MoPoTsyo Patient Information Centre

Annual report 2012

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INTRODUCTION

MoPoTsyo Patient Information Centre is Cambodian not for profit organization registered at the Ministry of Interior since 2005. It tries to help chronic patients with Non Communicable Diseases create an effective and affordable public health system to serve their long term health needs. It does this by involving chronic patients themselves in the organization and delivery of medical services preferably in the public services and as close as possible to where chronic patients live.

The core strategic tool used by our NGO is the establishment of a network of community-based diabetic peer educators in a structure that can be supervised by the Operational District authorities with adapted tools and modern technology.

The health outcomes for people with diabetes remain consistently good compared to other countries, in particular when compared to developing countries. For non-diabetic hypertensive people a stronger effort is required together with the public health system to overcome the barriers to care.

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SUMMARY OF THE REPORT

Increased coverage: The year 2012 saw continued growth of MoPoTsyo's Peer Educator Networks (PEN) and with that the exponential growth in service outputs: An additional 219,969 adults were screened for Diabetes (DM) during the year 2012, adding to the numbers of people who benefit directly from the PEN activities.

TABLE 1 SCREENING ADULTS FOR DIABETES PER YEAR

years	until 2007	2007 until 2008	2007 until 2009	2007 until 2010	2007 until 2011	2007 until 2012
Nr of covered and screened adults	29335	71329	99839	156860	240550	460240

The number of chronic patients who registered as member grew with 50% from 8,310 at the end of 2011 to 12,496 at the end of 2012.

Enormous Needs: Despite special efforts to raise awareness of High Blood Pressure (HBP) and strokes, our Continuum of Care (CoC) remains seriously underutilized by patients with HBP who do not also have DM. Preliminary analysis of the laboratory data suggests that Chronic Kidney Disease (CKD) could be present among one third to half of our members with DM. The screening for Diabetic Retinopathy in collaboration with CSC showed that 28% of our members in urban area have Diabetic Retinopathy.

Financial analysis: MoPoTsyo contributed to the International Forum on Health Financing held in Phnom Penh in May 2012 with its financial data on PEN. Peer Education (or *Expert Patients*) in DM and HBP care in developing countries is still a relatively new health policy area without many peer reviewed publications, in particular on health financing. The Cambodian experience with the growing PEN and their ability to help organize popular health services, was shared with the international health policy experts through 4 presentations, posters and with an "Expert Diabetes Patient-panel". The year 2011 was used as the year in which the cost – which was actually the expenditure - had been calculated per type of output produced by the Peer Educator Intervention. The results were presented at the conference in the form of different "health care products" that the NGO using the PEN is able to produce to assist the different populations "at risk". Later, the cost per type of service unit was calculated as well, using a method called "stepping stones". The costing analysis result 2011 is in the annex of this report.

Monitoring Adherence to prescribed treatment for diabetes and hypertension: The Annual Report 2011 contained already some data on adherence to medical treatment prescribed to our members by the Medical Doctors consulted through the continuum-of-care system that is being facilitated in each Operational District (OD) by the PEN there. The measurement of adherence, on average for groups of patients, or at individual level of every patient, is possible thanks to the links between data on prescribing, the Revolving Drug Fund (RDF) management, the dispensing

at contracted pharmacies through the integrated database. During the year 2012, we began to automate the system. For this Annual Report 2012 the method of calculation of adherence has been improved. The details of the methodology are in the annex to this report. By applying our methodology we find everywhere that the adherence to DM treatment, despite being much more expensive than for HBP, is much better among DM members than among non-DM members who have only HBP. The difference is such that we should say that adherence for DM is good (72%) with 8% loss of patients whereas for HBP it is in general a disaster with only 38% adherence and 25% of patients who did not buy their medication at all during 2012.

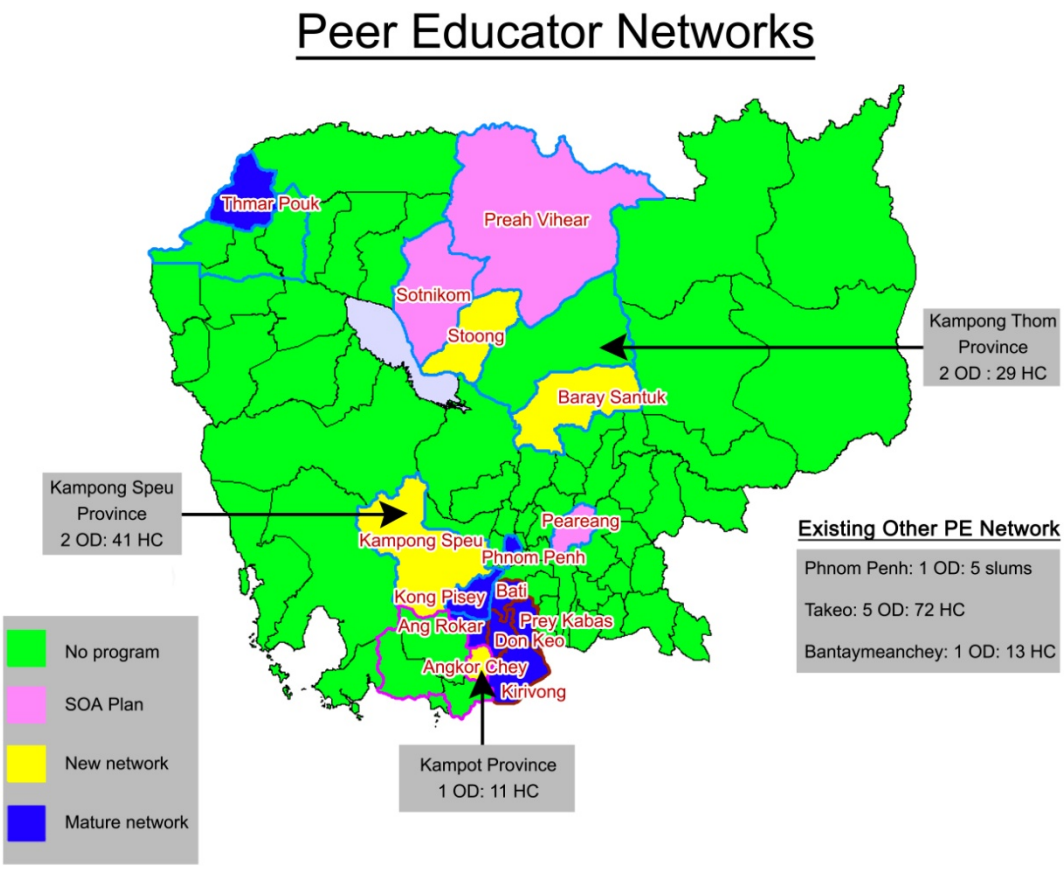
National Strategy Development: During the year 2012 negotiations continued among stakeholders, notably different departments in the Ministry of Health (MoH) and a key Development Partners (DP), about Cambodia's new National Strategy for the Prevention of NCD 2013 – 2020. From July to September 2012 an experienced international WHO consultant helped the MoH to draft a new strategy. The finalized draft of this strategy – translated into Khmer - calls for continuation and expansion of PEN for DM and HBP. The MoH takes on responsibility for the PEN and prepares for the cost of these networks to be included into the Annual Operational Plan (AOP) for 2013, at least in the OD which qualify as Special Operating Agency (SOA), a special administrative status. It is unclear if the transfer of responsibilities will be complete or not, because there are some activities, currently routinely undertaken by MoPoTsyo, which the counterparts may find challenging. During 2012, we have continued to experiment with a discount voucher system. It entitles our Peer Educators and designated Poor Patients to a price reduction at the contracted pharmacies where they buy their prescription drugs. The same kind of voucher is distributed by them to poor DM patients. The discount is minimally 50% but it can be as high as 90%. The actual value of the discount varies with the height (cost) of the individual's monthly prescription.

New Partners: MoPoTsyo began to partner with CSC and with CARITAS Takeo to organize screening for Diabetic Retinopathy. Louvain Coopération au Développement (LD), a Belgian University NGO and MoPoTsyo began to implement an agreement signed in December 2011, to set up a peer educator network in Baray Santuk OD, in Kampong Thom province. GIZ, the German technical cooperation agency, provided MoPoTsyo with a grant at the end of October 2012 to support peer educator networks in 4 OD's in Kampong Thom and Kampong Speu provinces. This allowed us to start up 2 new networks. On 10 November 2012, with GIZ funding, we were able to draw national attention to Diabetes on World Diabetes Day. organized in Kampong Speu with more than 1000 attendants who marched a few kilometers, followed by a large rally held on the grounds of the Provincial Health Department.

Research: MoPoTsyo has chosen to become involved in 2 research projects: A multi-country translational research, led by ITM in Antwerp, measures the effect of SMS messages on blood sugar control. PATH (Seattle USA) and MoPoTsyo signed a partnership to collaborate on research among an urban population of Cambodian adults to compare different DM screening methodologies.

CONTINUATION & EXPANSION OF PEER EDUCATOR NETWORKS

FIGURE 1 LOCATIONS OF PEER EDUCATOR NETWORKS IN CAMBODIA



There are Peer Educator Networks in different stages of development. Mature networks exist in Phnom Penh, Takeo province, in Kong Pisey OD (Kampong Speu province) and in Thmar Pouk OD (Banteay Meanchey province). In 2012 we began to set up new networks in Baray Santuk OD in Kampong Thom province. Also, we began to prepare the expansions to Stoong OD in Kampong Thom province and to Kampong Speu OD in Kampong Speu province. The Ministry of Health has invited MoPoTsyo to set up PEN in 2013 in 3 OD's that are Special Operating Agency, which qualifies them for HSSP pooled funds from the donors. The Peer Educator Network in Phnom Penh is counted as 1OD but the slums are located in 3 different OD's. In 2011 we began to set up a peer educator network in Mongolborei OD but this OD has no SOA status (Banteay Meanchey). We are not aware of any donor being able to fund our activity there so the set up was put on hold in Banteay Meanchey until we resolve the lack of funding. During 2012 MoPoTsyo continued its steady growth in terms of beneficiaries and also of expenditures, gradually covering a larger adult population with the services of the Peer Educator Networks. We have spent over a 1.5 million USD dollars since we began operations in 2004.

EXPENSES AND COSTS

Expenses per covered adult and definition of coverage

The expenses figures show that economies of scale make the expenses per covered adult go down. A covered adult is defined as a person who is familiar with the network through the screening and lives in an area covered by a peer educator network, not necessarily a member, because the beneficiaries are everyone who has been screened for diabetes. The reasoning for using this definition is as follows: Theoretically, every adult who has received urine glucose strip for self-testing for diabetes, is aware that the peer educator is living in her/his area and available any time to do a repeat test or provide information. In addition, there must be a Village High Blood Pressure Group in this person's village, because the urine glucose screening in the village is immediately followed by the establishment of this High Blood Pressure Group. There are people with diabetes with high blood pressure and people without diabetes with high blood pressure who are member of this group and who use the automated Blood Pressure machine to check regularly on their blood pressure to see if it is in control. The Peer Educator regularly visits the High Blood Pressure group to register new high blood pressure patients and facilitate an appointment at the Referral Hospital for these new patients to get a prescription for the routine medication from the revolving drug fund. So any adult in the village, whether already a patient or not yet, the system is available for use.

TABLE 2 EXPENSES PER BENEFICIARY 2007 - 2012

Beneficiaries/expenses in USD trend fom 2007 to 2012 in adults covered through the Peer Educator Networks						
Years	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Beneficiaries Annual growth %		143%	40%	57%	53%	91%
Categories of Beneficiaries						
Number of people living in OD's with PEN	1,109,287	1,109,287	1,466,213	2,322,262	2,322,262	2806790
Number people at NCD risk (=adults)	554,644	554,644	733,107	1,161,131	1,161,131	1,403,395
Nr of covered&screened adults	**29,335**	**71,329**	**99,839**	**156,860**	**240,550**	**460,238**
Coverage of Total Population	2.6%	6.4%	6.8%	6.8%	10.4%	16.4%
Coverage of target population at risk	5.3%	12.9%	13.6%	13.5%	20.7%	32.8%
Expenses Annual growth %		120%	44%	37%	62%	19%
Annual Expenses [in USD]	$59,808	$131,725	$189,773	$260,446	$422,145	$502,025
Accumulated expenses of whole intervention		$191,533	$381,307	$641,752	$1,063,897	$1,565,922
Expenses per Unit per beneficiary [in USD]						
per person living in the area	$0.05	$0.12	$0.13	$0.11	$0.18	$0.18
per population at risk of NCD (= all adults)	$0.11	$0.24	$0.26	$0.22	$0.36	$0.36
per covered & screened adult	**$2.04**	**$1.85**	**$1.90**	**$1.66**	**$1.75**	**$1.09**

With growth the intervention is becoming more efficient, as larger numbers of beneficiaries are being served for less money.

