has limited surgical possibilities. CPA 3 provides the most advanced level of surgery. It should be noted that not all district referral hospitals are actually at the same CPA level. Furthermore, if the injury is of such degree that the district referral hospital cannot treat it, then the patient will be transferred to the provincial referral hospital. All provincial referral hospitals are at CPA 3. Moreover, in some areas there are no or not sufficient district referral hospitals so that patients are directly referred to the provincial referral hospital. It should be clarified that all health facilities are managed by the Cambodian ministry of health and Sky is not involved in any in the management of the health care procedures.

When a Sky member seeks treatment the payment scheme differs depending upon in which district and province the member is a domicile. Hence, the premium is set to comply with the costs imposed on Sky within each specific province. However, the overall set up of the scheme is the same in all districts but two. The most common system is the capitation system at the first two treatment levels; health centre, and district referral hospitals. This system is

based on monthly payments by Sky to the health facilities contracted based on the number of members the microinsurance scheme has in each district and province and hence the predicted treatment consumption. The other payment system, which is only applied in two of the areas in which Sky is present, is one where monthly payments by the capitation system is made to the health centres and the district referral hospitals whilst at the provincial referral hospitals case payments are applied.

Furthermore, Sky uses the premium to cover for mainly four different cost areas. The first being technical costs that includes the operational and administrative costs. The second is the cost for health services that is being paid to the health centres and the district and provincial referral hospitals. Thirdly, Sky has also committed to cover for all transportation costs that are tied to an emergency, such as ambulance costs. Last is the death benefit which Sky pays to the family in case a family member deceases. This cost, however, can vary quite a lot depending on for how long a family has been with the scheme. Also, death benefits cannot be collected for infants. The Sky microinsurance scheme covers all health care, including surgical procedures. The only exception is for chronicle deceases, which is not included in the scheme.

The premium paid by members is set per family and depends on how many dependants there are in each family. Also, members do not face any additional costs for consuming health care. The definition of a family is very broad and can be said to include all people that actually live under the same roof and are part of the same household. The average family in Cambodia has 4.5 members but can often be in numbers twice as high in the rural areas. The table below, table 1, illustrates in riel[5] how high the premium is per month depending on how many family members there are and also on in which district the family lives. The reason why the premiums have such high level of variation is because some of them were set at an early stage when it was not known at what level it really should be set at. Also, in fear of facing extensive dropout rates the premiums have not been raised and this is something that will be more thoroughly examined in this paper, how premium changes affect dropout rates. In order to increase policy holders length of stay with the scheme Sky offer discounts. For example, if paying for five months in advance the policy holder will get an extra month for free and if paying for ten months in advance they will be covered for twelve rather than ten months.

[5] Riel is the Cambodian currency and 4,000 riel is approximately one US dollar.

Table 1: Premium levels in the different zones

District/Family	1 pers	2-4 pers	5-7 pers	8+ pers
Z1 - Rolous	1200	2400	3000	3500
Z2 - Ang Roka	2500	5500	7000	9000
Z3 - Kirivong	2500	5500	7000	9000
Z4 - Kâmpong Thom	4000	7500	9500	11000
Z5 - Kampot	4000	7500	9500	11000
Z6 - Koh Thom	4000	7500	9500	11000

Source: Sky - Cambodia Premium Payment Tables

In order to make sure the health services provided are sufficient and in accordance with Sky's set criterions, quality indicators are being introduced to evaluate the health centres and the district and provincial referral hospitals. This in hand will ascertain that members actually get the appropriate medical treatment they should be able to expect from the microinsurance scheme.

Moreover, to each province where Sky is present a Field Insurance Officer is allocated and s/he is responsible for all the activity within the allotted province and s/he spends roughly half of his/her time in the field visiting members, health centres and government representatives. The work also includes collecting the premiums on the 21st each month from the different field offices and also keeping track of net additions to the number of members within the province. The Field Insurance Officer is assisted by a Field Coordinator in each district and this person is responsible for the day-to-day activities including promotion activities such as coordinating door-to-door visits and also for arranging village meetings where the Sky scheme is presented to the villagers. Assisting the Field Coordinator are three Insurance Agents that each are responsible for three health centres and all the members belonging to these. The Insurance Agents are people from the district in which they work in order to make sure they have local knowledge and that they have some knowledge of what conditions the families within the district are facing. Lastly, Member Facilitators are staff employed half time that are responsible for collecting the premiums from the families each month and also for keeping the records on each family updated in order for the right capitation payments to be made to the authorities.

Sky is in a constant process of extending its operations in Cambodia and a part of this is locating new areas where the microinsurance scheme would be both suitable and feasible. In order to only allocate resources to where they are most efficiently used a thorough evaluation is made of the proposed area prior to any operations are being established. There are two main criterions which Sky evaluates when looking at a new area. Firstly, the level of the present health facilities and these facilities ability to meet the set criterions are examined. Secondly, the overall economic status of the households within the region under scrutiny is being assessed. For example, the number of households that live in poverty and the number of households that could actually afford to pay a premium is assessed.

A major problem facing any organization in Cambodia is that of the rural economic activity having traditionally been heavily characterized by barter economics. In addition to this, the major part of the Cambodian population lives in rural rather than urban areas. Effectively, a problem of low monetarisation has been hindering the development. This, however, has started to become less and less of a problem allowing organizations such as Sky to be able to implement their operations into the rural areas in addition to the urban areas. Another issue that has previously caused a problem is the health sector and how this has been characterized by a high degree of creditisation. This is something that has changed today and has therefore allowed the positive development prevailing today in Cambodia.

4. Theoretical and empirical background

4.1 Microinsurance

Low income households are usually those most vulnerable to both economic shocks and risk. Hence, the importance of insurance to these people can be seen as higher than compared to households more well off that can afford paying unexpected medical bills up front for example. This has caused the emergence of microinsurance, which has the aim to alleviate the financial burden an unexpected cost has to a low income household most likely found in developing countries. Thus, in order to successfully fight off one of the world's largest problems, namely poverty, establishing proper insurance schemes to protect the poor can be considered as a necessity in the strive to reach global equality. This is where microinsurance

can make a difference since it allows the poor to be less exposed to large potential health care costs and hence it offers economic stability and security at a low cost.

In developing countries there is great difficulty in establishing insurance markets that in an efficient manner provides insurance for both the high and low income segments under the same scheme. Focus tends to be on the high income segment only, thus leaving the most vulnerable uninsured. Hence, microinsurance has emerged as a means of providing insurance to this vulnerable low income segment. This segment can be defined as that which is being ignored by the commercial insurance companies according to the Geneva Papers on Risk and Insurance. Effectively, microinsurance is a phenomenon that is mainly found in developing countries.

There are numerous ways of providing a microinsurance service and also decisions must be made concerning whether the scheme should be public, hence provided for by the government, or if instead it should be provided by the private sector. Other issues in connection to establishing a microinsurance scheme are if it should be an upscaling or a downscaling. An upscaling would mean formalising informal insurance schemes, i.e. non-governmental organisations are allowed to enter the market and provide the product to the low income segment. The other alternative, downscaling, is to have the commercial insurance actors provide insurance for the low wage segment. However, due to the low, or even negative, profits within the microinsurance market commercial insurance actors are less likely to be attracted. It must be considered that commercial actors are obliged to maximize share value and this is not something that is easily done when entering the market for microinsurance. Nonetheless, providing microinsurance can be profitable; it is basically a matter of the sheer number of policy holders that an actor can attract. Considering that a majority of the world's population live in poverty the issues of small scale operations should not pose as an obstacle. However, the difficulty lies in establishing a scheme that will function as intended whilst at the same time obliging to the rules and regulations covering the insurance markets of the world. Hence, in order for commercial insurance actors to take on microinsurance policy holders they must adapt to new rules and regulations since these tend to differ from the actors home and other markets in the developed parts of the world.

Microinsurance can be defined in countless number of ways. Some of the simpler definitions can be risk-pooling instrument for the protection for low income households, insurance with small benefits, insurance involving low level of premium, or insurance for people working in the informal economy. However, we have decided to accept the definition made by the International Association of Insurance Supervisors (IAIS). "Microinsurance is insurance that is accessed by low-income population, provided by a variety of different entities, but run in accordance with generally accepted insurance practices (…). Importantly this means that the risk insured under a microinsurance policy is managed based on insurance principles and funded by premiums."[6] IAIS is an organization representing insurance regulators in almost 140 countries that in total constitutes 97 percent of the world's insurance premiums.

Organisations running microinsurance schemes tend to have restricted access to capital; hence, it is of essence that costs are kept at a minimum in order for the premiums to be kept as low as possible and hence for the target group to be able to afford the premium. Unless premiums are low enough the scheme provider will not be able to attract sufficient numbers of policy holders, which effectively causes the scheme to fail. When assessing microinsurance schemes, a constantly reoccurring point of attention and importance for a successful scheme is, as mentioned, that of share numbers, meaning that a high number of policy holders is essential for a successful implementation. This, obviously, does not come straight away but rather it will take time to establish a wide trust in the scheme that eventually should make it less dependent upon external financial support. Moreover, in order to keep costs down the product must be kept simple and be maintainable at a low cost. Also, in order to be able to keep its clients a microinsurance provider must ascertain that it is not excessively difficult to make claims for the policy holders. The reason being, if a policy holder finds it too difficult to make claims s/he will not consider it being worthwhile to pay the premium and hence be part of the scheme.

Microinsurance programs can cover several areas such as health, agriculture and livestock, life, and property. The focus in this paper, however, will be on microinsurance within the health segment. Effectively, this covers illness related issues but with certain limitations such as death benefits for infant mortalities is not covered for and chronic diseases such as asthma

[6] *Issues in regulation and supervision of microinsurance*.

are not to mention a few exemptions. Furthermore, it should be noted that microinsurance is not a precisely defined product or range of products that can only be provided by certain organisations. Rather, microinsurance is simply the provision of financial cover to the low income segment of the market regardless of who does it and how it is financed.

Furthermore, microinsurance schemes can be found in numerous countries around the world and in almost as many forms. However, they all have the common denominator that they are all found in developing countries and most commonly run by an organisation from the developed world. The most number of organisations working with microinsurance is found in Africa with Asia being the second most frequent attractor of such schemes. The table below gives an indication of what countries are enjoying microinsurance schemes in one form or another regardless of what area the scheme is active within.

Table 2: Microinsurance around the world

Institution	Start of scheme	Country	Persons covered	Segment
Malawi Union of Savings and Credit Cooperatives	1980	Malawi	56,000 (2003)	Life
Pulse Holdings Ltd.	2002	Zambia	2,200 (2003)	Life
Seguro Integral	2002	Paraguay	15,600 (2002)	Health
Seguro Materno – Infantil	1998-2003	Peru	350,000 (2001)	Health
Shepherd	1999	India	15,000 (2004)	Life, livestock and health
Society for Social Services	1996	Bangladesh	27,000 families (2004)	Health
Tao Yeu May's Mutual Assistance Fund	1996	Vietnam	68,000 (2004)	Life
Yeshasvini Trust	2002	India	1,450,000 (2005)	Health
La Equidad Seguros	1970	Colombia	30,000 (2004)	Life

Source: Protecting the poor - A microinsurance compendium.

4.2 Health insurance

The main reason for having health insurance is to spread the risk of incurring large health care expenditures. By being insured the policy holder will only pay a small part of such expenses, which in most cases are unpredictable (Ma and Riordan 2002). Thus, health insurance should increase the welfare of individuals and eventually society as a whole and ultimately create a pareto efficient equilibrium. However, with regard to health insurance this becomes a complicated question. Arrow (1963) discusses how a change from a pareto efficient

equilibrium actually can be beneficial despite the fact that some consumers are made worse off. This will be the case when a change is such that the benefit to those that gain outweighs the loss incurred on those that are made worse off. Effectively, the outcome of a departure from the pareto efficient equilibrium will be that the gains exceeds the losses.

Health care is much different from other services since its demand is unpredictable. Compared with, for example, food and clothes, which holds a fairly regular consumption pattern, health care faces an irregular and unpredictable demand. Furthermore, illness implies a cost in itself since it could prevent a person from earning sufficient income and thereby the logic behind consumption differs (Arrow 1963). Another problem with health care is the quality of the care. Since the policy holder has no possibility to know about the provided service before seeking it, it is impossible to know whether the quality of the service is satisfactory and this uncertainty in itself implies another cost (Arrow 1963). This however, does only pose as a problem when the insurers' supply of health care is distinguished from the health care that the policy holder would utilize without having the health insurance.

The health insurance business has undergone a change from being a system in which it is under demand management into a supply management or a managed care system (Ma and Riordan 2002). A demand management system, which is becoming less and less frequently used, is based on copayments, deductibles and other kinds of coverage limitations to the health care providers in order to control the level of care provided. This kind of system causes policy holders to under-consume health care since they feel they wish to consume their "share" only when it is really needed. Effectively, this will lower the premiums paid since less and less claims are being made, which in hand causes the risk levels to increase as the exposure to bad health increase even further as consumption is lessened.

The supply management or managed care system[7] on the other hand is using different schemes to give health care providers financial incentives to provide good and sufficient care to policy holders. Such schemes can include prospective payments, various cost sharing

[7] "Managed Care is an overall concept for numerous care systems in which the classic separation between cost units and service providers is relaxed or set aside. Managed Care is a generic term for ,,controlled care", i.e. the cost unit, for example a sickness fund, controls the business management of medical care." (Greiner et al. 2001).

contracts to cover for more expensive treatments, and capitation payments. This kind of provision has become the more frequently used system as the benefits compared to the demand management system are much greater and also the problems are less extensive.

Moreover, during the pilot run of the microinsurance scheme, Sky implemented a demand management system; however, it was found that this was not an efficient solution since the problems discussed above arose. Instead Sky opted for the managed care system when the scheme was introduced in its current form and most of the previous problems could hence be dealt with. Whether the new system has allowed Sky to avert the most common problems insurance companies face is what is under scrutiny in this thesis.

4.3 Asymmetric Information

The main problem with health insurance originates in asymmetric information between the policy holder and the insurer. This means that policy holders may hold private information concerning their specific risk type, their actions and their actual health condition. This is what creates the asymmetry between policy holder and the insurer, which in hand causes the pricing of insurance to become difficult. As Cardon and Hendel (2001) discusses, the private information is only available to the insurer when accidents occur and claims are being made and it can only be used as a point of reference for future contracts. As Stiglitz (1988) discusses, the behaviour of the policy holder is either to costly or impossible to monitor. Hence, the benefit from monitoring the policy holder would be offset by its cost, even if it was actually possible to observe. The private information may provide the policy holder with hidden incentives which could threat the sustainability of the insurance. If the policy holders act upon the private information it might be impossible to supply a sustainable, efficient insurance with a complete coverage. Ma and Riordan (2002) argue that insurance introduces incentive towards exaggerated consumption, which has the consequence that asymmetric information results in market failure and inefficient markets. Eventually this asymmetry results in *moral hazard* and/or *adverse selection* problems. This poses as a dilemma when premiums are to be set; therefore, moral hazard and adverse selection will both in turn be discussed as they may both render a market failure. However, the empirical investigation undertaken in this thesis will have its focus on adverse selection since a moral hazard problem in itself cannot be identified within the insurance scheme under scrutiny. Nonetheless, it is

essential with a basic understanding of the concept of moral hazard to understand the complete problem facing a microinsurance provider.

4.3.1 Moral hazard

Even though insurance is regarded as spreading risk and hence reducing risk for individuals, it is also well known that insurance can induce moral hazards and thereby increase the level of risk (Eisenhauer 2004). The problem of the policy holder having private information outlined above may actually causes a change in the behaviour of the policy holder since the premium paid does not have to possibility to include this factor when being priced. Marshall (1976) describes moral hazard as excessive expenditure due to eligibility for insurance benefits. Since the policy holder is subsidized in his spending on health care he will continue his consumption even after the marginal benefit falls below the marginal cost. By taking this view the social cost of moral hazard could be seen as a dead weight loss. Pauly (1968) states, in contradiction to other economist (Arrow 1968) that moral hazard is not a moral or ethical problem, but rather that moral hazard is an example of rational behaviour. Since the policy holders' cost of consuming the health care is spread over all of the other policy holders, s/he is not prompted to restrain his/her consumption. If moral hazard is a problem of upholding generally accepted moral qualities, or if it is rational economic behaviour, will however not have any effect on the study. An additional, and somewhat more explanatory, view of moral hazard is given by Grubel (1971), "Moral hazard (...) refers to the generally well known empirical phenomenon that a group of persons which is insured against a certain risk tends to become victimized by the risk more often or more severely than a comparable group not insured."

The central part of the problem with moral hazard is that policy holders are given a possibility to act upon private information not observable by the insurance provider, which is asymmetric information. This causes a problem for the insurance scheme since it cannot base its pricing on unknown information. This may in the end add up to a market failure. There is mainly two ways that the policy holder can act upon the private information. First, there is a risk of moral hazard ex ante where those maximising their utility will substitute insurance for precautionary activities (Eisenhauer 2004). Secondly, there is a risk of moral hazard ex post which is

implied by the increasing incentives for policy holders to consume an excessive amount of health care only from the price being lower (McGuire 1997).

4.3.2 Adverse selection

According to Cardon and Hendel (2001) the evidence on the sheer existence of adverse selection in health insurance markets is both scarce and contradictory, which may give rise to confusion. Nonetheless, what is evident, regardless of any findings, is that adverse selection poses as an ever present problem for any insurer. Moreover, since the policy holder may have information about their health state that is private or unobservable, the insurance market is likely to suffer from an adverse selection problem with the effect being market failure (Rothschild and Stiglitz, 1976). Adverse selection, in itself, is present when an individual that is more likely to need health care will purchase a health insurance with larger coverage (Cardon and Hendel 2001). Perhaps an easier definition would be the tendency that people with larger risk is likelier to buy health insurance or at least to buy more of it than those less likely to need it (Cummings, et al., 1982). Hence, the adverse selection, which originates in asymmetric information, is in favour of the buyer.

There are two kinds of insurance markets: unregulated and regulated, with the Sky scheme being an example of the latter. The unregulated market will be one where premiums are set according to the policy holder's risk class, which could be based on age or previous claims made with the effect that younger policy holders will face lower premiums than older policy holder that are more likely to make claims. Within the Sky insurance scheme the premium is the same regardless of a persons´ risk level. This effectively causes a situation in which the healthier, most likely the younger, are subsidising the health care treatment of the older policy holders that tend to make more claims. The outcome of this may be what Buchmueller and DiNardo (2002) refer to as the "adverse selection death spiral". This is when the younger policy holders feel that they are carrying an uneven burden from the elderly as they have to pay rates that are used to cover for those making more claims. The outcome of this will be a high number of drop outs amongst the younger, which in hand causes the premium to increase even further as the source of subsidisation is being lost. Therefore, an insurance plan that is more attractive to high risk individuals will suffer from the "adverse selection death spiral".

Moreover, findings by Cardon and Hendel (2001) show that healthier individuals are less inclined to attain a health insurance than what individuals with worse health conditions are, which is in line with Buchmueller and DiNardo's "adverse selection death spiral" theory. A study by Akerlof (1970) shows a theoretical view of the pattern from adverse selection. In his study Akerlof states an example where the insurer has no possibility of distinguishing between individuals experiencing high or low risk for illness. The insurer, however, knows what the average consumption of the policy holder is and the premium is set at this level. Since the cost of the premium gives incentive for more high risk individuals to purchase the insurance, the premium is increased and hence results in lower risk individuals dropping out of the insurance scheme. The process continues until only the highest risk-baring individuals purchase the insurance at a very high premium and thereafter the insurance scheme will collapse. Hence, if adverse selection is detected in insurance schemes it holds a larger risk of failure. However, the empirical evidence for adverse selection is scarce. Studies made by Phelps (1976) could not find any systematic relation between the insurance that individual choose and their health condition.

For a health insurance scheme to work effectively, it needs to be both efficient and in a stable equilibrium. There is always going to be problems with asymmetric information in an insurance market since it would be impossible for the insurer to have all information on individuals readily available without a high cost being incurred. However, it is most important to evaluate if the asymmetric information gives source to moral hazard or adverse selection problems, or possibly both, because if this is the case the insurance scheme will default in the long run. Furthermore, it is important to try to distinguish the two problems from each other, with the reason being that they require different actions in order for them to be dealt with.

6. Method and Hypothesis

6.1 Empirical strategy and theoretical models

Both moral hazard and adverse selection give rise to a positive correlation between having insurance and utilizing health care, that is Corr(Insurance, Health care $\mid$ X), were X is the observable risk factor that is used to price the insurance. In the Sky scheme, however, the risk factor is not readily observable and all premiums are set at the same level in a specific region

based on costs incurred on Sky. It is important to note that the correlation originates from different factors depending on whether the correlation derives from adverse selection or moral hazard. With moral hazard the correlation originates from decreasing incentives to take care of your health, as well as increasing incentives to seek health care. Both of these effects results in an increased demand for health care. Insurance for health care thereby serves as a causal effect on the utilization of health care. With adverse selection the correlation originates from the fact that individuals with a higher probability of needing health care in the future will be more prone to buy the insurance.

The complexity lies in separating the effect of moral hazard and adverse selection. The reason for this is that both effects derive from the fact that the policy holders act upon private information, which is not observable by the insurer. Common ways of studying the problems with adverse selection and moral hazard is either to observe a proxy for private information or to study situations where some of the policy holders face modified incentives. In our case the latter will be used through observing a policy change in the form of an increased premium for some of the policy holders while holding it constant for the remaining. The policy change will give us a possibility to observe how the behaviour of the policy holders that faced the policy change differs from the behaviour of the policy holders that did not face the policy change.
The premium was increased in zone 2 last of May 2007, while it was held constant in zone 1. This change is outlined in the table below.

Table 3: Premium change in zone 2

Price starting	1 pers	2-4 pers	5-7 pers	8+ pers
01-06-05	2000	4500	6000	7000
31-05-07	2500	5500	7000	9000

Source: Sky - Cambodia

Since zone 1 and zone 2 is comparable in terms of seasonal effects the premium increase in zone 2 gives us a possibility to perform a policy experiment where it will be possible to study the effects of a policy change in relation to a control group. The empirical setup gives us a rare opportunity to study the presence of adverse selection. Similar data has been used by

Buchmueller and DiNardo (2002); however, our data is more simplified and sterile, and hence gives us a good possibility to obtain robust results.

The policy change should presumably have implications on the incentives of policy holders. A low-risk policy holder, that is a policy holder with low probability of utilizing the insurance scheme, should find it less beneficial to stay within the scheme after the premium is increased. Hence, the relatively healthier policy holders would potentially drop out of the scheme and thereby causing the health care consumption to increase after the premium increase. It should also be that the consumption of the policy holders that do not drop out after the policy change is higher than for those policy holders dropping out. If this is not the case, then it could be that a psychological effect is present where the policy holders increase their consumption just from the price being higher. Since there are no case payments in the Sky microinsurance scheme, there should not be any incentives to change the consumption of health care as a result from the policy change. That is, policy holders that do not drop out of the insurance scheme as a result of the policy change should not increase their consumption after the premium increase.