The expenses per screened adult have been broken down in different types of benefits that these adults can receive, depending on their individual situation, as can be seen in the table below. The provision of benefits depends on the needs of the individual as these needs are not the same for everyone. Once the peer educator network is established and has screened a village and puts the Village High Blood Pressure Group in place, in fact the entire village population is covered, whether they are a still a child, a healthy adult, a diabetic, pre diabetic or pre hypertensive. The system is ready to receive them when healthy adults become diabetic or hypertensive as there is no financial threshold that makes membership difficult for them. In Cambodia, the adult population is roughly 50% of the total population. Our expenses per screened adult can therefore be conveniently converted into expenses per capita by reducing by half the expenses per screened adult.

Cost per service unit

In 2013, with technical assistance from GIZ, we were able to calculate the cost per service unit. We opted to create 4 service units. Screening is activity that may be only necessary during the start up phase. The cost of the community-based peer educator was calculated separately to be able to inform health policy makers of what it costs to add peer education into the care model. The annual treatment cost of a Diabetic patient and a High Blood Pressure patient are both low partly as a result of a community-based peer educator being involved in the care organization and service delivery. Without the peer educator both the health outcome would likely be much inferior to what it is now and the cost of care would be much higher as seen in other low-income countries.

TABLE 3 COST PER SERVICE UNIT IN 2011

1 adult screened for diabetes	$ 0.10
1 Community-based Peer Educator in 2011	$13,118.70
1 Diabetes Patient receiving care in 2011	$ 43.47
1 High Blood Pressure Patient receiving care in 2011	$ 16.81

For the definitions used in each service unit and details, see the annex. In order to isolate the cost of care per patient per year, certain expenses were excluded, such as primary prevention, advocacy and health system development. The cost of the dispensing by the pharmacy to the patient was added (a 15% profit margin for the pharmacies). It is useful to note the phenomenon that for some patients some of the peer educators act as a “shopper”: (s)he collects their patient books, goes to the pharmacy, gets all the medicine packed for every patient, redistributes these with the patient book and collects their money. When it happens, it further decreases overall cost of care per patient. Calculation of cost of care per patient is further complicated by the differences in services and in adherence levels, with diabetes patients having much better adherence to therapeutic treatment than high blood pressure patients. The cost of care for the high blood pressure patients should be around USD 25 per year with better utilization of service by this type of patient.

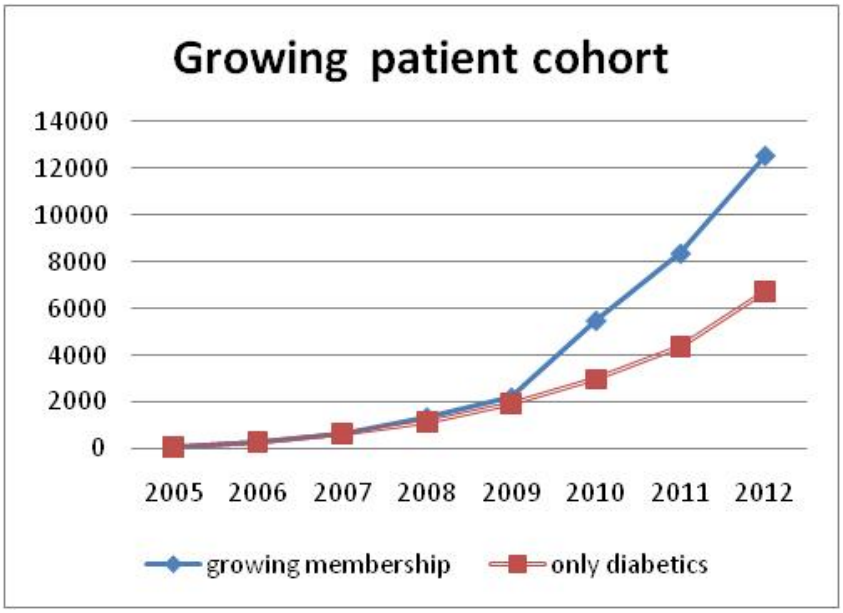
MORE PATIENTS DETECTED AND MORE MEMBERS

The numbers of chronic patients who register as member of MoPoTsyo have continued to increase from 8,310 until 12,496 members at the end of 2012. Only patients with diabetes and or hypertension (>140/90) can become member.

The membership figures do not represent the current membership because we have not removed from this figure the patients who have died since 2005. A mortality rate of 2 to 3% yearly is what we estimate it to be.

Further down below we discuss access to and utilization of medical services by these patients and the follow-up system of these patients. Some registered patients make little use of the system compared with others. The graph below reflects the number of chronic patients who over the years have been formally assessed by the PE so we have their ID, address and bio-data in our database.

FIGURE 2 GROWING MEMBERSHIP

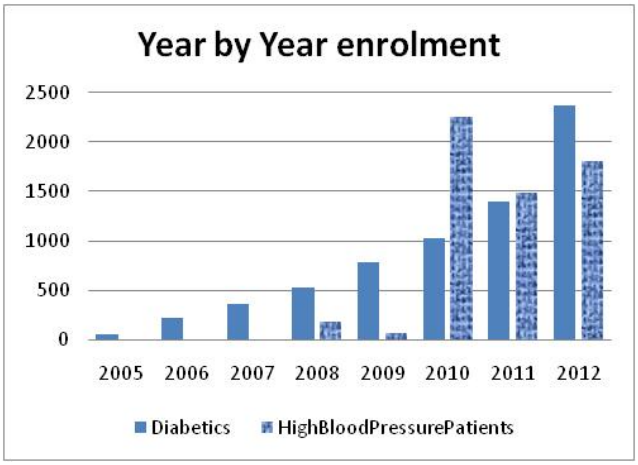


MoPoTsyo Peer Education began in urban slums in mid 2005 with screening for patients with diabetes (DM), including also care for diabetes patients with High Blood Pressure. In mid 2007 this intervention was piloted in a rural area, when peer educators began to be trained in Ang Roka OD in Takeo province with small amounts of funding from the World Diabetes Foundation, Swiss Red Cross, MSF Belgium and others to cover one entire operational district, with one peer educator per health center coverage area. The design was created to follow Cambodia's National Health Coverage plan which is population based and which does not follow the country's administrative division into communes and administrative districts.

Since 2008, there is no more active diabetes screening in urban areas. There are only 5 urban peer educators who are very busy following up large numbers of diabetes patients, compared to more than 130 rural peer educators. There is no active High Blood Pressure program in the urban area, only in rural areas.

High Blood Pressure: An initial small group of members with High Blood Pressure, without diabetes, were recruited to the program in 2007 in urban slums. We created a Village High Blood Pressure group in 4 villages. After 2 attempts it did not catch on with the VHBGroup Leader nor the patients. Then it was tried in rural area, which initially also did not work well. There we added a primary prevention campaign for community leaders and for school teachers. This latter feature helped to ensure wider support for the intervention, but it cannot be implemented in the high-class urban environment by low-educated slum-resident-peer educators. In the rural areas a provisional modus operandi was found which shows better results. The High Blood Pressure intervention design remains unfinished without proper links with the health centers. The challenge is not to detect and register and counsel members on High Blood Pressure but to make them get a prescription and especially to make them adhere to treatment once the symptoms are over.

FIGURE 3 YEARLY GROWTH IN MEMBERSHIP

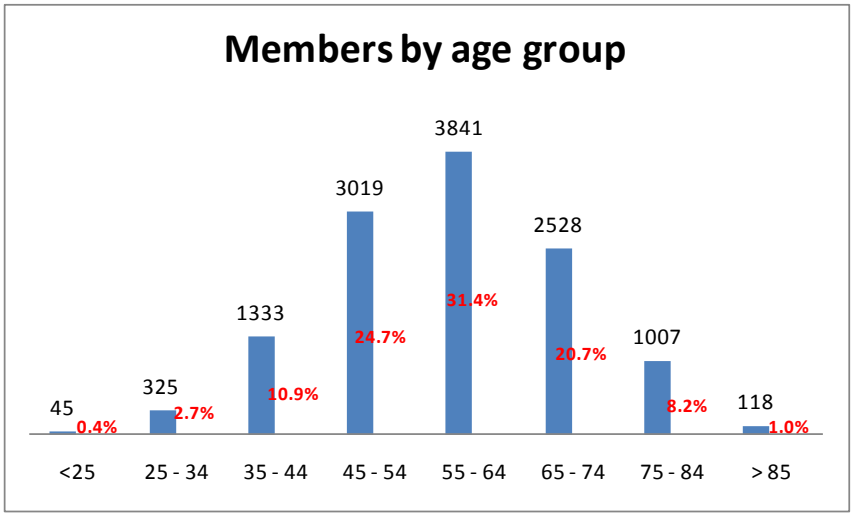


Yearly growth of people with DM is more gradual than the yearly growth of the members with High Blood Pressure. High Blood Pressure intervention design still requires more work and closer collaboration with the public service to enhance its effectiveness.

ELDERLY

According to the definition of the Madrid Plan of Action[1] we have 5,531 members of 60 years and older. According to that definition 46% is "old". However, the WHO STEP survey is using the age group 25 to 65. By adopting the age groups of the STEP survey we may be able to compare the registered numbers of patients of with national prevalence figures if the samples are large enough.

FIGURE 4 ABSOLUTE NUMBERS & % PER AGE GROUP IN 12,216 MEMBERS AT THE END OF 2012



The age groups of only diabetics (non diabetics excluded) shows a similar pattern. More than 23% of the members with Diabetes is 65 years or older, an age group that is not (yet) being surveyed as part of STEP survey. In the 2008 Census the people from this age group formed only 5.15% of the general population.

TABLE 4 DIABETICS BY AGE GROUP

Diabetics per age group		
Age Group	Number	%
<25	31	0.5%
25 - 34	179	2.7%
35 - 44	798	12%
45 - 54	1813	28%
55 - 64	2202	34%
65 - 74	1156	18%
75 - 84	359	5%
> 85	21	0.3%
Total members	6559	100%

HUMAN RESOURCES: PEER EDUCATORS AND SALARIED STAFF

[1] (http://undesadspd.org/Ageing/DataonOlderPersons.aspx)

Every year MoPoTsyo is training new Peer Educators (PE) increasing Cambodia's health workforce with lay workers having a received special training that makes them in practice, a highly effective and low cost resource for public health duties. In 2012, 54 new PE's were added to MoPoTsyo's network, representing the largest yearly increase in PE's since operations began. From 2005 to 2012 there have been a total of 135 PE's trained by MoPoTsyo. Among them 112 are still working as PE.

FIGURE 5 TOTAL NUMBERS OF PE TRAINED + PE STILL WORKING

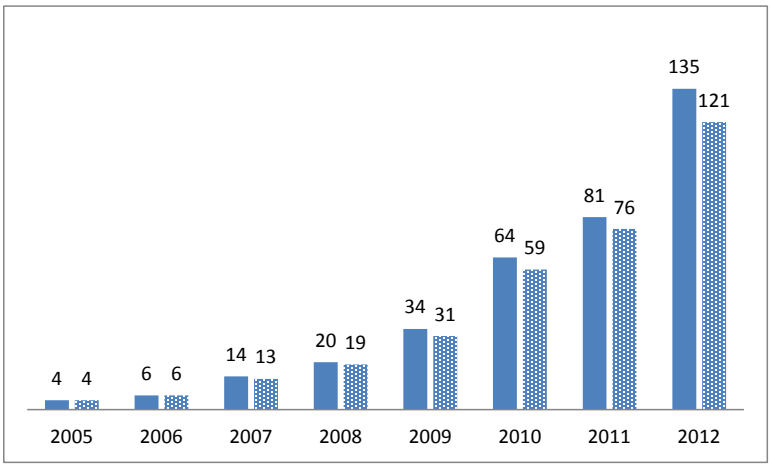
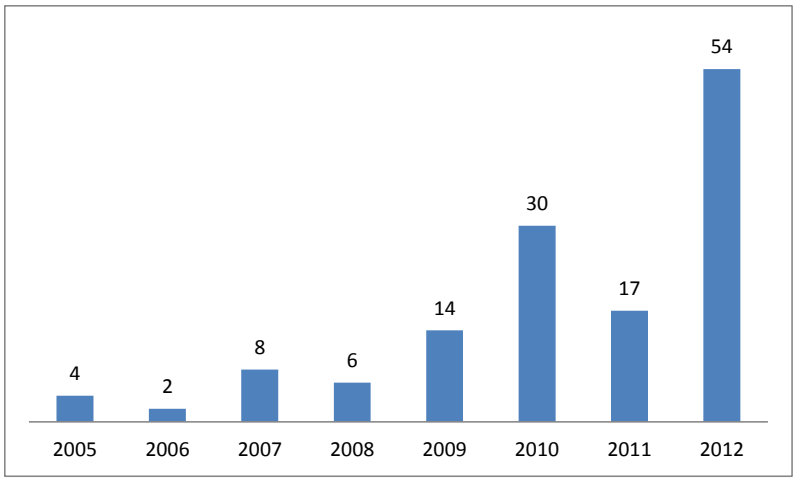
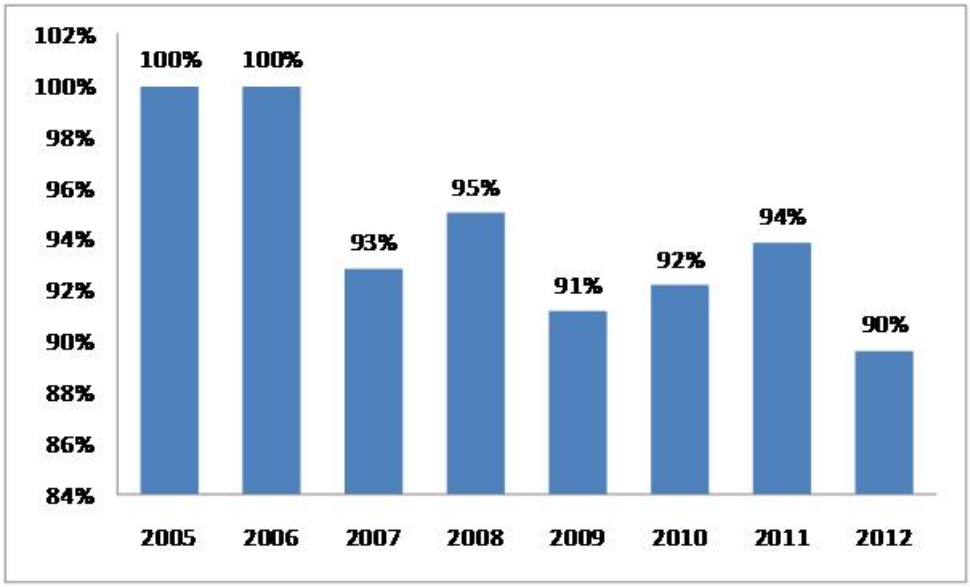


FIGURE 6 YEARLY NUMBER OF PE TRAINED



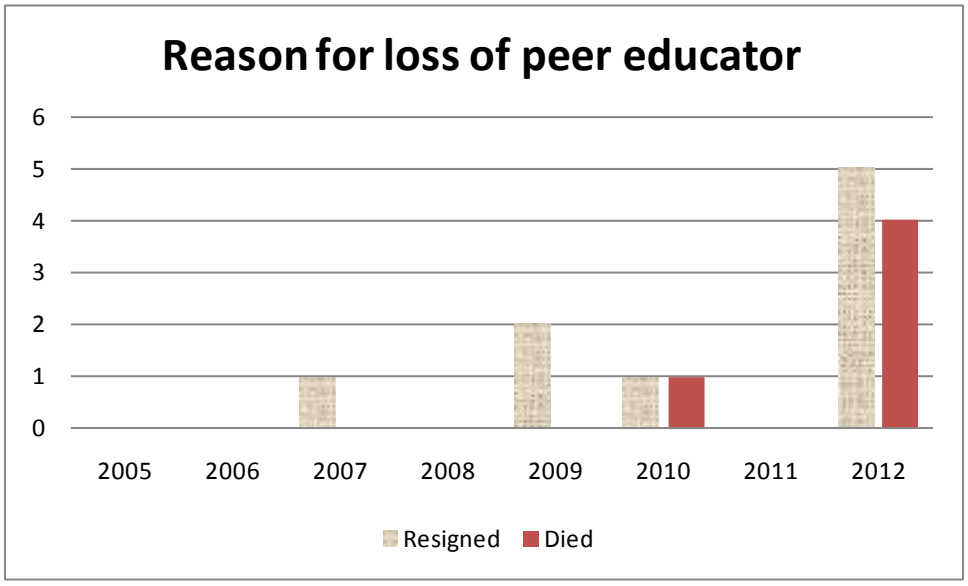
At the end of 2012, the percentage of PE's still working with MoPoTsyo remains very high: **90%** (121 out of 135). Although there is little sign of attrition until now, with climbing of their age, this must be factored in for the future. We also have never *re*-trained the peer educators. In 2012 we did train the peer educators in *new* issues, such as Diabetic Retinopathy and in High Blood Pressure and Stroke by special educational materials in the form of an animated video. Also the peer educators have received special training in how to explain the biochemistry laboratory results to the patients.

FIGURE 7 PERCENTAGE OF PEER EDUCATORS STILL WITH MOPOTSYO



If we look at the reasons why we lose a PE, the following picture begins to emerge (figure 8).

FIGURE 8 REASONS FOR LOSING A PEER EDUCATOR



Also, not every trained PE remains in function as PE over time and there are different reasons for this. Some continue to work, but change their function from being a volunteer Peer Educator to a salaried staff member. These are PE's who are more involved in organisational issues or training. When they become salaried staff members, a new PE must be identified and trained so he/she can replace the "ex"-PE who continues to live inside the community. This has

happened several times, in particular in the urban slums, where several patients worked themselves into the MoPoTsyo's salaried staff, being replaced by their former patients. Until the end of 2012 MoPoTsyo HQ has 5 former Peer Educators and in the province there are 4 former Peer Educators who have become salaried staff. They are involved in management, representation, supervision and have organisational tasks in the Capacity Building Dpt of MoPoTsyo where the Peer Educator Networks are being managed. They help strengthen the capacity of the P.E.N. at the OD level..

HC in the table below stands for "Health Center" as a health center normally covers villages with numbers of residents between 8,000 to 15,000 people in total.

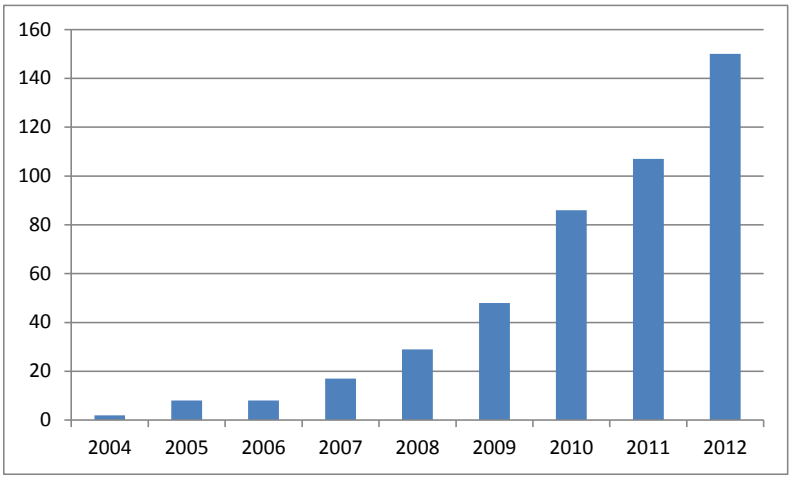
PEN field staff comprises the salaried Peer Educators who have become MoPoTsyo staff charged with management positions as supervisors and the volunteering peer educators who are not receiving salary but who receive a reimbursement of their travel costs related to their activities plus small incentives based on performance and outputs.

TABLE 5 PEER EDUCATORS & SALARIED SUPERVISORS

At the end of the year 2012			
Provinces / Municipalities	**HC areas with peer educator**	**salaried supervisors**	**Total PEN field staff incl PE's**
Phnom Penh	5	2	7
Takeo	56	5	61
Banteay Meanchey	11	1	12
Kompong Speu	24	1	25
Kampong Thom	18	1	19
totals	***114***	***10***	***124***

With 36 salaried staff plus the volunteers working for MoPoTsyo the workforce has gradually risen to 150 persons in total 2012. The ratio of workforce to members has to be understood in proper perspective because until 2007 there was no Revolving Drug Fund, nor were we organizing medical consultations. In 2009 we added non-diabetic hypertensive patients. In 2010 began to organize laboratory services.

FIGURE 9 VOLUNTEERS AND SALARIED STAFF



Also, Primary Prevention activities were added. These were first organized for school teachers in 2009 followed by similar sessions for Community Leaders, so the range of services that are being provided with the help of peer educators, themselves patients, has greatly increased.

For the reasons mentioned above, of the total 135 Peer Educators who have been trained, there were a total of 114 community-based peer educators at the end of 2012. In the year 2012 the network itself grew from 74 to 114 peer educators, an increase of 40 functioning PE's. At the start of 2012 we had 33 salaried staff members. This number grew to 36 at the end of the year, so the total number of salaried staff and volunteer staff had grown to 150 at the end of 2012.

TABLE 6 NUMBERS OF PEER EDUCATORS PER PROVINCE

Yearly growing	Takeo	Phnom Penh	Bantey Meanchey	Kompong Speu	Kampong Thom	**Total**
per December 2012	56	5	11	24	18	**114**
per December 2011	46	5	7	16	0	**74**
Per December 2010	41	5	6	11	0	**63**

The figures above indicates health center coverage areas with a trained PE. Each health center area is covered by a single PE, with the exception of two PE's that each cover two health center areas. The figure does not include the salaried leader of each network Therefore, the real number of peer educators with the required skills is larger than indicated in the table 4 above.

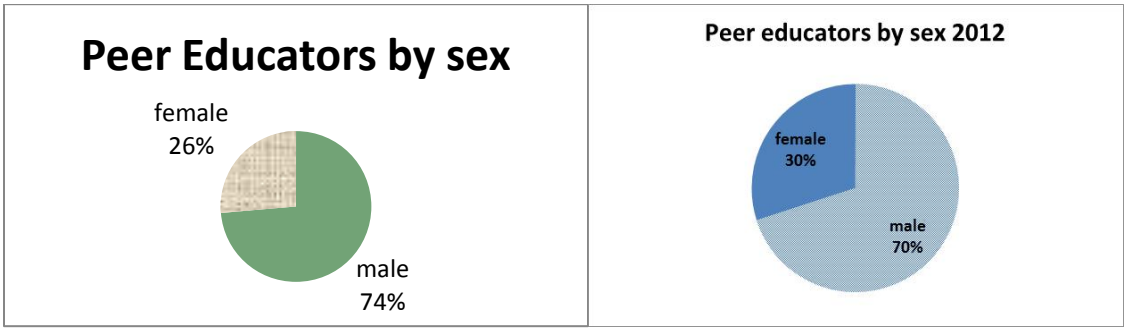
The leader of the Peer Educator Network is chosen by MoPoTsyo in consultation with the local health authorities. Once the leader is appointed, usually a new PE is trained to take over the

daily peer education tasks. The leader then receives a salary as supervisor of the network, normally USD 5 per Health Center with a Peer Educator that he/she must supervise and report about.