In order to study a potential problem with adverse selection in the Sky scheme we have chosen to investigate three hypotheses. To test the validity of our hypothesis we will perform a number of tests from which results we will be able to draw further conclusions regarding the problem with adverse selection. Our first hypothesis (*Hypothesis 1*) is that policy holders will consume more health care than non-policy holders. Here we test if there is any support for asymmetric information within the microinsurance. The reason for us believing this is because an individual that benefits from being insured will face a lower marginal cost when seeking health care. That is, policy holders have larger incentives to use health care than non-policy holders. Also we believe that individuals with a higher risk of needing health care will be more prone to buy the insurance. Our second hypothesis (*Hypothesis 2*) is that the mean consumption will be higher after the premium increase than before the premium increase in zone 2, our test group. We believe that when the premium is increased, low consuming policy holders will tend to drop out of the microinsurance scheme. The reason behind is that they no longer feel that it is economically efficient to stay on the scheme. That is, when low consuming policy holders drop out, the mean consumption will increase. However, the result might be affected by a potential seasonal effect, which will be solved for using a control

group. (*Hypothesis 3*) is that the mean consumption during the period January through May 2007 will be higher for those that did not choose to drop out of the scheme after the premium increase than for those that did drop out. The reason for testing this is because we want to control for the effect that policy holders not dropping out of the scheme start consuming more after the premium increase, as a psychological effect of utilizing more just because of the higher price.

Moreover, the tests will be performed both for the change in cost of consumption and for the change in the number of visits since there is not always perfect correlation between the cost and number of visits. To run these tests we will be using t-tests and rank sum tests. T-tests are used to compare the means of two samples where the variables are either independent or dependent. The underlying assumption for these tests is that the population distribution of the differences between the variables is normally distributed. Also, both tests are two-tailed tests. In equation 1 it is assumed that there are two different means for the two unequal samples and that the variance is assumed to be equal.

Equation 1: $$t = \frac{\overline{X}_1 - \overline{X}_2}{s_{\overline{X}_1 - \overline{X}_2}} \quad \textbf{where} \quad s_{\overline{X}_1 - \overline{X}_2} = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

s^2 = unbiased estimator of the variance for the two samples
n = number of people in each group
$n-1$ = is the number of degrees of freedom for either of the two groups

In equation 2 the assumptions are the same as in equation 1 apart from the variance is assumed to be unequal instead.

Equation 2: $$t = \frac{\overline{X}_1 - \overline{X}_2}{s_{\overline{X}_1 - \overline{X}_2}} \quad \textbf{where} \quad s_{\overline{X}_1 - \overline{X}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

s^2 = unbiased estimator of the variance for the two samples
n = number of people in each group

The number of degrees of freedom for the second equation is given by:

Equation 3:
$$d.f. = \frac{(s_1^2/N_1 + s_2^2/N)^2}{(s_1^2/N_1)/(N_1-1) + (s_2^2/N_2)/(N_2-1)}$$

The second test we undertake is the Mann-Whitney U test, which compares the medians of two independent samples. This test is a good alternative to the t-test when you have extreme outliers affecting the result since medians are being compared rather than means. The distribution of the Mann-Whitney U test approaches a normal distribution rather quickly as the sample size is increased and given our large sample sizes a normal distribution can be assumed without any limitations. In the equation below the test variables are outlined.

Equation 4:
$$Z = \frac{U - \mu_U}{\sigma_U}$$

Where

1) $U = n_1 n_2 + \frac{n_1(n_1+n_2)}{2} - R_1$, is the Mann-Whitney U statistic

2) $\mu_U = \frac{n_1 n_2}{2}$, is the mean for the two samples combined

3) σ_U is the standard deviation of the combined samples

The before and after estimates will be used in testing hypothesis 2 and this can be found under empirical results. Additional information about the presence of asymmetric information and especially the problem with adverse selection could be found by observing which individuals, high or low risk, that tend to drop out of the insurance after a premium increase. Even though there is a fairly good chance of proving existence of asymmetric information in a health insurance, it is theoretically difficult to separate the effects of moral hazard and adverse selection (Chiappori and Salanié 2000). The comparative statistics of previous consumption between drop outs and non-drop outs can be found in the last part of the section for empirical testing, further comments on drop out data.

6.2 Data and comparability

The data being analysed in this thesis is, in its full and complete form, attained from Sky. Sky hold records of all their 13,000 members showing in which region they are domiciles, what

kind of health care they have consumed, what premiums they pay, and for how long they have been members of the scheme. The data contains both quantitative figures, such as level of health care consumed, and qualitative figures such as gender and age. It should be noted that the information about consumption is manually recorded by the staff at the health facilities which are regulated by the Cambodian Ministry of Health. That is, the data could contain errors, which has to be considered when analyzing future test results. However, since the capitation paid by Sky to the health facilities is based on these records, the incentive not to enter the data should be fairly low working in favour of our findings. All the members have a member code which is being used in order for us to be able to handle the material without breaching the members' integrity. Moreover, the specific data that was used in this thesis was extracted from the Sky database between the January 18 and March 12 2008 and covers Sky's operations for 2005, 2006 and 2007. However, the major part of the tests will specifically use the data from zones 1 and 2 on consumption for 2007, the reason being that individual data was first being recorded in January 2007.

Furthermore, the data used for non-members was obtained from the Cambodian Ministry of Health and is aggregated on family level. The average family in Cambodia consists of 4.7 members and this is close to what is found amongst the families that are members. Moreover, zone 1 has been chosen as our test group since it was the only zone in which no alterations had been made to the policy or scheme in general. In zone 1 there is only one health centre that is connected to the Sky scheme as Sky does not cover the whole province in zone 1. Hence, this health centre is responsible for all members in zone 1. In addition, there is only a provincial hospital rather than the three step model found in zone 2; however, we do not see this as a potential reason for differences in consumption patterns. In zone 2 there are nine health centres responsible for all members and three referral hospital and then the provincial hospital covering all major procedures within the zone. For our tests we are using the data gathered at all instances and not only at the health centres since we find this to give the most valid picture of the situation.

Moreover, since the individual data is only available for 2007 a possible seasonal effect could cause an exaggerated result of asymmetric information in the tests. To solve for this a control group, zone 1, is being used. Our main assumption is that the seasonal effect in the two investigated zones is the same. This assumption is based on the fact that zone 1 is located in

the Kandal Province and zone 2 is located in the Takeo Province, which are both located in southern Cambodia. Their geographical locations can be seen on the map in appendix IV. Individuals in the two zones face the same health risks and their income is approximately the same[8]. Zone 1 includes 569 individuals in period 1 and 511 in period 2. Zone 2 covers 4,370 individuals in the first period and 3,171 individuals in the second period. This should give us large enough samples to give us a fairly robust test results. Furthermore, in appendix III an outline is given over the history of the number of members for the years 2005, 2006 and 2007. Data is shown for both zones 1 and 2 and is divided into monthly observations.

When Sky started supplying the insurance in zone 2, the premium was set at a higher level than in the already established insurance scheme in zone 1. The reason for this being that Sky faced higher costs in zone 2. In the end of May 2007 the premium was increased in zone 2 (see table 3 above) while it was held constant for the whole year in zone 1. The reason for the increase in the price of the premium was that Sky could not cover its cost for the operations within zone 2 and hence the premium increase was necessary to maintain operations without subsidising from other more profitable zones. In zone 1 Sky has cut its cost by scaling down on marketing and employees starting from the middle of 2007. The reason for doing this is because Sky does not see an equally good opportunity to extend its operations in zone 1 as in zone 2. This can be seen in figures 1 and 2 in appendix III where the number of members between 2005 and 2007 has increased in zone 2 and decreased in zone 1 prior to the change of marketing policy.

[8] Information from Sky´s evaluation form, which is based on income levels, health facilities available and general standard of the region.

7. Empirical testing

In this section we will perform a number of different tests that each focus on somewhat different aspects of the microinsurance scheme and evaluate each of them in turn in order to determine their validity and applicability. First, we will compare the mean consumption for members with the mean consumption for non-members, which would give us a more general indication about a possible problem with asymmetric information. Secondly, we will use t-tests and rank sum tests to look at the change in the mean and median consumption between the period before and after the premium increase was undertaken in zone 2. We will also perform difference in difference tests where we use a control group to solve for seasonal effects. Thirdly, we will test if the policy holders that stayed as members after the policy change increased their consumption following a psychological effect from the price increase. Lastly, we will show descriptive data comparing the previous consumption of individuals that have dropped out with those not dropping out.

7.1 Hypothesis 1: Correlation between being insured and utilizing health care

Our first prediction is that individuals that are policy holders have a greater tendency to consume health care compared to individuals that are non-policy holders and effectively do not face limited costs to their health care consumption. Hence, the null hypothesis that we will try to reject is that policy holders do not consume more health care that non-policy holders. Accordingly, the alternative hypothesis is that policy holders consume more health care than non-policy holders. Formally stated:

$$H0: P \leq NP \text{ and } H1: P > NP$$

where P is equal to consumption for policy holders and NP is equal to consumption for non-policy holders. To investigate whether we can reject the null hypothesis we study data on previous consumption for both members and non-members over a period from January 2006 to November 2007.

Table 4: Target group and number of member families for each health center in zone 2

Zone 2 health centres	Target group[9]	No. of families Jan 2006	No. of members Nov 2007
Ang Roka	2,066	80	167
Ang Ta Som	2,244	90	138
Prey Chour	1,585	69	113
Prey Sbat	1,881	110	80
Kus	2,062	46	129
Trapem	2,043	47	83
Tramkak	2,180	70	141
Traipang Andeuk	2,308	43	61
Traipang Pring	1,562	41	87

Source: Sky – Cambodia and Cambodian Ministry of Health

Data includes total number of visits each month for both policy holders and non-policy holders and by comparing the average visit per family for the two groups we can get an indication of whether the insurance enhances the use of health care, that is: if the correlation between having insurance and using health care is larger than zero.

In figure 1 in appendix I it is possible to see that the average number of visits per member family was approximately three times the average for non-members. Hence, we get a fairly good indication that member families are more prone to use the health centre than those families that are not members of the scheme. The null hypothesis that policy holders do not consume more health care than non-policy holder can thereby be rejected and we get an indication of a problem with asymmetric information. However, from figure 1 in appendix I it is also possible to see that there are greater fluctuations for policy holders than for non-policy holders, the reason for this is presumed to be the smaller sample size for the policy holders.

The result can be seen as fairly easy to predict since the marginal cost of consuming health care once a person is a member of the scheme is zero. However, the absolute majority of the members are farmers and consider it a large problem being away from home, which thereby makes visiting a health care facility costly in terms of an opportunity cost being placed on

[9] The target group for each health center is equal to the total households in the region less the households that are eligible to equity funds due to their limited economic situation.

them. A more detailed overview of the average consumption can be seen in table 1a-i in appendix I.

Moreover, the test has some limitations. First, it should be noted that the result is limited to the assumption that the size of member families and non-member families are equal. This limitation should however not be of any great influence since the sample of families is large. The second limitation is that our data is compiled manually by the different health facilities, which makes it difficult for us to validate its accuracy. The test indicates that there is asymmetric information in the insurance; however, we have to do further tests to see if there is a problem with adverse selection.

7.2 Hypothesis 2: Testing for change in mean consumption

Our second prediction is that the premium increase will cause the mean consumption of health care and the mean number of visits to increase in zone 2. If the mean consumption has increased it might be a problem with adverse selection, that is, due to drop out of low-risk individuals the share of high-risk individuals might have increased. In order to investigate this we look at two hypothesis, 2a and 2b, studying the mean cost of consumption and the mean number of visits respectively. Both of the hypotheses will be tested using two sample independent t-tests and rank sum tests. The reason for not using paired sample t-test is because the samples are not the same between the two periods since some have dropped out after the premium was increased in May 2007. Hence, it could be seen as the samples are randomly selected. In addition to the above mentioned tests we will undertake difference in difference tests where we relate the mean value in period 1 to the observed values in period 2. The reason for this is to give account for a possible seasonal effect that may affect our results.

For hypothesis 2a the null hypothesis that we will try to reject is that the mean cost of consumption will not change after the premium increase. Accordingly, our alternative hypothesis is that the mean cost of consumption will change after the premium increase. Stated formally:

$$H0:\ \overline{Y}_t = \overline{Y}_{t+1} \text{ and } H1:\ \overline{Y}_t \neq \overline{Y}_{t+1}$$

here $\overline{Y}_t$ is the mean cost of consumption before the premium increase, that is, between January and May 2007 and $\overline{Y}_{t+1}$ is the mean cost of consumption after the premium increase ,that is, between June and October 2007.

For hypothesis 2b the null hypothesis, which we will try to reject, is that the mean number of visits will not have changed after the premium increase. Hence, our alternative hypothesis is that the mean number of visits will have changed after the premium increase. Stated formally:

$$H0:\ \overline{V}_t = \overline{V}_{t+1}\ \ and\ H1:\ \overline{V}_t \neq \overline{V}_{t+1}$$

where $\overline{V}_t$ is the mean number of visits before the premium increase, that is between January and May 2007 and $\overline{V}_{t+1}$ is the mean number of visits after the premium increase, that is between June and October 2007.

In order to investigate the accuracy of our prediction we will compare the mean consumption in the period before and after the premium increase. The mean consumption for the period before the premium increased is based on a sample of 4,371 individuals, which is the total number of members in zone 2 between January and May in 2007. The mean consumption for the period after the premium increase is based on a sample of 3,172 individuals, which is the total numbers of members in zone 2 between June and October in 2007. It should be noted that those members being included in the study were all members in January 2007 and all new members after January 2007 are being excluded. By using a before and after estimate we are able to see if the mean consumption has increased during the period. If the mean consumption has increased between the periods this would give an indication that low-risk individuals tend to drop out as a result of the premium increase. The tests are constructed as follows:

$$\Delta\overline{Y} = \overline{Y}_{t+1} - \overline{Y}_t\ \ and\ \Delta\overline{V} = \overline{V}_{t+1} - \overline{V}_t$$

where ΔY is the mean difference in cost of consumption between the period before and after the premium increase, $\overline{Y}_{t+1}$ is the mean cost of consumption after the premium increase and $\overline{Y}_t$ is the mean cost of consumption before the premium increase. $\Delta\overline{V}$ is the mean difference in number of visits between the period before and after the premium increase, $\overline{V}_{t+1}$ is the mean

number of visits after the premium increase and $\overline{V}_t$ is the mean number of visits before the premium increase.

When performing the t-test for hypothesis 2a, where the cost change in cost is being investigated, we did not obtain significant results and hence could not reject the null hypothesis. When performing the t-test for visits in hypothesis 2b we once again cannot reject the null hypothesis as the test results are not significant. The results can be seen in table 5 through 8 below. The rank sum test, however, showed stronger results and the null hypothesis could be rejected on a five percent level for cost (p= 0.029) and on a ten percent level for visits (p= 0.061). The results are shown in table 9 through 12 below. Our suggested explanation to the results being significant in the rank sum test but not in the t-tests is that our samples suffer from large outliers. Interpreting the result we see that the consumption increased between period 1 and period 2, both in terms of cost of consumption and number of visits, with the most substantial increase in number of visits.

T-test comparing cost of consumption before and after premium increase

Table 5: Data descriptives

	Zone 2: Period	N	Mean	Std. Deviation	Std. Error Mean
Zone 2: Cost	1	4370	4607,00	22745,478	344,076
	2	3171	5130,72	22239,917	394,944

Period 1 includes observations between January - May 2007 and period 2 include observations from June through October 2007. N is the number of observations, in this case individual members.

Table 6: Results from t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Zone 2: Cost	Eq. var. assumed	1,401	,237	-,996	7539	,319	-523,714	525,677	-1554,188	506,761
	Eq. var. not assumed			-1,0	6917	,317	-523,714	523,802	-1550,527	503,099

The table presents the result from the t-test, which is being used to compare the mean of two populations. The t-value is -0,996 (P-value of 0,319), which shows a statistically insignificant difference between the underlying distributions of cost of consumption in period 1 and cost of consumption in period.

T-test comparing number of visits before and after premium increase

Table 7: Data descriptives

	Zone 2: Period	N	Mean	Std. Deviation	Std. Error Mean
Zone 2: Visits	1	4370	1,99	3,154	,048
	2	3171	2,10	3,170	,056

Period 1 includes observations from January through May 2007 and period 2 include observations from June through October 2007. N is the number of observations, in this case individual members.

Table 8: Results from t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Zone 2: Visits	Eq. var. assumed	3,145	,076	-1,54	7539	,123	-,114	,074	-,258	,031
	Eq. var. not assumed			-1,54	6810	,123	-,114	,074	-,259	,031

The table presents the result from the t-test, which is being used to compare the mean of two populations. The t-value is -1,54 (P-value of 0,123) which shows a statistically significant difference between the underlying distributions of number of visits in period 1 and number of visits in period 2.

Rank sum test comparing cost of consumption between drop outs and non-drop outs

Table 9: Data descriptives

	Zone 2: Period	N	Mean Rank	Sum of Ranks
Zone 2: Cost	1	4370	3726,39	16284314,50
	2	3171	3832,48	12152796,50
	Total	7541		

Period 1 includes observations from January through May 2007. N shows the number of families that dropped out after the premium increase as well as the number of families that did not drop out after the premium increase.

Table 10: Results from rank sum test

	Zone 2: Cost
Mann-Whitney U	6733679,50
Wilcoxon W	16284314,5
Z	-2,182
Asymp. Sig. (2-tailed)	,029

The table presents the result from the rank sum test, which is being used to compare the medians of two populations. The results suggest that there is a statistically significant difference in the number of visits between period 1 and period 2 (Z = -2.182 and P-value = 0.029).

Rank sum test comparing number of visits between drop outs and non-drop outs

Table 11: Data descriptives

	Zone 2: Period	N	Mean Rank	Sum of Ranks
Zone 2: Visits	1	4370	3732,80	16312350,00
	2	3171	3823,64	12124761,00
	Total	7541		

Period 1 includes observations from January through May 2007. N shows the number of families that dropped out after the premium increase as well as the number of families that did not drop out after the premium increase.

Table 12: Results from rank sum test

	Zone 2: Visits
Mann-Whitney U	6761715,000
Wilcoxon W	16312350,00
Z	-1,872
Asymp. Sig. (2-tailed)	,061

The table presents the result from the rank sum test, which is being used to compare the medians of two populations. The results suggest that there is a statistically significant difference in the number of visits between period 1 and period 2 (Z = -1.872. and P-value = 0.061).

Furthermore, it is difficult to reach any firm conclusions from these results, since they can potentially be either exaggerated or understated due to a possible seasonal effect. To solve for this the change in consumption and number of visits will be compared with our control group. However, the tests depend on the assumption that the seasonal effect is the same in the test group and the control group. That is, if there had been no policy change in zone 2, the change in consumption would be exactly the same in both zones. This is a critical and limiting assumption, but we feel confident to stress that we see the two groups as very similar, which has been further discussed in section 6.2 data and comparability. The tests will be done in accordance with a difference in difference estimator, which is shown below:

Equation 5: $$DiD = (A - B) - (C - D)$$

where A = mean consumption (visits or cost) in zone two, period two divided by the mean consumption (visits or cost) in zone 2, period 1.

B = mean consumption (visits or cost) in zone 2, period 1

C = mean consumption (visits or cost) in zone 1, period 2 divided by the mean consumption (visits or cost) in zone 1, period 1

D = mean consumption (visits or cost) in zone 1 period 1

Since some of the policy holders drop out of the scheme after the premium increase it was not possible to use matched pairs when performing the difference in difference tests. Also we wanted to use relative change instead of change in absolute terms, since the consumption in the control group, zone 1, was larger than for the test group, zone 2, in period 1. We use the mean consumption in period 1 as an approximate when calculating the change in consumption. That is, we divide the consumption for visits and cost in period 2 with the mean consumption in period 1 to measure the change in consumption.

To see whether the results are statistically significant we also consider the standard error, which is calculated as follows:

Equation 6:
$$SE = \sqrt{(SE(A)^2 + SE(B)^2 + SE(C)^2 + SE(D)^2)}$$

When performing the test for number of visits we got the following result:

$$\text{DiD} = (1.1137 - 1) - (0.9766 - 1) = 0.1371$$

$$\text{SE} = \sqrt{(0.0856)^2 + (0)^2 + (0.0676)^2 + (0)^2} = 0.1091$$

Looking at the results we see that the change in number of visits arrived at the expected sign and was fairly significant with a standard error of 0.1091. Hence, when taking the seasonal effect into account we get fairly robust results for an increase in the number of visits following the policy change.

When performing the test for cost we got the following results:

$$\text{DiD} = (1.0572 - 1) - (1.1314 - 1) = -0.0742$$

$$\text{SE} = \sqrt{(0.0283)^2 + (0)^2 + (0.0527)^2 + (0)^2} = 0.0598$$

Looking at the result for the cost, we see that the test arrived at the unexpected sign and also the result seems fairly robust considering the standard error. Hence, we see that there is in fact a difference when performing the test for visits and cost and the results for the two actually point in opposite directions. Effectively, given the results we have arrived at, it is very difficult to say anything definite about a problem with adverse selection. However, we believe that visits is a more accurate factor to study since this is something that is known to the policy holder. Not many people know how much different medical procedures cost and hence the visits should be a more accurate factor for measuring the adverse selection within the scheme. That is, the small increase in number of visits gives an indication of a problem with adverse selection.

Furthermore, we think it is interesting to see if the results are affected by a possible psychological effect to increase the level of consumption simply because the premium increases. To further investigate this possibility we put it under further scrutiny in hypothesis 3 below.

7.3 Hypothesis 3: Testing for an increase in consumption as a result of the policy change

To solve for the psychological effect we will compare the means before the premium increase between the families that drop out of the scheme after the premium increase with those that do not drop out. We believe that the ones that choose to stay in the microinsurance scheme after the premium increase will have consumed more health care in period 1 than those dropping out after the premium increase. We will test this both for cost of consumption, hypothesis 3a and number of visits, hypothesis 3b. Also, it should be noted that the previous consumption, i.e. prior to the policy change, can be considered as an approximated measure of each families' attitude towards risk, which Sky uses as a proxy when setting the new premium.

For hypothesis 3a the null hypothesis, which we will try to reject, is that the mean cost of consumption is the same in period 1 for the ones that dropped out of the microinsurance after the premium increase and for those that did not drop out. Accordingly, our alternative hypothesis is that there is a difference in the mean cost of consumption in period 1. Stated formally:

$$Ho:\ \overline{Y}_{t,D} = \overline{Y}_{t,ND} \text{ and } H1\text{:}\ \overline{Y}_{t,D} \neq \overline{Y}_{t,ND}$$

where $\overline{Y}_{t,D}$ shows the mean cost of consumption in period 1 for those that did drop out of the scheme after the premium increase and $\overline{Y}_{t,ND}$ shows the mean cost of consumption in period 1 for those that did not drop out.