CHALLENGE OF CREATING A BETTER GENDER BALANCE

It is difficult to reach an appropriate gender balance in both PE's and patients. Many husbands do not want their wife to become a PE. It is also difficult to find women with sufficient capacity who are willing to work as PE. The pay is minimal, making the job of PE something that you do mostly for honor. The immaterial rewards weigh probably more than the material rewards. Members in the household can be unhappy when the mother is not paying as much attention to them, and is busy going around the area in order to care for other people. This type of pressure can come from their children and from their husband. They demand the matriarch to be available 100% for them. In 2011, 26% of peer educators were female. In 2012, balance improved slightly to 30%. There is also an imbalance in the gender of patients…but this is the opposite! The proportion of 1/3 male versus 2/3 female patients has not changed since 2005. In 2012, we find the following mismatch: only 34% of the diabetics are male, while 70% of PE's are male. Compared to 2011, we redressed the imbalance by 4%.

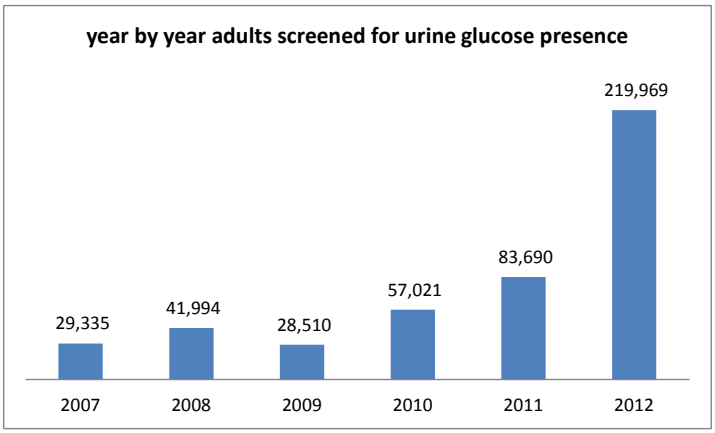
FIGURE 10 PEER EDUCATORS BY SEX IN 2011 & 2012



SCREENING ACTIVITIES

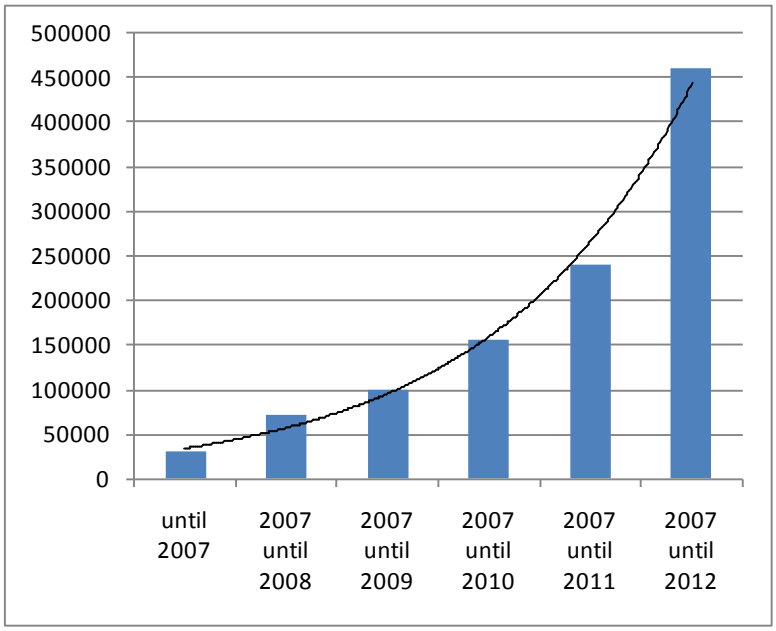
At the end of 2012, there were 460,240 adults in Cambodia that have had a post-prandial glucose screening (within 2-3 hours of a meal).

FIGURE 11 YEAR BY YEAR SELF SCREENING FOR PRESENCE OF URINE GLUCOSE



The community-based PE distributes urine glucose strips to adults for self-testing. The figures above and below relate to newly screened adults who learn how to use the strip to test themselves. Adults who buy a strip from the Peer Educator (USD 0.03) to retest themselves in later years are not included. Figure 11 below indicates the accumulated number of adults who have been made familiar with the Peer Educator Network (PEN?), through use of urine glucose strips over the years; almost half a million Cambodian adults are now living in an area with a peer educator whose advice they can seek if they want to retest themselves, including blood glucose (USD 0.33).

FIGURE 12 ACCUMULATING COVERAGE OF ADULT POPULATION BY PEER EDUCATOR NETWORKS



To view self-screening activity from a perspective of efficacy in translation to membership: In 2012, the number of diabetics rose by 2242, from 3953 to 6195. Of the 219,969 screened in 2012, 2,242 newly diagnosed diabetics joined MoPoTsyo. This translates to 1.02% of members screened, which is well below the expected prevalence of diabetes determined by STEP: A survey of prevalence of diabetes in rural areas among adults. MoPoTsyo organizes screening among all adults, not just adults aged > 25 years and < 65 years, a different population than the sample in the STEP Survey. As the Cambodian population is relatively young, a large group of adults having access to MoPoTsyo's urine glucose test strips are between 20 and 25 years old.

It may be hypothesized that some resources are being wasted by testing such a young population. Among this younger group are MODY's (Maturity Onset Diabetes among the Young). As the disease group's name suggests, MODY's are younger people. MODY's are thought to be heterogeneous in nature, meaning that a variety of environmental or genetic factors may be able to account for discrepancies in prevalence of MODY among different populations. Among MoPoTsyo's staff several are probably MODY. Most MODY's registered with MoPoTsyo require insulin but they are not type 1 DM. This subtle technical difference indicates that without insulin they would not die as fast as Type 1 DM, but would still suffer severe diabetic complications within a few years if they remain without insulin. Also, Cambodia's mass starvation that lasted from 1975 until 1979 began almost 40 years ago. Children who were conceived and borne during that period are more at risk of developing diabetes and other diseases than others. In summary, there are good reasons for Cambodia to diagnose early by screening including younger lives and ensure a healthy workforce among young adults. Like elsewhere in Asia, Type 1 DM in Cambodia is probably rare in Cambodia, but Type 2 MODY's are not. The issue should get more attention from experts to find out which kinds of MODY are prevalent in this country.

MoPoTsyo keeps the name, age, sex and address of every adult who has been screened for diabetes. The first 40,000 people had been asked additional questions about chronic disease and related spending on chronic disease, and on being indebted for health care but since 2008 this is no longer asked. Since 2007, these data are no longer entered into database. So far once a village has been screened for diabetes, it is not screened again.

Screening for High Blood Pressure:

At the end of 2012, there were 5978 patients with High Blood Pressure (HBP)registered as members with MoPoTsyo. There were 4075 patients at the end of 2011, meaning 1903 new patients registered during 2012.

In the beginning of 2011, the screening process for HBP was changed from a screening process that depended on the PE's doing the screening to a system where there is one automated blood pressure machine in each village which can be used by people for self-screening. The PE's can still actively screen using their own BP machine to detect HBP patients, but if the PE is not around, people can also self-screen. If they are found to have HBP, the Village High Blood Pressure Group (VHBPG) leader reports it to the PE who comes once per month to collect the

results. Similar to the previous model, a PE has to meet the person to assess the BP and confirm the "hypertensive status". By making the machine available at village level, people who live in a village with an automated blood pressure machine can use the machine once or twice a year to check their blood pressure to find out if it is too high or not. VHBPG are meant not just for the people with HBP living in the village but for anyone who is at risk. This means that the whole village has to be aware of the possibility to test as well as how, where, and when they can try it. It is the job of the PE to set up VHBPG's with the leader and then make them work. People who are found to have HBP can then be formally assessed by the PE so they get a patient book, access to laboratory testing, consultation, and prescription services.

Before such a VHBPG can be set up, the PE must do some screening in the village to find people with HBP who can form the group and are interested to sign up for this. Once they are find, a formal contract is made up between the VHBPG and MoPoTsyo before the machine is being dispatched to the Leader of the group. The machine reaches the group via the PE.

Screening for Dyslipidemia

All members of MoPoTsyo can access a lipid panel blood laboratory test. The test includes Total Cholesterol, HDL and Triglycerides. LDL may be estimated using a formula unless Triglycerides are high (>400mg/dl) and LDL is not below 80. The members are encouraged to do it but it is no obligation. The price of the tests is on average at 30% of the level of well known other laboratories and the blood collection is in the community during early morning to improve convenience for members and facilitate the test being done under fasting conditions.

Screening for Chronic Kidney Disease

Chronic Kidney Disease (CKD) can be stopped or slowed down in many cases with simple treatment. The therapeutic cost related to slowing down this progression towards CKD is almost negligible compared to the cost of dialysis (in Cambodia) let alone transplantation (abroad). However, we have not investigated to what extent the physicians are prescribing appropriate medication. All members of MoPoTsyo who use the laboratory service do the creatinine test and the potassium test. These two tests are more strongly recommended as the results are essential for appropriate prescription of routine medication: Metformin, a commonly prescribed anti-diabetic agent, may carry a risk of lactic acidosis if prescribed to a patient with lowered kidney function. Another common anti-diabetic agent, glibenclamide is a renally eliminated drug, meaning that in patients with low kidney function, medication effects may be prolonged and increase the risk of hypoglycemia. Angiotensin Converting Enzyme Inhibitors (ACE-I) such as enalapril or captopril decrease glomerular filtration due to efferent arteriole dilation causing transient increases in SCr and potassium which may also carry risks in a CKD patient. Also, hydrochlorothiazide (HCTZ) tends to lose efficacy as a hypertensive agent in the setting of low kidney function making it a somewhat inappropriate choice for a hypertensive patient with CKD. Additionally, members are encouraged to be tested for proteinuria. This was introduced in late 2011. In 2012 we have began to collect data and engaged with a USA based nephrologist for

analysis. The preliminary analyses indicate that CKD is present among almost half of our diabetic members.

MEDICAL SERVICES FACILITATED BY PEN

Below we review first the laboratory services, their utilization and cost, then the Medical Consultations, their utilization (discussed as access to prescription because every medical consultation results in a prescription that can be used repeatedly to buy prescribed medicines at the pharmacy), and then the cost to the patient of adhering to the treatment and adherence. This is followed by a review of the Revolving Drug Fund that is managed through contracted private and public pharmacies that dispense the medicines using preprinted invoices, paid for by our members.

Laboratory Services

MoPoTsyo began to organise laboratory services in 2009. In 2010, laboratory services were used during the so called "re-assessments". These are assessments of members of MoPoTsyo who have been registered for more than 6 months. We take a random sample of patients among those who are followed by every one of our peer educators and assess blood sugars, blood pressures, knowledge and other health outcomes. These randomized patients do not have to pay for the laboratory tests, explaining the high utilization in that year. Although this was too costly to continue it was useful to make the patients familiar with the new service and give them important information that they need for self-management. We stopped paying for it in 2011. After we had stopped to provide the free lab service, utilization of the lab first fell back. It rebounded firmly with 3916 users in 2012. Now it appears financially sustainable.

Laboratory service is useful for 3 main reasons:

1) It helps to inform and motivate patients to seek medical care and make use of the medical consultation service and adhere to their medication. Without a laboratory, people rely on their feeling of well-being. This can be treacherous as many conditions are "silent" and a-symptomatic.

2) The Doctor needs the laboratory result for prescription of appropriate medication for the patient and for adaptation of the prescription and referral.

3) Public Health authorities need access to these results to be able to analyse whether people's therapeutic needs are being adequately met by prescribing physicians and monitor the effectiveness of prescription therapy.

There were 3381 patients who used the laboratory at least once during 2012, compared to 969 in 2011, a 3.5 times what it was. We have had to increase the number of laboratory technicians to 2 Full Timers. As can be seen in the figure below, a substantial proportion of people from the age groups in which the prevalence of NCD is not measured during the national STEP survey

make use of our laboratory services as members with chronic disease: Elderly people and younger persons who are member of MoPoTsyo also use these services.Compared to 2011, the proportion of elderly people (65 years or older) using the laboratory services during the year 2012 rose to 22%. Among 3916 users 16% used the lab twice. The figure below is now more meaningful as we show those who have access compared to how many patients there are in their own age groups in the assessment data. This way we can keep an eye on which age group is crowding out another one. We can see that access for the elderly is an issue among those over 65 years, unsurprisingly.

FIGURE 13 ACCESS TO LAB SERVICES BY DIFFERENT AGE GROUPS

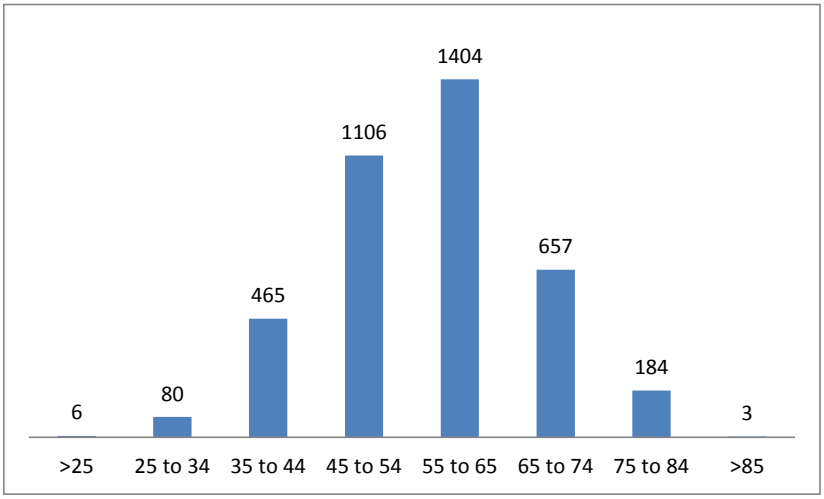
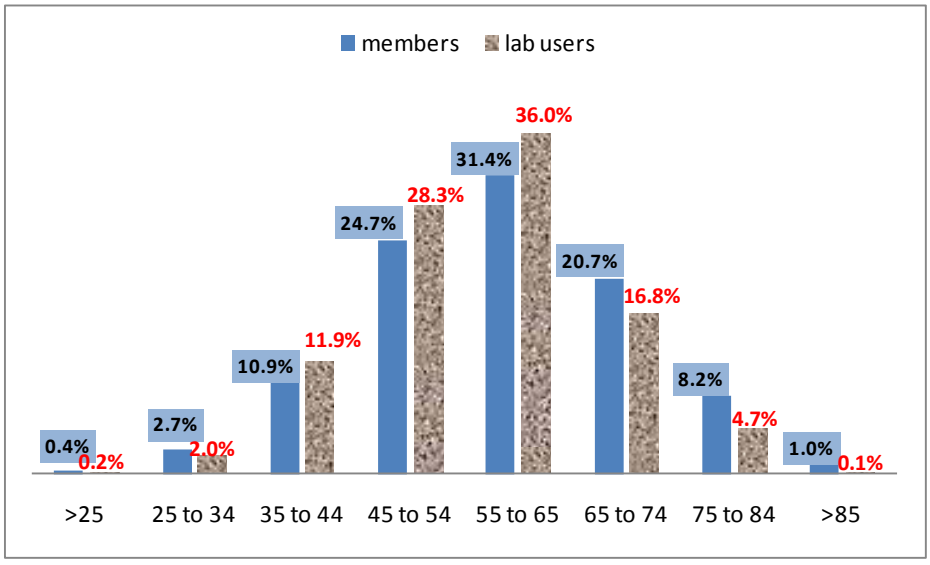


FIGURE 14 ACCESS TO THE LAB IS REDUCED FOR ELDERLY



As proportionally more women use the services of MoPoTsyo, they also make more use of the lab. In that sense, the access for women and men to the laboratory services was equal,

according to their representation as members in MoPoTsyo with women 2/3 and men 1/3 of the total in 2011. This remains the same in 2012.

TABLE 7 EQUAL ACCESS AMONG MEMBERS TO THE LAB SERVICES BY GENDER IN 2012

men	1246	32%
women	2670	68%
in 2012 Total	3916	100%

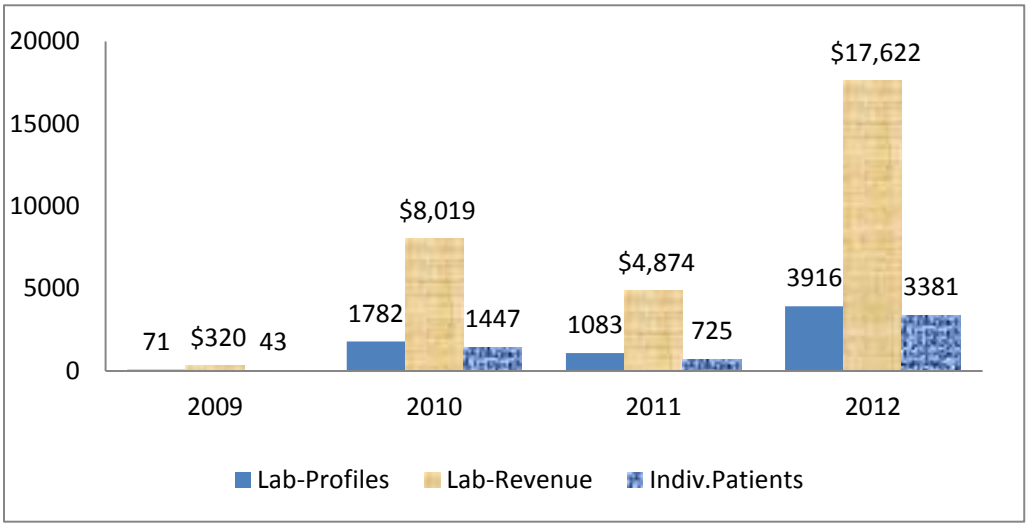
There is a declining proportion of (15% in 2012) users who use the laboratory more than once during the year. This trend suggests increasing efficiency of the service. While we allow "elites" to use the cost-effective service more than once per year, we want every patient to use it at least once per year. The problem is that many did not use the service, as can be concluded from the numbers of patients registered as member in 2012. On the other hand, it is encouraging to see how the number of patients who uses the laboratory service increases yearly, despite the fact that this service is provided almost at the cost price.

It seems worthwhile to subsidize the service for the poorest patients, so they can access the service as well.

Cost of the Lab Services

During 2012, we calculated the cost of the laboratory services by putting the life of our lab machines at 10 years which is optimistic. That creates the cost picture in the table below. It shows it is truly a "not for profit approach". The result of our pricing policy is that we offer the laboratory service at 70% lower than the rates of Cambodia's public services. It would have been more realistic to put life at 5 years.

FIGURE 15 LABORATORY SERVICES USE AND COST



If the machines in reality break down after only 5 years, the cost of depreciation would have been double. Then we would have been operating at a loss. We may have to adjust our lab prices upward in the future if we want to be able to replace our laboratory machines every 5 years.

TABLE 8 LABORATORY COSTS BASED ON 10-YEAR LIFE OF MACHINES

fixed cost of laboratory program						
	Purchase price	2009	2010	2011	2012	2013
humalyser Junior	$ 2,854	$ 285	$ 285	$ 285	$ 285	$ 285
humalyser 3000	$ 5,800	$ -	$ 580	$ 580	$ 580	$ 580
combilyzer 13	$ 1,500	$ -	$ -	$ 150	$ 150	$ 150
Humascope	$ 950	$ -	$ -	$ 95	$ 95	$ 95
Ionogram	$ 4,200				$ 420	$ 420
		$ 285	$ 865	$ 1,110	$ 1,110	$ 1,110
Expenditure in laboratory program		$ 4,710	$ 12,020	$ 5,892	$ 22,622	total
expenditiure on fixed costs		$ 2,854	$ 5,800	$ 2,450	$ 11,104	fixed
expenditure on variable costs		$ 1,856	$ 6,220	$ 3,442	$ 11,518	variable

Cost per lab result		
total of fixed 2009-2011	$ 2,261	$ 1,110
total of variable	$ 11,518	
Total cost 2009-2011	$ 13,779	
number of results	**2935**	
cost per result	$ 4.69	$ 20,188
cost per member who used the lab	$ 6.22	
Expected Number of Results		4300
Expected Revenue		$ 23,650
Cost Recovery MoPoTsyo		**$ 3,462**

The range of laboratory tests is as shown on the 2 examples below which show the result form of 2011 and how it was improved in 2012. The name of test is written both in Khmer and English, as well as the normal value and a basic indication of what the test measures to facilitate patient understanding of disease severity.

FIGURE 16 THE OLD LAB RESULT (2011)

លទ្ធផលតេស្ត / Test's results:			
លេខ Nr.	ឈ្មោះតេស្ត Test Name	លទ្ធផលតេស្ត Test Result	គោលដៅតំលៃធម្មតា Target Normal
1	កូលេស្តេរ៉ុលសរុប / Total Cholesterol	226	តិចជាង 200 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ
2	អេច ដេ អិល / HDL Cholesterol	56	ច្រើនជាង 40 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ
3	ទ្រីគ្លីសេរីដ / Triglyceride	131	តិចជាង 150 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ
4	ក្រេអាទីនីន / Creatinine	0.7	តិចជាង 1.2 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ សំរាប់បុរស និង 1.1 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ សំរាប់ស្ត្រី
5	អ៊ី ជី អែហ្វ អរ / eGFR	>60	ធំជាង 60 មីលីលីត្រក្នុងមួយនាទី
6	ស្ករក្នុងឈាម / Blood Sugar	139	មុនហូបអាហារពេលព្រឹក៖ ច្រើនជាង 126 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ បង្ហាញថាអ្នកមានជំងឺទឹកនោមផ្អែម ច្រើនជាង 110 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ បង្ហាញថាអ្នកអាចមានជំងឺទឹកនោមផ្អែម ចន្លោះ 65 ទៅ 100 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ បង្ហាញថាអ្នកមានលទ្ធផលល្អ
7	ប៉ូតាស្យូម / Potassium	4.2	ចន្លោះ 3.5 ទៅ 5.1 មីលីមូលក្នុងមួយលីត្រ
8	ត្រង់សាមីនាស / Transaminase (SGPT)	33	ចន្លោះ 1 ដល់ 50 ឯកតាក្នុងមួយលីត្រ
9	ត្រង់សាមីនាស / Transaminase (SGOT)	33	ចន្លោះ 6 ដល់ 40 ឯកតាក្នុងមួយលីត្រ
10	ប្រូតេអ៊ីន / Proteinuria	0	ស្មើនឹងសូន្យ(គ្មាន)

During 2012, we improved the presentation of results to help patients understand and peer educators explain the results to the patients. This is possible because the database now allows to print multiple results over time of the same patient. This helps everyone to see in one glance what is happening with the trend of each indicator, see the example below. Last but not least, it saves the Doctor time during the medical consultation.