For hypothesis 3b the null hypothesis, which we will try to reject is that the mean number of visits is the same in period 1 for the ones that dropped out of the scheme after the premium increase and for those that did not drop out. Thus, our alternative hypothesis is that the there is a difference in the mean number of visits in period 1. Stated formally:

$$Ho:\ \overline{V}_{t,D} = \overline{V}_{t,ND} \text{ and } H1:\ \overline{V}_{t,D} \neq \overline{V}_{t,ND}$$

where $\overline{V}_{t,D}$ is the mean number of visits in period 1 for those that did drop out of the scheme after the premium increase and $\overline{V}_{t,ND}$ shows the mean number of visits in period 1 for those that did not drop out. Below follows the construction of the tests:

$$0 = \overline{Y}_{t,ND} - \overline{Y}_{t,D} \text{ and } 0 = \overline{V}_{t,ND} - \overline{V}_{t,D}$$

When performing the t-test for hypothesis 3a, we obtain a t-value of 1.880 and we can reject the null hypothesis on a ten percent level (p-value = 0.060). When performing the t-test for hypothesis 3b, we obtain a t-value of 3.337 and we can reject the null hypothesis on a five percent level (p-value = 0.001).. When performing the rank sum tests we obtain similar results, which can be seen in tables 25 thorough 32 below.

T-test comparing cost of consumption between drop outs and non-drop outs

Table 13: Data descriptives

	Dropped out	N	Mean	Std. Deviation	Std. Error Mean
Cost of consumption zone 2 period 1	No	3200	4997,09	25865,917	457,249
	Yes	1021	3439,67	9956,338	311,592

Period 1 includes observations from January through May 2007 and period 2 include observations from June through October 2007. N is the number of observations, in this case individual members.

Table 14: Results from t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Cost of consumption zone 2 period 1	Eq. var. assumed	4,979	,026	1,880	4219	,060	1557,427	828,464	-66,799	3181,652
	Eq. var. not assumed			2,815	4092,251	,005	1557,427	553,323	472,612	2642,241

The table presents the result from the t-test, which is being used to compare the mean of two populations. The t-value is 1,880 (P-value of 0,060), which shows a statistically significant difference between the underlying distributions cost of consumption I period 1 for non-drop outs and cost of consumption in period 1 for drop outs.

T-test comparing number of visits between drop outs and non-drop outs

Table 15: Data descriptives

	Dropped out	N	Mean	Std. Deviation	Std. Error Mean
Number of visits zone 2 period 1	No	3200	2,09	3,229	,057
	Yes	1021	1,71	2,944	,092

Period 1 includes observations from January through May 2007 and period 2 include observations from June through October 2007. N is the number of observations, in this case individual members.

Table 16: Results from t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Number of visits zone 2 period 1	Eq. var. assumed	9,186	,002	3,337	4219	,001	,379	,114	,157	,602
	Eq. var. not assumed			3,500	1865,78	,000	,379	,108	,167	,592

The table presents the result from the t-test, which is being used to compare the mean of two populations. The t-value is 3,337 (P-value of 0,001) which shows a statistically significant difference between the underlying distributions of number of visits in period 1 for non-drop outs and number of visits in period 1 for drop outs.

Rank sum test comparing cost of consumption between drop outs and non-drop outs

Table 17: Data descriptives

	Dropped out	N	Mean Rank	Sum of Ranks
Cost of consumption zone 2 period 1	No	3200	2152,56	6888181,00
	Yes	1021	1980,75	2022350,00
	Total	4221		

Period 1 includes observations from January through May 2007. N shows the number of families that dropped out after the premium increase as well as the number of families that did not drop out after the premium increase.

Table 18: Results from rank sum test

	Cost of consumption zone 2 period 1
Mann-Whitney U	1500619,000
Wilcoxon W	2022350,000
Z	-4,104
Asymp. Sig. (2-tailed)	,000

The table presents the result from the rank sum test, which is being used to compare the medians of two populations. The results suggest that there is a statistically significant difference in the number of visits between period 1 and period 2 (Z = -4.104 and P-value = 0.000).

Rank sum test comparing number of visits between drop outs and non-drop outs

Table 19: Data descriptives

	Dropped out	N	Mean Rank	Sum of Ranks
Number of visits zone 2 period 1	No	3200	2152,20	6887036,50
	Yes	1021	1981,88	2023494,50
	Total	4221		

Period 1 includes observations from January through May 2007. N shows the number of families that dropped out after the premium increase as well as the number of families that did not drop out after the premium increase.

Table 20: Results from rank sum test

	Number of visits zone 2 period 1
Mann-Whitney U	1501763,500
Wilcoxon W	2023494,500
Z	-4,077
Asymp. Sig. (2-tailed)	,000

The table presents the result from the rank sum test, which is being used to compare the medians of two populations. The results suggest that there is a statistically significant difference in the number of visits between period 1 and period 2 (Z = -4.077 and P-value = 0.000).

Interpreting these results it is possible to state that those that did drop out of the scheme after the premium increase consumed less in period 1 than those that did not drop out. Hence, we conclude that the tests for hypothesis 2a and 2b, showing an increase in consumption between period 1 and period 2, was not seriously affected by a potentially increase in consumption by individuals that did not drop out of the scheme after the premium increase. That is, since the policy holders being insured in period 2 consumed more in period 1 than those dropping out of the insurance after the premium increase, we feel confident to say that our result in hypothesis 2a and 2b was not affected by any psychological effect previously discussed.

7.4 Further comment on drop out data

Moreover, to further investigate if the increase in mean consumption between period 1 and period 2, could be due to low risk individuals dropping out of the scheme the data is more thoroughly discussed below. In this section we will look into the consumption pattern during

the period January through May 2007 for those individuals that dropped out of the insurance after the premium increase and compare this to the consumption of those that did not drop out. Amongst those dropping out as a result of the premium increase, or at least those dropping out after the premium increase regardless of reason, in the period June through October 47.2 percent were zero consumers, i.e. they had not consumed any health care during the first five months of 2007. 21.2 percent of those dropping out were in the second lowest group of health care consumption, which included care above zero but below 3,000R[10]. Comparing these figures to those of the members that did not drop out it was found that slightly less, 42.2 percent, were in the zero health care consumption category and only 17.3 percent in the second least consumption category. When looking at only those dropping out immediately after the premium increase, that is those dropping out in July, these findings are even more in favour of our prediction for the zero consumption category, 52.2 percent and 20.7 percent for the second lowest category. Effectively, we can say that these findings are in line with what we found in previous tests: there is a problem with adverse selection within the Sky microinsurance scheme. However, we cannot say how extensive it is and if it really poses as a problem that must be dealt with. Nonetheless, it should be noted once again that in our test we have only looked at those members that drop out without returning during our sample period or after, which effectively would have a positive effect on diminishing the risk of an adverse selection death spiral. The above findings are outlined in more detail in table 4 below.

Table 33: Comparison between drop outs (DOs) and non drop outs (Non-DOs) after the premium increase for the period January throughout May 2007 and also July drop outs amongst those dropping out after the premium increase

Share nr mem	Jan – May DOs Average	Jan – May Non-DOs average	July DOs
0	47.2%	42.2%	52.2%
0<X<3K	21.2%	17.5%	20.7%
3K<=X<4.5K	9.6%	11.3%	9.0%
4.5<=X<6K	5.8%	7.5%	4.1%
6K<=X<10K	7.1%	9.9%	6.2%
10K<=X<20K	5.7%	7.2%	3.7%
20K<=X<50K	3.1%	3.5%	3.7%

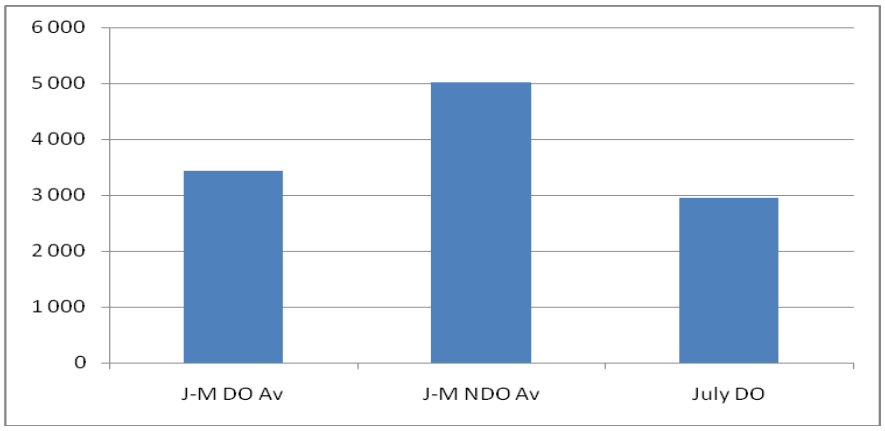
[10] The categories were based on how costly visits to the health care facilities are. The first group includes those that never went to a health care facility during the first five months; the second group includes those going once for adults and twice for children. A child visiting a health centre will incur a cost of 1000R on Sky whilst the equivalent visits costs 1500R for an adult. Due to the increasing cost of going more than once for the same illness and the different costs for going to district and provincial hospital the categories are not divided evenly by the initial amount of 1500R but rather on different levels incurred on the more advanced levels of health care.

50K<X<=200K	0.3%	0.8%	0.4%
200K<=X	0.1%	0.2%	0.0%

Source: Our own calculations

Moreover, the above findings are given more strength by doing a comparison of the average cost for the period January through May for the two groups, drop outs and non drop outs. The comparison shows that those not dropping out after the premium increase had an average consumption 46.0 percent higher in the period January through May than those dropping out sometime between June and October. Furthermore, looking at those dropping out in July the number is even higher at 70.5 percent, which is support of our prediction that those dropping out tend to be those consuming less than those not dropping out as a result of the premium increase.

Figure 1: Average cost between January and May 2007 for those dropping out after the premium increase (J-M DO Av), those not dropping out (J-M NDO Av) and those dropping out in July (July DO)



Source: Our own calculations

8. Conclusion and discussion

Looking at our first hypothesis it was found that the average health care consumption for the policy holders is greater than that of non-policy holders on a family basis. This is in line with what can be expected as the marginal cost for consuming health care once a family is a member of the microinsurance scheme is zero whilst it is greater than zero for those families that are not members. Also it is in line with the assumption that people with larger risk for needing health care are more prone to buy the insurance. The results from the data gave an indication of asymmetric information; however, it gives no information whether there is actually a problem with adverse selection in the scheme.

In our second hypothesis we examined the effect of the premium increase on an individual level. The undertaken tests showed that the mean cost of consumption had increased in the period following the policy change and also that the mean number of visits had increased. However, the undertaken t-tests were not significant and hence cannot provide evidence in favour of adverse selection. The undertaken rank sum tests were significant and thus gave support in favour of findings of adverse selection. Moreover, in order to determine if our results suffered from inaccuracy due to a seasonal effect we performed difference in difference tests. What these showed, was that there was a potential problem with a seasonal effect when looking at cost whilst so was not the case when looking at the number of visits. This led us to conclude that our data does not show any strong results for a probem with adverse selection. However, we believe that the number of visits is a more accurate factor to measure adverse selection, and hence we were able to find indications of a problem with adverse selection.