FIGURE 17 THE NEW 2 PAGE LAB RESULT (2012)

ឈ្មោះសមាជិក (member name):		003349
ភេទ (sex): ស្រី	អាយុ (age): 67	កាលបរិច្ឆេទស្នើសុំ (date):
វត្តមានឈាមក្នុងសេរ៉ូម (BIS): 0		17/12/2012

		លទ្ធផលចុងក្រោយ (last results)				
លរ nr	បរិយាយតេស្ត (test description)	03-05-2012	02-07-2012	17-12-2012	ឯកតា (unit)	គោលដៅកំណត់ធម្មតា (normal range)
1	ស្ករក្នុងឈាមមុនហូបអាហារ (Fasting Blood Sugar)	98	102	109	mg/dl	មុនហូបអាហារពេលព្រឹក៖ ច្រើនជាង 126 mg/dl បង្ហាញថាអ្នកមានជំងឺទឹកនោមផ្អែម ច្រើនជាង 110 ml/dl បង្ហាញថាអ្នកត្រៀមមានជំងឺទឹកនោមផ្អែម ចន្លោះ 60 ទៅ 100 mg/dl ជាលទ្ធផលដូចអ្នកគ្មានជំងឺទឹកនោមផ្អែម
2	ប៉ូតាស្យូម (Potassium)	4.6	3.8	4.4	mmol/l	ចន្លោះ 3.5 ទៅ 5.0 មីលីមូលក្នុងមួយលីត្រ
3	សូដ្យូម (Sodium)			148	mmol/l	ចន្លោះ 135 ទៅ 145 មីលីមូលក្នុងមួយលីត្រ
4	ក្លរ (Chloride)			102	mmol/l	ចន្លោះ 98 ទៅ 108 មីលីមូលក្នុងមួយលីត្រ
5	ទ្រីគ្លីសឺរីដ (Triglyceride)	149	113	92	mg/dl	តិចជាង 150 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ
6	កូលេស្តេរ៉ុលសរុប (Total Cholesterol)	222	206	202	mg/dl	តិចជាង 200 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ
7	អេច ដេ អិល (HDL Cholesterol)	42	46	52	mg/dl	ចន្លោះពី 40 ទៅ 70 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ
8	អិល ដេ អិល (Estimated LDL Cholesterol)	150	137	132	mg/dl	ចន្លោះ 62 ទៅ 100 mg/dl អត់មានបញ្ហាខ្លាញ់មិនល្អ ចន្លោះ 100 ទៅ 160 mg/dl ត្រៀមមានបញ្ហាខ្លាញ់មិនល្អ ច្រើនជាង 160 mg/dl មានបញ្ហាខ្លាញ់មិនល្អ
9	ត្រង់សាមីនាស (Transaminase SGPT)	38	34	29	U/L	ចន្លោះ 7 ដល់ 50 ឯកតាក្នុងមួយលីត្រ
10	ត្រង់សាមីនាស (Transaminase SGOT)	31	37	25	U/L	ចន្លោះ 10 ដល់ 40 ឯកតាក្នុងមួយលីត្រ
11	ក្រេអាទីនីន (Creatinine)	0.9	0.8	1.2	mg/dl	តិចជាង 1.1 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ សំរាប់ស្ត្រី តិចជាង 1.2 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ សំរាប់បុរស
12	អ៊ី ជី អែហ្វ អរ (eGFR)	>60	>60	45	mL/min	ធំជាង 60 មីលីលីត្រក្នុងមួយនាទី
13	ប្រូតេអ៊ីនក្នុងទឹកនោម (Proteinuria)	-+	-+	+	សញ្ញា	- គ្មានប្រូតេអ៊ីនក្នុងទឹកនោម -+ សង្ស័យមានប្រូតេអ៊ីនក្នុងទឹកនោម + វី ++ វី +++ វី ++++ មានប្រូតេអ៊ីនក្នុងទឹកនោម (សូមពិនិត្យតេស្តអោយបាន 3ដងក្នុង3ខែ ដើម្បីបញ្ជាក់ថាអ្នកមានប្រូតេអ៊ីនក្នុងទឹកនោម)
14	អាល់ប៊ូមីនក្នុងទឹកនោម (Albuminuria)	150	150	150	mg/l	តូចជាង 20 មីលីក្រាមក្នុងមួយលីត្រ

continuing on a second page with:

លរ nr	បរិយាយតេស្ត (test description)	03-05-2012	02-07-2012	17-12-2012	ឯកតា (unit)	គោលដៅកំណត់ធម្មតា (normal range)
15	ក្រេអាទីនីនក្នុងទឹកនោម (Urine Creatinine)	200	200	300	mg/dl	ចន្លោះពី 10 ទៅ 300 មីលីក្រាមក្នុងមួយដេស៊ីលីត្រ
16	អនុបាតអាល់ប៊ូមីនទៅក្រេអាទីនីន (Albumin-to-Creatinine Ratio)	មិនធម្មតាតិច	មិនធម្មតាតិច	មិនធម្មតាតិច		-ធម្មតា លទ្ធផលអនុបាតតូចជាង 30 mgអាល់ប៊ូមីនក្នុង 1 gគ្រេអាទីនីន -មិនធម្មតាតិច ចន្លោះពី 30 ទៅ 300 mgអាល់ប៊ូមីនក្នុង 1 gគ្រេអាទីនីន -មិនធម្មតាច្រើន អនុបាតធំជាង 300 mgអាល់ប៊ូមីនក្នុង 1 gគ្រេអាទីនីន

សំគាល់៖ សូមយកលទ្ធផលតេស្តនេះទៅជាមួយរាល់ពេលដែលអ្នកទៅពិនិត្យ និងពិគ្រោះជំងឺជាមួយគ្រូពេទ្យព្យាបាល។

អ្នកបច្ចេកទេសមន្ទីរពិសោធន៍ (laboratory technician)

Signed by one of 3 laboratory technicians employed by MoPoTsyo. At the end of 2012 we have hired a specialist to carry out an independent assessment of our lab which resulted in a series of recommendations which are being addressed in 2013.

Patient Consent in the Lab Test application Form:

In the annex is the application form for the lab test. This is filled when the member pays for the tests. This happens in advance. At the bottom of this application form is a special permission to use the result for research purpose is mentioned at the bottom of the form.

Medical Consultation Services

Medical consultations are organised by MoPoTsyo in 9 public facilities in 8 Operational Districts, mostly at rural referral hospitals (CPA1 or CPA2) in a room at the hospital that is made available or kept available for these weekly or 2-weekly sessions. A session lasts half a day during which some 30 to 35 patients receive medical consultation.

For more than 10,000 medical consultations in 2012, MoPoTsyo hired 4 experienced Medical Doctors, every one of them once or a couple of times per month, for a morning. MoPoTsyo's capacity building department plans these sessions, based on information it receives through its PEN about the size of need, in other words "the volume of the demand". The contracted doctors then travel to the public facility to hold a consultation session which is "run" and organised by a team of PE's. The PE's perform tasks such as crowd control, registration, preparing, administration etc., tasks that in other countries is done by nurses and other professional hospital staff. Sometimes the session is in the morning, sometimes in the afternoon, but never the whole day. Some of these doctors are government staff and others are not government staff. Government staff hold their sessions on the weekends.

There are different advantages in letting the PE's join in the management of the service delivery to the members including but not limited to:

1. Lower overall cost because nurse time is much more expensive than PE time
2. Patients trust the PE's because they know them personally
3. PE's can hear the doctor's treatment or advice. Often it is helpful if PE's repeat and repeat again the advice of the doctor, later back in the community, because very often patients do not remember what the doctor told them once they are outside or back home again.
4. Prestige, motivation, and ownership of the service by the PE's
5. PE's provide a safeguard against loss of coherence between prescription by doctors and dispensing of medication through the RDF, by being vigilant and monitoring services.
6. PE's offer convenient hours/time for consultation (weekends) outside working hours.
7. Service provision is more casual and more fun for everyone.
8. Having a PE creates a more satisfactory work environment for the Doctor

In the local context it is difficult to list any disadvantages that really make sense. It remains utterly puzzling why it is not done more often in other resource constrained contexts comparable to the Cambodian one.

During 2012, the number of consultations increased from 6,347 consultations (2011) to 10,955 consultations in total (in 2012), an increase by 73%.

The number of consultation ***sessions*** increased by only 51% from 208 to 314, thus the number of patients per session rose from 31 in 2011 to 35 patients per session in 2012. This means shorter time spent between the doctor and the patient. We have to analyse if this issue is causing problems or simply represents a gain in efficiency - for example to better availability of laboratory results - requiring less time for the physician to come to a decision. Ultimately it depends on "which doctor achieves the best outcomes" if we can isolate this from other confounding factors. We have never analysed this so far.

We have been working with four different physicians to deliver more than 10,000 consultation services to our members. Among them, two are private doctors and two are government employees (who perform consultation services during the weekends when they are not on duty in national hospitals.) MoPoTsyo hires them in their private capacity and pays these civil servants for their travel and for performing these services for our NGO and its members.

TABLE 9 HIRED MEDICAL CONSULTANTS IN 2012 SEEING OUR MEMBERS

Dr 1	547	5%
Dr 2	7043	64%
Dr 3	2939	27%
Dr 4	426	4%
total consultations	**10955**	**100%**

Only patients who are member of MoPoTsyo can see the doctor. It is an appointment-based system, facilitated through the Peer Educator Network. So far the patients pay a user fee to the hospital, not to MoPoTsyo. The idea behind hiring a doctor, is to train the residing doctor of the public facility to do the medical consultation, however their attendance is irregular.

Below is the cost calculation of 2011: the 205 half mornings does not include the "travel" time that is needed for the doctor to travel to and from the hospital. For estimating the Full Time Equivalent (FTE) of Doctors needed to do this activity, the traveling time should be added. We have not calculated the FTE for conducting all the consultations that include travel time. It may be more than 1 FTE. The session time is 0.5 FTE.

However, the cost of reimbursing the doctors for traveling and spending time traveling is included. It is of course more efficient to pay the doctor for his travel than to reimburse 35 patients for their travel. If on average 35 patients would have to travel to the provincial hospital, it would add at least 1,000,000 riels (USD 250) to their travel cost. So this solution is more

efficient and probably helps reduce Out of Pocket Health Expenditure for a large and vulnerable population.

If the doctors in the local hospitals become comfortable examining and treating patients, they can begin to take over the less complicated cases. When that happens, the specialised doctors will not have to travel so frequently to the local hospital as used to do. This is not yet the case in 2012.

TABLE 10 MEDICAL CONSULTATIONS IN 2011 AND 2012

year 2011	TOTAL	annual average per location	average monthly for 8 locations
1. Nr of patients who received Consultation	6347	793	66
2. Cost [(nr3+nr4)*nr5]	$ 20,257	0	0
3. Transportation	$ 478	0	0
4. Paid in Doctor fees for 8 locations	$ 318	0	0
5. Number of consultation sessions	205	17.1	1.4
6. Nr of patients per session	31		
cost per consulting patient (nr2/nr1)	$ 3.19		

In 2012, consultations were done in 10 hospitals in 9 OD's, compared to 2011, when consultations were done in 8 OD's and 9 hospitals.

	Total	Per OD	
year 2012		Annual average	Monthly average
1. Nr of patients who consulted Doctor	10,363	1,151	96
2. Cost [(nr3+nr4)*nr5]	$20,773.00	$ 2,308.11	$ 192.34
3. Transportation expenses	$ -		
4. Fee for Doctor per consult session	$ -		
5. Nr of consultation sessions	219	24	2
	$ -		
cost per consulting patient (nr2/nr1)	$ 2.00		

Because of the varying distances that must be covered by the Doctor to travel to remote hospitals the cost per consultation per patient varies strongly, depending on the location.

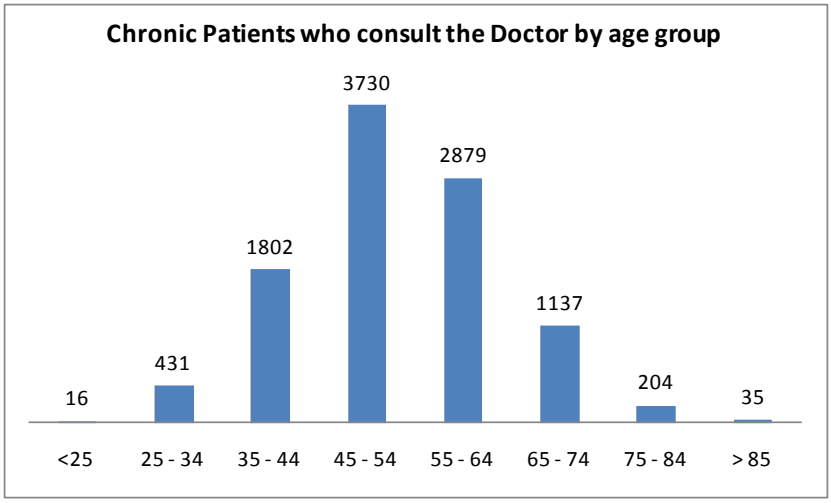
TABLE 11 HELPING PATIENTS SAVE TRANSPORTATION COST 2011 AND 2012 WHEN THEY SEE THEIR PHYSICIAN

	1	2	3	4	5	6	7	8
year 2011	**Pochentong**	**Ang Roka**	**Doun Keo**	**Bati**	**Prey Kabass**	**Kirivong**	**Thmar Pouk**	**Kong Pisey**
1. Nr of patients who received Consul	642	588	621	639	527	1149	606	1575
2. Cost [(nr3+nr4)*nr5]	**$913.50**	**$2,106.00**	**$1,782.00**	**$2,268.00**	**$2,178.00**	**$3,509.00**	**$4,392.00**	**$3,108.00**
3. Transportation	$7.50	$45.00	$45.00	$45.00	$85.00	$85.00	$115.00	$50.00
4. Fee per consultation for Doctor	$36.00	$36.00	$36.00	$36.00	$36.00	$36.00	$68.00	$34.00
5. Nr of time of consultation	21	26	22	28	18	29	24	37
cost per consulting patient (nr2/nr1)	**$1.42**	**$3.58**	**$2.87**	**$3.55**	**$4.13**	**$3.05**	**$7.25**	**$1.97**

	PhnomPenh	Takeo Province					BMC	K. Speu	K. Thom
	1	2	3	4	5	6	7	8	9
year 2012	**Pochentong**	**Ang Roka**	**Doun Keo**	**Bati**	**Prey Kabass**	**Kirivong**	**Thmar Pouk**	**Kong Pisey**	**Baray Santuk**
1. Nr of patients who consulted D	1529	662	1118	662	628	1739	1077	2163	785
2. Cost [(nr3+nr4)*nr5]	**$1,479.00**	**$1,782.00**	**$1,620.00**	**$1,215.00**	**$2,299.00**	**$3,751.00**	**$3,553.00**	**$3,612.00**	**$1,462.00**
3. Transportation expenses	$7.50	$45.00	$45.00	$45.00	$85.00	$85.00	$115.00	$50.00	$50.00
4. Fee for Doctor per consult sess	$36.00	$36.00	$36.00	$36.00	$36.00	$36.00	$72.00	$36.00	$36.00
5. Nr of consultation sessions	34	22	20	15	19	31	19	42	17
t per consulting patient (nr2/nr1)	**$0.97**	**$2.69**	**$1.45**	**$1.84**	**$3.66**	**$2.16**	**$3.30**	**$1.67**	**$1.86**

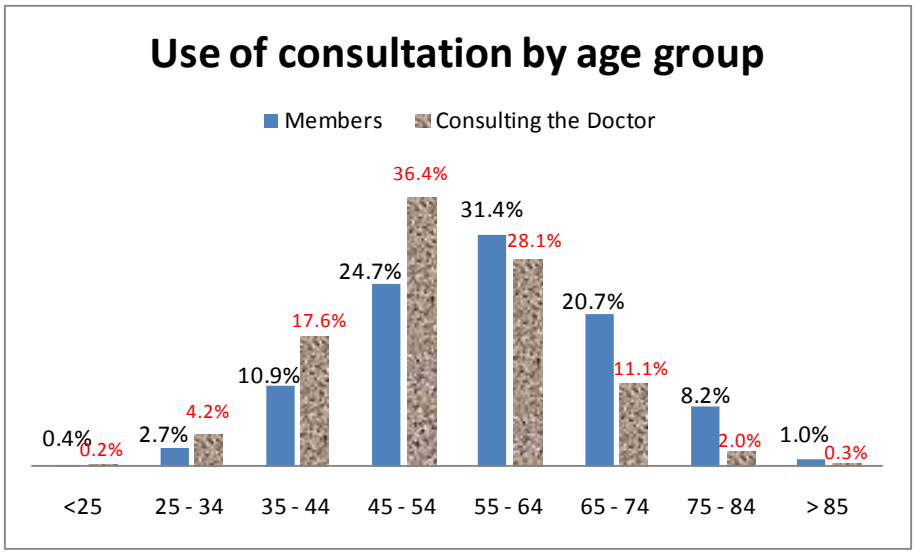
The average cost in 2011 per patient was USD 3.19. This was reduced to USD 2 per patient in 2012. In the coming 5 years, even if local doctors working at the referral hospitals in OD's where the PEN are active, become sufficiently trained to examine and prescribe appropriate treatment for the majority of patients with Diabetes and High Blood Pressure, there will be always a proportion who should be sign by a more experienced Doctor. The PEN can remain "instrumental" in organizing such complicated cases into groups, for which it is worthwhile to make the specialist travel, rather than making these vulnerable people travel to a clinic.

FIGURE 18 BY AGE GROUP 10,234 MEDICAL CONSULTATIONS IN 2012



The profile of the 10234 patients who consulted the medical doctor in 2012 is seen in the figure above. We can see a barrier to access if we compare the actual use by age group with their proportion among the membership of MoPoTsyo as chronic patients. For elderly people their access to medical services appears compromised with climbing of age.

FIGURE 19 USE OF MEDICAL CONSULTATION BY AGE GROUP



Throughout the report the underutilization of services by non-diabetic hypertension patients is evident in almost all the areas. The table below is meant to show that although there is some progress over the years, it remains very unsatisfactory.

TABLE 12 USE OF MEDICAL CONSULTATION BY TYPE OF PATIENT

Medical consultations facilitated by the Peer educator networks in the public services				
year	Diabetes, no hypertension	Diabetes & Hypertension	Hypertension no Diabetes	**Totals**
2007	42	92	0	134
2008	180	511	8	699
2009	370	800	15	1185
2010	664	1093	295	2052
2011	1709	3045	1355	6109
2012	3030	5080	2330	10440
totals	**5,995**	**10,621**	**4,003**	**20,619**

Medical consultations facilitated by the Peer educator networks				
year	Diabetes, no hypertension	Diabetes & Hypertension	Hypertension no Diabetes	**Totals**
2007	31%	69%	0%	100%
2008	26%	73%	1%	100%
2009	31%	68%	1%	100%
2010	32%	53%	14%	100%
2011	28%	50%	22%	100%
2012	29%	49%	22%	100%
totals	29%	52%	19%	100%

For most of the Diabetes patients in 2012 who went to see their Doctor it was not the first time. MoPoTsyo database records go back to 2007. The average of these individual DM patients was 3.8 so while most have experience, 997 came for the first time and came only once in 2012.

FIGURE 20 DIABETES PATIENTS IN 2012 BY THEIR TOTAL NUMBER OF MEDICAL CONSULTATIONS

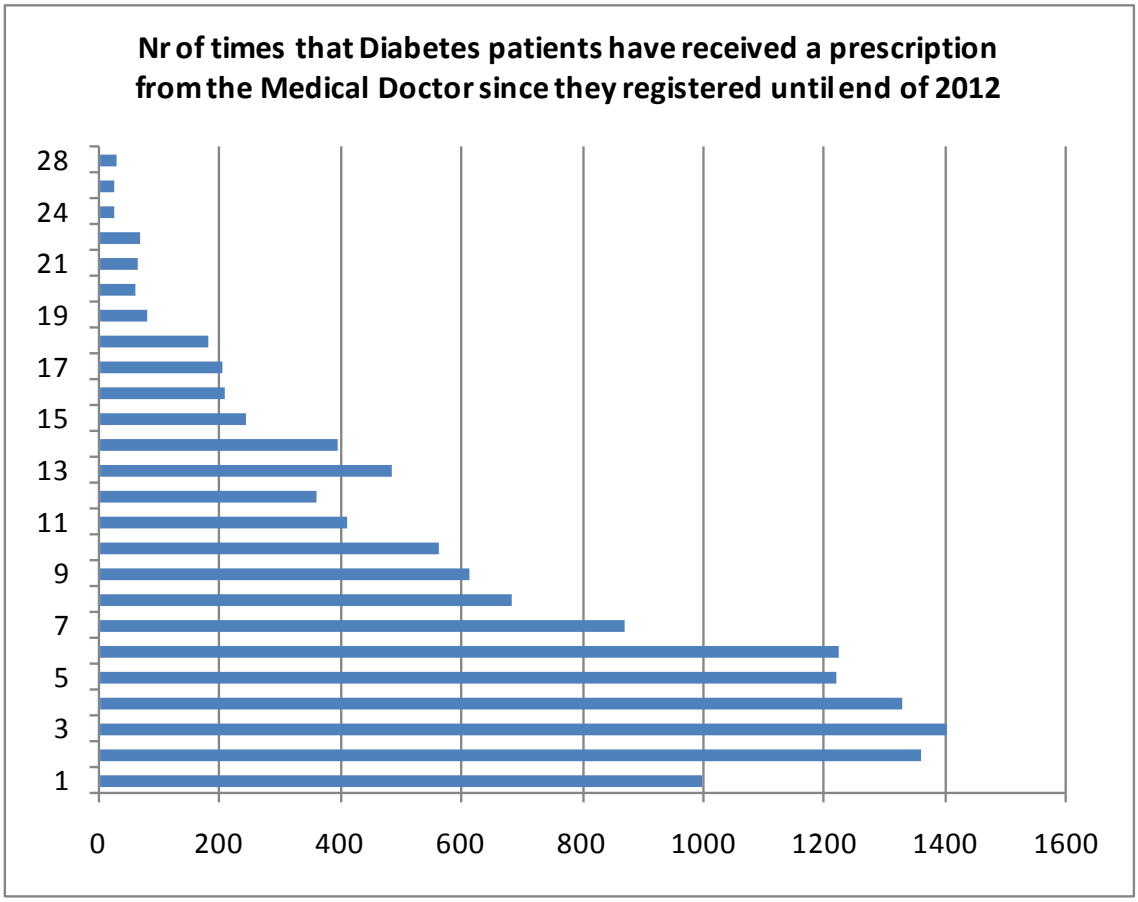


TABLE 13: ACCESS TO MEDICAL CONSULTATION & PRESCRIPTION BY DIABETES PATIENTS 2010-2012

Year	DM regist	Med Consult	Indiv DM Pat	Annual Contact Rate	Has no prescription
2010	2965	1757	1161	0.59	60.8%
2011	4357	4751	2193	1.09	49.7%
2012	6732	8085	3440	1.20	48.9%

The number of diabetes patients who register has more than doubled between 2010 and 2012 showing a steady increase. The proportion of diabetes patients who are without a prescription (due to not being examined by a medical doctor) was reduced from 61% to 49% over the same period.

The number of individual diabetes patients who are using the medical consultation service during the given year has tripled from 1160 individuals in 2010 to 3440 individuals in 2012. The frequency with which these individuals are using the medical services is also increasing from (1757/1161 in 2010, to 4751/2193 in 2011 to 8085/3440 in 2012) but that figure is not so relevant as the annual contact rate which takes as denominator all the patients who have registered:

$$\frac{\text{total medical consultations}}{\text{Nr of DM patients registered}}$$

The trend shows that overall the trust in the medical services is gradually improving and that more diabetics are ready to meet the doctor:

a) Among diabetics a larger proportion now has a prescription
b) Those diabetics who have a prescription go more often to the doctor

The most relevant denominator would be the number of diabetes patients who live in the area, whether they have been registered or not. So ultimately we should use the estimated prevalence of diabetes as the denominator. This becomes possible with regularly repeated surveys such as the STEP Survey.

The tables below show the comparison of DM and HBP. The trend in the figures is encouraging. While the totals of patients registered do not differ enormously, the Diabetics make much better use of the services. The proportion of diabetics among those who consult the Doctor is much larger than the consultations of HBP patients without diabetes. (NB Prescription is a proxy for "having consulted a Medical Doctor" so "has no prescription" means that the patient has not yet consulted a Medical Doctor.

TABLE 14: ACCESS TO PRESCRIPTION

Year	DM regist	Med Consult	Indiv DM Pat	Annual Contact Rate	Has no prescription
2010	2965	1757	1161	0.59	60.8%
2011	4357	4751	2193	1.09	49.7%
2012	6732	8085	3440	1.20	48.9%
Year	HBP	Med Consult	Indiv HBP Pat	Annual Contact Rate	Has no prescription
2010	2514	295	263	0.12	89.5%
2011	3997	1358	907	0.34	77.3%
2012	5809	2323	1343	0.40	76.9%

A similar line of reasoning as for DM above and analysis is made for HBP. This shows that for HBP the picture is worse than for DM. HBP continues to pose an enormous challenge. There is

no way PE's for diabetes can deal with the organization caseload of HBP all by themselves. More support is needed from the public services, in particular the health centers. This requires an adaption of public policy with health centers being actively involved in providing support for chronic care for HBP patients.