Our third hypothesis examined the difference in consumption pattern between those dropping out and those not dropping out in the period following the policy change. The hypothesis was performed to see if the results in hypothesis two where affected by a potential psychological effect to increase the consumption from the price increase. We examined both the difference in mean cost and the difference in mean number of visits. What we found was that those dropping out had both inflicted less cost on the scheme and also they had a lower number of

visits to health care facilities. The test was done for the period prior to the premium increase. The findings showed that the results from hypothesis two were probably not affected by any psychological effect.

Summing up, we see that the consumption in zone 2 increases between the first and second period. This could very well be because policy holders consuming less tend to drop out of the scheme when the price is increased. However, we have not been able to prove that previous consumption can actually explain a decision to drop out. We have controlled the results for seasonal effects and for the effect that policy holders might increase their consumption when the price is increased; however, there are further factors that could inflict on the result that the consumption increased between the periods, which we have not been able to find and put under scrutiny. Also it should be noted that the tests is limited by the short test period, which only amounts to five months prior to the policy change and five months after the policy change. The tests would surely benefit from a longer test period. However, since the scheme being used for our thesis is in its early stages in its present form the available data on the subject was rather limited. We do hope that similar tests will be performed in the future when more data is available to test for potential problems with adverse selection within the scheme.

Lastly, we would like to share some of our thoughts about why the tests showed the given results. The first thing that strikes us is that Cambodian people living in rural areas do not plan their future; they focus on today and the situation in which they live at the moment. This makes them more vulnerable to unexpected happenings and then microinsurance is a way of providing security to their lives. However, even though the microinsurance scheme has good intentions, it is not likely that the policy holders fully can comprehend how the scheme works. That is, a decision that seems very rational from their part might seem very irrational from our part. This of course makes it difficult for us to make predictions about their future decisions. The premium is set at a very low percentage of the family income and for us it seems like there is no reason not to be a part of the scheme, however, this is not the case as many members keep joining and dropping out again. The different rational could be illustrated by the fact that Cambodians are much more financially restrained and that they tend not to focus on the future as much as is common on more developed countries. Effectively, the decision of

being a policy holder or not is unfortunately being made only for the short run rather than for the long run for a very larger number of people.

9. References

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10. Appendices

Appendix I:	Data for hypothesis 1
Appendix II:	Data descriptives for DiD test
Appendix III:	Data on policy holders
Appendix IV:	Map of Cambodia

Appendix I - Summary of descriptive data in hypothesis 1

Figure 2: Monthly comparison between average consumption for policy holder and non-policy holders

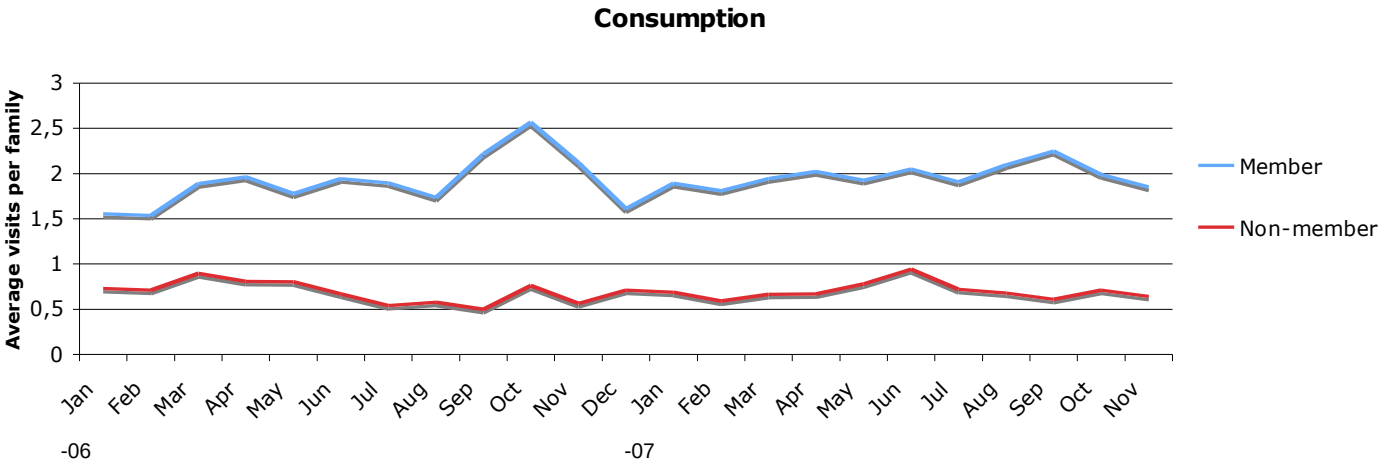


Table 21: Ang Roka health centre visits for member and non-member families

The table shows monthly observations of visits per family to the health center for the whole of 2006 and January until November for 2007. The observations are based on data acquired from the health center and is originally typed in manually by the staff at the health center.

2006				**2007**			
January	Visits	Total families	Average visit	**January**	Visits	Total families	Average visit
Target group	1746	2066	0,845111326	Target group	2063	2066	0,998547919
Members	66	80	0,825	Members	196	153	1,281045752
February	Visits	Total families	Average visit	**February**	Visits	Total families	Average visit
Target group	1648	2066	0,79767667	Target group	1689	2066	0,817521781
Members	86	89	1,075	Members	197	168	1,172619048
March	Visits	Total families	Average visit	**March**	Visits	Total families	Average visit
Target group	1716	2066	0,830590513	Target group	1875	2066	0,907550823
Members	144	93	1,548387097	Members	230	173	1,329479769
April	Visits	Total families	Average visit	**April**	Visits	Total families	Average visit
Target group	1685	2066	0,815585673	Target group	1820	2066	0,880929332
Members	79	94	0,840425532	Members	270	163	1,656441718
May	Visits	Total families	Average visit	**May**	Visits	Total families	Average visit
Target group	2060	2066	0,997095837	Target group	2083	2066	1,008228461
Members	56	86	0,651162791	Members	357	167	2,137724551
June	Visits	Total families	Average visit	**June**	Visits	Total families	Average visit
Target group	1392	2066	0,673765731	Target group	2599	2066	1,257986447
Members	89	88	1,011363636	Members	341	162	2,104938272
July	Visits	Total families	Average visit	**July**	Visits	Total families	Average visit
Target group	312	2066	0,151016457	Target group	2225	2066	1,07696031
Members	95	86	1,104651163	Members	306	162	1,888888889
August	Visits	Total families	Average visit	**August**	Visits	Total families	Average visit
Target group	1426	2066	0,690222652	Target group	1641	2066	0,79428848
Members	74	94	0,787234043	Members	305	176	1,732954545
September	Visits	Total families	Average visit	**September**	Visits	Total families	Average visit
Target group	626	2066	0,303000968	Target group	1856	2066	0,898354308
Members	173	107	1,61682243	Members	389	171	2,274853801
October	Visits	Total families	Average visit	**October**	Visits	Total families	Average visit
Target group	1673	2066	0,809777348	Target group	2052	2066	0,993223621
Members	224	132	1,696969697	Members	327	171	1,912280702
November	Visits	Total families	Average visit	**November**	Visits	Total families	Average visit
Target group	883	2066	0,427395934	Target group	1498	2066	0,725072604
Members	258	151	1,708609272	Members	305	167	1,826347305
December	Visits	Total families	Average visit				
Target group	1551	2066	0,750726041				
Members	158	151	1,046357616				

Table 22: Ang Ta Som health centre visits for member and non-member families

The table shows monthly observations of visits per family to the health center for the whole of 2006 and January until November for 2007. The observations are based on data acquired from the health center and is originally typed in manually by the staff at the health center.

2006				**2007**			
January	Visits	Total families	Average visit	**January**	Visits	Total families	Average visit
Target group	1969	2244	0,87745098	Target group	1782	2244	0,794117647
Members	102	90	1,133333333	Members	202	136	1,485294118
February	Visits	Total families	Average visit	**February**	Visits	Total families	Average visit
Target group	1889	2244	0,841800357	Target group	2006	2244	0,893939394
Members	56	93	0,622222222	Members	182	145	1,255172414
March	Visits	Total families	Average visit	**March**	Visits	Total families	Average visit
Target group	3192	2244	1,422459893	Target group	2292	2244	1,021390374
Members	87	71	1,225352113	Members	226	154	1,467532468
April	Visits	Total families	Average visit	**April**	Visits	Total families	Average visit
Target group	2370	2244	1,056149733	Target group	1853	2244	0,825757576
Members	119	84	1,416666667	Members	203	149	1,362416107
May	Visits	Total families	Average visit	**May**	Visits	Total families	Average visit
Target group	2501	2244	1,114527629	Target group	1973	2244	0,879233512
Members	125	89	1,404494382	Members	231	140	1,65
June	Visits	Total families	Average visit	**June**	Visits	Total families	Average visit
Target group	2127	2244	0,947860963	Target group	2046	2244	0,911764706
Members	132	96	1,375	Members	262	141	1,858156028
July	Visits	Total families	Average visit	**July**	Visits	Total families	Average visit
Target group	1854	2244	0,826203209	Target group	2240	2244	0,998217469
Members	152	98	1,551020408	Members	242	141	1,716312057
August	Visits	Total families	Average visit	**August**	Visits	Total families	Average visit
Target group	1884	2244	0,839572193	Target group	1867	2244	0,831996435
Members	145	96	1,510416667	Members	221	156	1,416666667
September	Visits	Total families	Average visit	**September**	Visits	Total families	Average visit
Target group	1809	2244	0,806149733	Target group	1297	2244	0,57798574
Members	208	116	1,793103448	Members	220	153	1,437908497
October	Visits	Total families	Average visit	**October**	Visits	Total families	Average visit
Target group	2591	2244	1,154634581	Target group	1749	2244	0,779411765
Members	286	134	2,134328358	Members	210	148	1,418918919
November	Visits	Total families	Average visit	**November**	Visits	Total families	Average visit
Target group	1847	2244	0,823083779	Target group	2117	2244	0,943404635
Members	243	142	1,711267606	Members	165	138	1,195652174
December	Visits	Total families	Average visit				
Target group	1941	2244	0,864973262				
Members	175	138	1,268115942				

Table 23: Prey Chour health centre visits for member and non-member families

The table shows monthly observations of visits per family to the health center for the whole of 2006 and January until November for 2007. The observations are based on data acquired from the health center and is originally typed in manually by the staff at the health center.

2006				**2007**			
January	Visits	Total families	Average visit	**January**	Visits	Total families	Average visit
Target group	1330	1585	0,839116719	Target group	896	1585	0,565299685
Members	187	69	2,710144928	Members	313	138	2,268115942
February	Visits	Total families	Average visit	**February**	Visits	Total families	Average visit
Target group	1189	1585	0,750157729	Target group	602	1585	0,379810726
Members	203	76	2,942028986	Members	322	145	2,220689655
March	Visits	Total families	Average visit	**March**	Visits	Total families	Average visit
Target group	1319	1585	0,832176656	Target group	578	1585	0,36466877
Members	209	74	2,824324324	Members	367	147	2,496598639
April	Visits	Total families	Average visit	**April**	Visits	Total families	Average visit
Target group	1262	1585	0,796214511	Target group	929	1585	0,586119874
Members	249	70	3,557142857	Members	349	140	2,492857143
May	Visits	Total families	Average visit	**May**	Visits	Total families	Average visit
Target group	1076	1585	0,678864353	Target group	1370	1585	0,864353312
Members	214	72	2,972222222	Members	275	131	2,099236641
June	Visits	Total families	Average visit	**June**	Visits	Total families	Average visit
Target group	1010	1585	0,637223975	Target group	1605	1585	1,012618297
Members	258	76	3,394736842	Members	298	124	2,403225806
July	Visits	Total families	Average visit	**July**	Visits	Total families	Average visit
Target group	754	1585	0,475709779	Target group	687	1585	0,433438486
Members	299	96	3,114583333	Members	298	121	2,462809917
August	Visits	Total families	Average visit	**August**	Visits	Total families	Average visit
Target group	647	1585	0,408201893	Target group	687	1585	0,433438486
Members	274	109	2,513761468	Members	298	121	2,462809917
September	Visits	Total families	Average visit	**September**	Visits	Total families	Average visit
Target group	948	1585	0,598107256	Target group	805	1585	0,507886435
Members	393	123	3,195121951	Members	357	126	2,833333333
October	Visits	Total families	Average visit	**October**	Visits	Total families	Average visit
Target group	992	1585	0,625867508	Target group	802	1583	0,506632975
Members	435	127	3,42519685	Members	313	128	2,4453125
November	Visits	Total families	Average visit	**November**	Visits	Total families	Average visit
Target group	929	1585	0,586119874	Target group	791	1585	0,499053628
Members	361	137	2,635036496	Members	277	113	2,451327434
December	Visits	Total families	Average visit				
Target group	1298	1585	0,818927445				
Members	269	139	1,935251799				

Table 24: Prey Sbat health centre visits for member and non-member families

The table shows monthly observations of visits per family to the health center for the whole of 2006 and January until November for 2007. The observations are based on data acquired from the health center and is originally typed in manually by the staff at the health center.

2006				**2007**			
January	Visits	Total families	Average visit	**January**	Visits	Total families	Average visit
Target group	668	1881	0,35513025	Target group	748	1881	0,397660819
Members	170	110	1,545454545	Members	290	114	2,543859649
February	Visits	Total families	Average visit	**February**	Visits	Total families	Average visit
Target group	861	1881	0,457735247	Target group	509	1881	0,270600744
Members	219	115	1,990909091	Members	316	122	2,590163934
March	Visits	Total families	Average visit	**March**	Visits	Total families	Average visit
Target group	934	1881	0,496544391	Target group	681	1881	0,362041467
Members	199	102	1,950980392	Members	331	134	2,470149254
April	Visits	Total families	Average visit	**April**	Visits	Total families	Average visit
Target group	1043	1881	0,554492291	Target group	714	1881	0,379585327
Members	212	104	2,038461538	Members	335	130	2,576923077
May	Visits	Total families	Average visit	**May**	Visits	Total families	Average visit
Target group	790	1881	0,419989367	Target group	696	1881	0,370015949
Members	197	95	2,073684211	Members	221	122	1,81147541
June	Visits	Total families	Average visit	**June**	Visits	Total families	Average visit
Target group	789	1881	0,419457735	Target group	1105	1881	0,587453482
Members	205	103	1,990291262	Members	226	123	1,837398374
July	Visits	Total families	Average visit	**July**	Visits	Total families	Average visit
Target group	1331	1881	0,707602339	Target group	697	1881	0,370547581
Members	205	113	1,814159292	Members	174	112	1,553571429
August	Visits	Total families	Average visit	**August**	Visits	Total families	Average visit
Target group	682	1881	0,362573099	Target group	1076	1881	0,572036151
Members	233	109	2,137614679	Members	254	106	2,396226415
September	Visits	Total families	Average visit	**September**	Visits	Total families	Average visit
Target group	541	1881	0,287612972	Target group	869	1881	0,461988304
Members	241	107	2,252336449	Members	263	93	2,827956989
October	Visits	Total families	Average visit	**October**	Visits	Total families	Average visit
Target group	862	1881	0,458266879	Target group	858	1881	0,456140351
Members	312	104	3	Members	190	86	2,209302326
November	Visits	Total families	Average visit	**November**	Visits	Total families	Average visit
Target group	765	1881	0,406698565	Target group	762	1881	0,405103668
Members	249	103	2,417475728	Members	154	80	1,925
December	Visits	Total families	Average visit				
Target group	769	1881	0,408825093				
Members	235	107	2,196261682				

Table 25: Kus health Centre visits for member and non-member families

The table shows monthly observations of visits per family to the health center for the whole of 2006 and January until November for 2007. The observations are based on data acquired from the health center and is originally typed in manually by the staff at the health center.

2006				**2007**			
January	Visits	Total families	Average visit	**January**	Visits	Total families	Average visit
Target group	1099	2062	0,532977692	Target group	1312	2062	0,636275461
Members	44	46	0,956521739	Members	131	103	1,27184466
February	Visits	Total families	Average visit	**February**	Visits	Total families	Average visit
Target group	1107	2062	0,53685742	Target group	544	2062	0,263821532
Members	50	51	1,086956522	Members	155	117	1,504854369
March	Visits	Total families	Average visit	**March**	Visits	Total families	Average visit
Target group	1117	2062	0,541707081	Target group	1335	2062	0,64742968
Members	52	51	1,019607843	Members	185	127	1,456692913
April	Visits	Total families	Average visit	**April**	Visits	Total families	Average visit
Target group	1016	2062	0,492725509	Target group	1422	2062	0,689621726
Members	58	53	1,094339623	Members	180	129	1,395348837
May	Visits	Total families	Average visit	**May**	Visits	Total families	Average visit
Target group	1249	2062	0,605722599	Target group	1644	2062	0,79728419
Members	56	44	1,272727273	Members	177	130	1,361538462
June	Visits	Total families	Average visit	**June**	Visits	Total families	Average visit
Target group	661	2062	0,320562561	Target group	1677	2062	0,81328807
Members	71	47	1,510638298	Members	157	141	1,113475177
July	Visits	Total families	Average visit	**July**	Visits	Total families	Average visit
Target group	1165	2062	0,564985451	Target group	978	2062	0,474296799
Members	87	55	1,581818182	Members	186	133	1,398496241
August	Visits	Total families	Average visit	**August**	Visits	Total families	Average visit
Target group	895	2062	0,434044617	Target group	1126	2062	0,546071775
Members	94	64	1,46875	Members	189	135	1,4
September	Visits	Total families	Average visit	**September**	Visits	Total families	Average visit
Target group	1932	2062	0,936954413	Target group	1338	2062	0,648884578
Members	122	74	1,648648649	Members	181	133	1,360902256
October	Visits	Total families	Average visit	**October**	Visits	Total families	Average visit
Target group	712	2062	0,345295829	Target group	1423	2062	0,690106693
Members	143	90	1,588888889	Members	211	129	1,635658915
November	Visits	Total families	Average visit	**November**	Visits	Total families	Average visit
Target group	1494	2062	0,724539282	Target group	1045	2062	0,506789525
Members	137	94	1,457446809	Members	147	128	1,1484375
December	Visits	Total families	Average visit				
Target group	1237	2062	0,599903007				
Members	106	98	1,081632653				

Table 26: Tapem health centre visits for member and non-member families

The table shows monthly observations of visits per family to the health center for the whole of 2006 and January until November for 2007. The observations are based on data acquired from the health center and is originally typed in manually by the staff at the health center.

2006				**2007**			
January	Visits	Total families	Average visit	**January**	Visits	Total families	Average visit
Target group	654	2043	0,320117474	Target group	1117	2043	0,546744983
Members	78	47	1,659574468	Members	213	73	2,917808219
February	Visits	Total families	Average visit	**February**	Visits	Total families	Average visit
Target group	687	2043	0,336270191	Target group	815	2043	0,398923152
Members	91	54	1,936170213	Members	233	86	3,191780822
March	Visits	Total families	Average visit	**March**	Visits	Total families	Average visit
Target group	958	2043	0,468918257	Target group	805	2043	0,39402839
Members	103	53	1,943396226	Members	265	92	2,880434783
April	Visits	Total families	Average visit	**April**	Visits	Total families	Average visit
Target group	969	2043	0,474302496	Target group	1132	2043	0,554087127
Members	92	54	1,703703704	Members	183	88	2,079545455
May	Visits	Total families	Average visit	**May**	Visits	Total families	Average visit
Target group	942	2043	0,461086637	Target group	892	2043	0,436612824
Members	91	52	1,75	Members	232	81	2,864197531
June	Visits	Total families	Average visit	**June**	Visits	Total families	Average visit
Target group	898	2043	0,439549682	Target group	189	2043	0,092511013
Members	80	54	1,481481481	Members	199	83	2,397590361
July	Visits	Total families	Average visit	**July**	Visits	Total families	Average visit
Target group	780	2043	0,381791483	Target group	1015	2043	0,496818404
Members	124	55	2,254545455	Members	269	80	3,3625
August	Visits	Total families	Average visit	**August**	Visits	Total families	Average visit
Target group	867	2043	0,424375918	Target group	1045	2043	0,511502692
Members	191	61	3,131147541	Members	187	84	2,226190476
September	Visits	Total families	Average visit	**September**	Visits	Total families	Average visit
Target group	873	2043	0,427312775	Target group	180	2043	0,088105727
Members	223	68	3,279411765	Members	182	80	2,275
October	Visits	Total families	Average visit	**October**	Visits	Total families	Average visit
Target group	1077	2043	0,527165932	Target group	1207	2043	0,590797846
Members	217	69	3,144927536	Members	185	78	2,371794872
November	Visits	Total families	Average visit	**November**	Visits	Total families	Average visit
Target group	992	2043	0,48556045	Target group	1103	2043	0,539892315
Members	205	68	3,014705882	Members	178	81	2,197530864
December	Visits	Total families	Average visit				
Target group	930	2043	0,455212922				
Members	167	72	2,319444444				

Table 40: Tramkak health Centre visits for member and non-member families

The table shows monthly observations of visits per family to the health center for the whole of 2006 and January until November for 2007. The observations are based on data acquired from the health center and is originally typed in manually by the staff at the health center.

2006

January	Visits	Total families	Average visit
Target group	776	2180	0,355963303
Members	83	70	1,185714286
February	Visits	Total families	Average visit
Target group	461	2180	0,21146789
Members	83	80	1,185714286
March	Visits	Total families	Average visit
Target group	1056	2180	0,48440367
Members	117	86	1,360465116
April	Visits	Total families	Average visit
Target group	1107	2180	0,507798165
Members	105	87	1,206896552
May	Visits	Total families	Average visit
Target group	885	2180	0,405963303
Members	166	96	1,729166667
June	Visits	Total families	Average visit
Target group	1638	2180	0,751376147
Members	162	103	1,572815534
July	Visits	Total families	Average visit
Target group	1674	2180	0,767889908
Members	143	117	1,222222222
August	Visits	Total families	Average visit
Target group	394	2180	0,180733945
Members	211	127	1,661417323
September	Visits	Total families	Average visit
Target group	1064	2180	0,488073394
Members	234	133	1,759398496
October	Visits	Total families	Average visit
Target group	1604	2180	0,735779817
Members	295	142	2,077464789
November	Visits	Total families	Average visit
Target group	1179	2180	0,540825688
Members	204	142	1,436619718
December	Visits	Total families	Average visit
Target group	1810	2180	0,830275229
Members	234	133	1,759398496

2007

January	Visits	Total families	Average visit
Target group	1928	2180	0,88440367
Members	213	137	1,554744526
February	Visits	Total families	Average visit
Target group	1587	2180	0,727981651
Members	211	136	1,540145985
March	Visits	Total families	Average visit
Target group	1443	2180	0,661926606
Members	142	129	1,100775194
April	Visits	Total families	Average visit
Target group	2453	2180	1,125229358
Members	155	119	1,302521008
May	Visits	Total families	Average visit
Target group	1739	2180	0,797706422
Members	226	115	1,965217391
June	Visits	Total families	Average visit
Target group	2229	2180	1,022477064
Members	233	116	2,00862069
July	Visits	Total families	Average visit
Target group	2346	2180	1,076146789
Members	192	115	1,669565217
August	Visits	Total families	Average visit
Target group	2312	2180	1,060550459
Members	247	127	1,94488189
September	Visits	Total families	Average visit
Target group	1777	2180	0,815137615
Members	253	133	1,902255639
October	Visits	Total families	Average visit
Target group	1616	2180	0,741284404
Members	211	134	1,574626866
November	Visits	Total families	Average visit
Target group	2230	2180	1,02293578
Members	263	137	1,919708029

Table 41: Traipang Andeuk health centre visits for member and non-member families
The table shows monthly observations of visits per family to the health center for the whole of 2006 and January until November for 2007. The observations are based on data acquired from the health center and is originally typed in manually by the staff at the health center.

2006				**2007**			
January	Visits	Total families	Average visit	**January**	Visits	Total families	Average visit
Target group	1386	2308	0,600519931	Target group	1026	2308	0,444540728
Members	96	43	2,23255814	Members	159	76	2,092105263
February	Visits	Total families	Average visit	**February**	Visits	Total families	Average visit
Target group	1201	2308	0,520363951	Target group	1207	2308	0,522963605
Members	105	52	2,441860465	Members	180	90	2,368421053
March	Visits	Total families	Average visit	**March**	Visits	Total families	Average visit
Target group	1473	2308	0,638214905	Target group	1238	2308	0,536395147
Members	98	51	1,921568627	Members	172	94	1,829787234
April	Visits	Total families	Average visit	**April**	Visits	Total families	Average visit
Target group	1516	2308	0,656845754	Target group	1261	2308	0,546360485
Members	83	51	1,62745098	Members	205	93	2,204301075
May	Visits	Total families	Average visit	**May**	Visits	Total families	Average visit
Target group	1404	2308	0,608318891	Target group	1391	2308	0,602686308
Members	91	47	1,936170213	Members	143	89	1,606741573
June	Visits	Total families	Average visit	**June**	Visits	Total families	Average visit
Target group	866	2308	0,375216638	Target group	1025	2308	0,444107452
Members	96	51	1,882352941	Members	164	77	2,12987013
July	Visits	Total families	Average visit	**July**	Visits	Total families	Average visit
Target group	952	2308	0,412478336	Target group	1227	2308	0,531629116
Members	115	53	2,169811321	Members	139	73	1,904109589
August	Visits	Total families	Average visit	**August**	Visits	Total families	Average visit
Target group	852	2308	0,36915078	Target group	1259	2308	0,545493934
Members	95	59	1,610169492	Members	142	69	2,057971014
September	Visits	Total families	Average visit	**September**	Visits	Total families	Average visit
Target group	1003	2308	0,43457539	Target group	1404	2308	0,608318891
Members	170	66	2,575757576	Members	95	64	1,484375
October	Visits	Total families	Average visit	**October**	Visits	Total families	Average visit
Target group	1041	2308	0,451039861	Target group	1578	2308	0,683708839
Members	176	68	2,588235294	Members	142	63	2,253968254
November	Visits	Total families	Average visit	**November**	Visits	Total families	Average visit
Target group	1389	2308	0,601819757	Target group	1434	2308	0,621317158
Members	164	72	2,277777778	Members	137	63	2,174603175
December	Visits	Total families	Average visit				
Target group	1543	2308	0,668544194				
Members	153	81	1,888888889				

Table 27: Traipang Pring health centre visits for member and non-member families

The table shows monthly observations of visits per family to the health center for the whole of 2006 and January until November for 2007. The observations are based on data acquired from the health center and is originally typed in manually by the staff at the health center. Data is missing for September 2006.

2006				**2007**			
January	Visits	Total families	Average visit	**January**	Visits	Total families	Average visit
Target group	943	1562	0,603713188	Target group	794	1562	0,508322663
Members	78	41	1,902439024	Members	185	98	1,887755102
February	Visits	Total families	Average visit	**February**	Visits	Total families	Average visit
Target group	929	1562	0,59475032	Target group	382	1562	0,244558259
Members	72	51	1,756097561	Members	189	105	1,928571429
March	Visits	Total families	Average visit	**March**	Visits	Total families	Average visit
Target group	991	1562	0,634443022	Target group	395	1562	0,252880922
Members	58	54	1,074074074	Members	220	103	2,13592233
April	Visits	Total families	Average visit	**April**	Visits	Total families	Average visit
Target group	939	1562	0,601152369	Target group	381	1562	0,243918054
Members	104	56	1,857142857	Members	196	96	2,041666667
May	Visits	Total families	Average visit	**May**	Visits	Total families	Average visit
Target group	885	1562	0,566581306	Target group	369	1562	0,236235595
Members	88	52	1,692307692	Members	181	100	1,81
June	Visits	Total families	Average visit	**June**	Visits	Total families	Average visit
Target group	721	1562	0,461587708	Target group	365	1562	0,233674776
Members	129	58	2,224137931	Members	167	93	1,795698925
July	Visits	Total families	Average visit	**July**	Visits	Total families	Average visit
Target group	784	1562	0,501920615	Target group	343	1562	0,219590269
Members	120	63	1,904761905	Members	155	87	1,781609195
August	Visits	Total families	Average visit	**August**	Visits	Total families	Average visit
Target group	613	1562	0,392445583	Target group	318	1562	0,203585147
Members	125	67	1,865671642	Members	164	93	1,76344086
September	Visits	Total families	Average visit	**September**	Visits	Total families	Average visit
Target group	Missing	1562	0	Target group	390	1562	0,249679898
Members	Missing	79	0	Members	172	95	1,810526316
October	Visits	Total families	Average visit	**October**	Visits	Total families	Average visit
Target group	875	1562	0,560179257	Target group	211	1562	0,135083227
Members	231	89	2,595505618	Members	115	89	1,292134831
November	Visits	Total families	Average visit	**November**	Visits	Total families	Average visit
Target group	875	1562	0,560179257	Target group	482	1562	0,308578745
Members	231	100	2,31	Members	152	88	1,727272727
December	Visits	Total families	Average visit				
Target group	174	1562	0,111395647				
Members	171	98	1,744897959				

Appendix II – Data descriptives for difference in difference tests

Table 28: Data descriptives, showing mean values and standard errors for visits in zone 1 and zone 2.

	N	Minimum	Maximum	Mean		Std.
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Z1_P1_visit	511	1,0000	1,0000	1,0000	,0000	,0000
Z1_P2_visits_diff	511	,0000	10,0843	1,1314	,0527	1,1904
Z2_P1_visit	3172	1,0000	1,0000	1,0000	,0000	,0000
Z2_P2_visit_diff	3172	,0000	15,0465	1,0572	,0283	1,5921
Valid N (listwise)	511					

Table 29: Data descriptives, showing mean values and standard errors for cost in zone 1 and zone 2.

	N	Minimum	Maximum	Mean		Std.
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Z1_P1_cost	511	1,0000	1,0000	1,0000	,0000	,0000
Z1_P2_cost_diff	511	,0000	14,5613	,9766	,0676	1,5288
Z2_P1_cost	3172	1,0000	1,0000	1,0000	,0000	,0000
Z2_P2_cost_diff	3172	,0000	214,5252	1,1137	,0856	4,8235
Valid N (listwise)	511					

Appendix III - Number of Sky policy holders

Figure 2a-b: The left graph shows the number of members in zone 1 2005 - 2007 and the graph on the right shows the percentage change for the same period

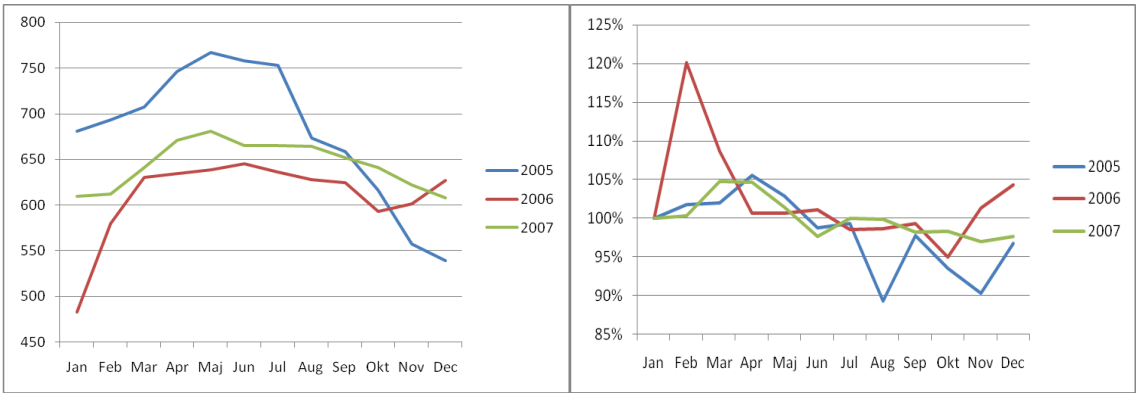


Figure 3a-b: The left graph shows the number of members in zone 2 2005 - 2007 and the graph on the right shows the percentage change for the same period

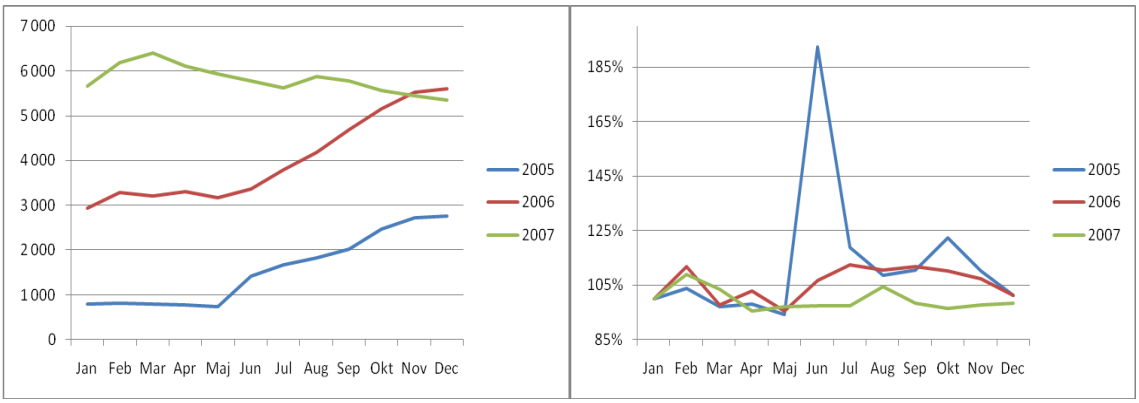
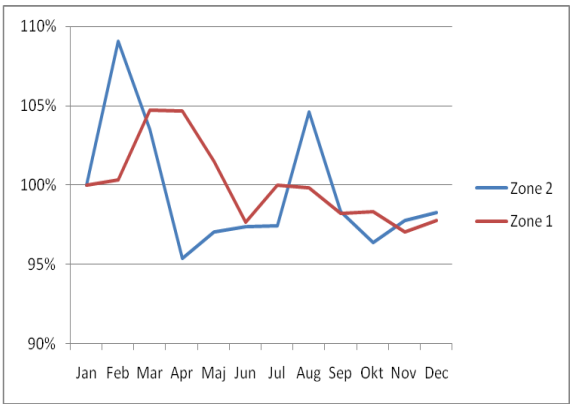


Figure 4: The graph shows the percentage development over the number of members for 2007 in both zone 1 and 2



Source: Our own calculations

Appendix IV - Map of Cambodia

The map shows in which regions the study was undertaken



Source: Sky – Cambodia: http://www.sky-cambodia.org