The trends in the HBP figures are the same as in DM: positive. But HBP remains less than satisfactory overall.

TABLE 15: ACCESS TO MEDICAL CONSULTATION BY ELDERLY CHRONIC PATIENTS (DM+HBP)

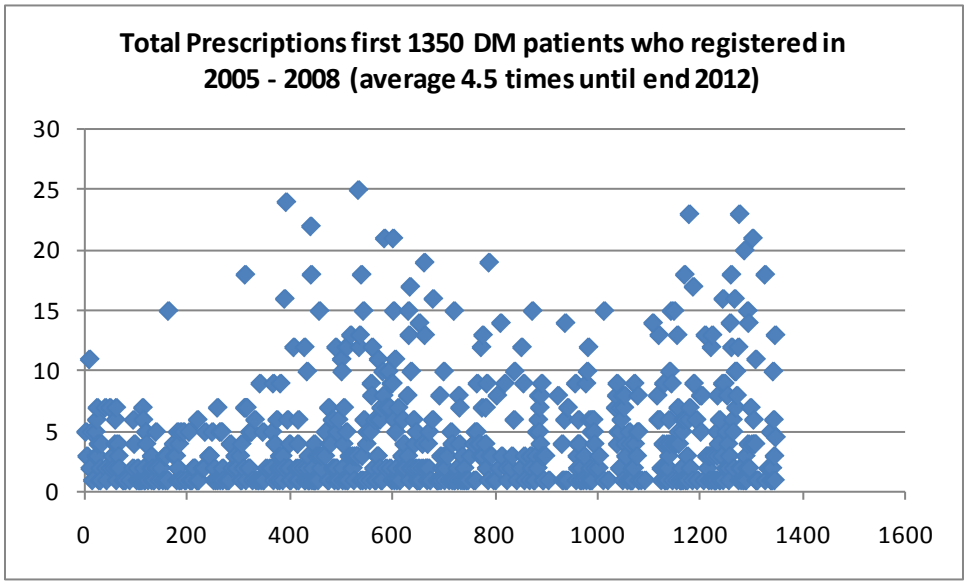
	2010	2011	2012
Consulting patients	2000	5918	10303
>60 years old	719	2088	3694
>65 years old	420	1227	2068

	2010	2011	2012
Consulting patients	2000	5918	10303
>60 years old	36%	35%	36%
>65 years old	21%	21%	20%

With the access to the laboratory services for elderly being compromised, it is no surprise that there is little or no improvement over the years in access for the elderly. We are increasing our numbers of patients in general, but we are not improving access for the elderly to medical consultation. Old people's access to the medicines is via medical consultation. This requires state subsidy and the burden cannot be put on the shoulders of diabetes patients who are already vulnerable.

It is interesting to look at the 77 diabetes patients who registered in 2007 some of whom have 1 prescription and others as many as 19 prescriptions in 4 years between 2007 and the end of 2011. With prescription we mean that the Medical Doctor, consulted by the patient, writes in the MoPoTsyo self-management book of the patient, which medicines must be taken every day and the quantity, and signed by this Doctor and dated. With this prescription, the patient can go to one of the pharmacies contracted by MoPoTsyo and buy for example 30 days of medication, with a maximum of 3 months. When the medication is finished, the patient can go back the pharmacy with the same old prescription to pay for a refill. PE's are supposed to keep an eye on the patient to see if the medication is working adequately or not. If the PE see that it is time for the patient to get a change in medication, they urge the patient to go for medical consultation. Then, the Doctor gives the 2nd prescription. Patients go to see the Doctor once or twice a year on average. In the table below, prescription equals "went to consult the Doctor". The frequency with which diabetic people go to the Doctor varies a lot as can be seen in the figure below.

FIGURE 21 THE FIRST 1350 DIABETICS FREQUENCY OF MEDICAL CONSULTATION



The average number of times that 655 Diabetics (among the first registered 1350 diabetic members) have gone to see the Doctor since they registered with MoPoTsyo (inside the period 2005 until end of 2008), until the end of 2012, is 4.5 times. 694 never go, which you cannot see on this scatter diagram, and others to as much as 25 times. Among this first group of diabetics 657 are rural and 693 are urban slum diabetics.

Through the peer educator's experience new patients will get a sense of how much it is going to cost them every month to buy medication, if they go to consult the Doctor at the Hospital, in a session organized by MoPoTsyo's Peer Educator Network. For this reason we must assume that only people who want to and are able to pay for their medicines go to consult and have a prescription.

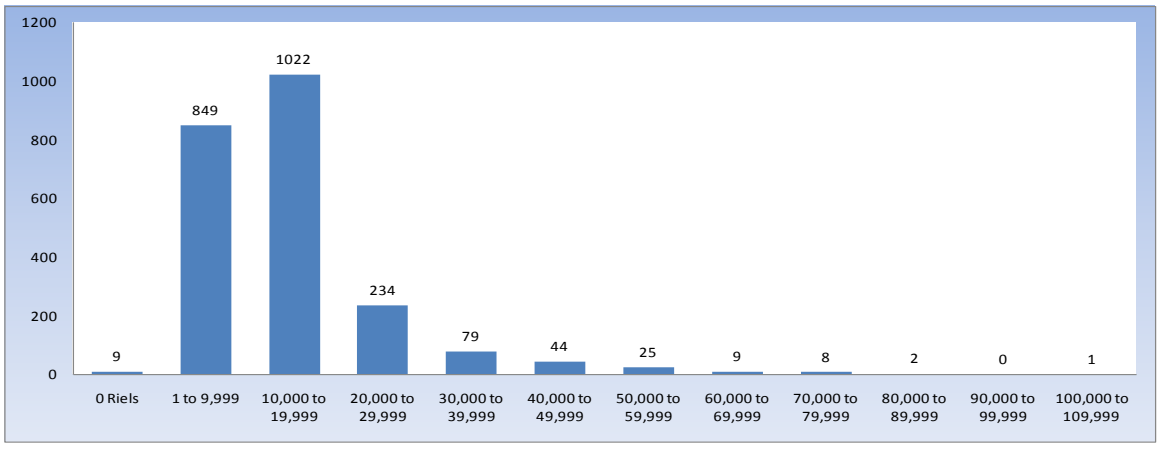
The price of consultation is usually much lower than the price of the medicines. The lowest is 1500 Riels (USD 0.38) and the highest is 3500 Riels (USD 0.88). The patients pay these amounts at the Public Hospital according to the user fee schedule of each hospital. MoPoTsyo's peer educator collects it and hands it over to the Hospital as user fee income. However, this income is not used by the Hospital to pay the Medical Doctor, hired as consultant from outside and paid by MoPoTsyo. In 2012, the cost of that Medical Doctor is paid by our donors or out of the revenue of the Revolving Drug Fund if there is no donor to pay for the location where we are organizing these consultations. For the real cost to MoPoTsyo of these consultations see the analysis further down below.

Through talking with their own PE, who can usually give them a fair estimation of what their disease is going to cost them every month, the patients are already aware before they meet the

doctor during consultation what their monthly cost approximately is going to be. This knowledge is probably discouraging for some and encouraging others. Among those who do not have a prescription, there are many who do not need a prescription, because they are successfully applying lifestyle changes. There are also many who should have a prescription but they do not want to or they are unable to afford the medication or meet other barriers. We do not know the barriers and proportions exactly. But when studying a sample among them, in July 2011, we found that on average, the people without prescription are in better health than people with a prescription. The data showed that the average level of education and training among the group without a prescription is slightly higher than among the group with a prescription, but there are also poor people among this group who simply cannot afford the medication. This data may be limited by the small sample size or be reflective of baseline sickness levels instead of showing that medications are not helping those with a prescription.

The monthly cost that the patients had to pay in 2011 for medication when they receive their first prescription in this year 2011 looks as in the graph below. On average it is USD 3.60 in 2011, but the variation is large as it depends on the seriousness of disease. It ranges from 0 to more than 100,000 Riels (USD 25) per month. Please note that in 2011 there are patients who already had a prescription in 2010 so it is not their real first prescription as a patient. Over time as disease progresses, more medicine is needed to keep it under control. It can be that the category of higher prescription costs per se discourages patients from getting that kind of prescription. It is true that some very sick poor uncontrolled diabetics need a lot of encouragement to dare to go to see the Doctor because they have had many bad experiences already.

FIGURE 22 1ST PRESCRIPTION MONTHLY COST (N=2281 1ST PRESCRIPTIONS)



4000 Riels = 1USD

The average level of cost of the “first prescription” given to a DM patient in a given year is of course lower than the average cost-level of all prescriptions given in that year, because later prescriptions for the same patients almost always add medication as can be seen below. It is remarkable that the median in 2012 is reduced compared with 2011, see table below.

TABLE 16 COST TREND (PRICES CHARGED) PRESCRIPTIONS FOR DIABETIC PATIENTS

Total / Year	3-year trend in prescription cost		
Nr of prescriptions analysed	monthly cost to be paid by DM patients for their medication (1USD=4000 riels)		
14326	3-years	average	median
1757	2010	$ 4.47	$ 3.75
4751	2011	$ 6.09	$ 4.88
7818	2012	$ 6.29	$ 4.50

There are more reasons for the increase in 2011 compared with 2010:

In 2011 we introduced a statin and a fibrate, SIMVASTATIN 20mg and GEMFIBROZIL respectively. Both are relatively expensive compared to the other drugs but necessary to treat types of dyslipidemia. Because these 2 molecules are already relatively expensive, MoPoTsyo does not mark them up. This means that they are dispensed at an actual loss to MoPoTsyo. Gemfibrozil is necessary as we have 15% of diabetics presenting with normal glucose and normal cholesterol values but Triglycerides >400 mg/dl. This puts them at risk for pancreatitis. Statins are part of WHO's recommended standard package for low resource settings for most cases of dyslipidemia.

In 2012, 39% of DM patients pay less than 500 Riels per day, so less than USD 3,75 per month. That leaves 61% of patients among those with prescription vulnerable to cost related barriers in obtaining medication, see the Table below. There is also a much smaller group that would need to pay >30,000R (7.5USD) per month that may be highly vulnerable to cost related barrier in obtaining medication. The table below summarizes these findings.

TABLE 17 PROPORTION OF DM WITH HIGH PRESCRIPTION COST IN 2012

year 2012		
per month $	Riel/day	
3.75 - 5.63	500-750	23%
5.63 - 7.50	750-1000	14%
7.50 - 9.38	1000-1250	7%
9.38 - 11.25	1250-1500	5%
> 11.25	>1500	12%
	in total	61%

Whom to target with a subsidy (a discount voucher) and with how much?

The table shows that it may be more efficient to help the bottom 3 rows (12%+5%+7%) =24% of patients with 70-90% of their cost instead of helping "all diabetics" so 100% patients with an "average" amount. The average and median are not enough for those who face the highest cost and the majority of diabetic patients may not need financial help with this. It is an organizational

challenge to target the right patient with the right amount of financial assistance. If you help only the bottom 24%, there may be some people in the 14% group and in even some in the 23% group that could also benefit from assistance but they are not the priority with the highest needs. After you have dealt with the bottom 24%, you can add that group as well, but then the total proportion of assisted diabetics is still not more than 38% of everyone with a prescription.

When we analyse the cost of prescribed medication for a NEW diabetes patient, for one month, when this patient consults the Doctor for the first time within the year and we compare how that type of cost evolves over the past 3 years then we get the following table:

Nr of 1st prescrptions	Year	daily cost in Riel	monthly cost
1161	2010	546	$ 4.09
1537	2011	565	$ 4.24
2069	2012	487	$ 3.65

The numbers of new patients are rising year by year, but the proportion of new patients compared to the patients already in the cohort becomes smaller. That is good sign.

TABLE 18 PROPORTION OF NEW PATIENTS AMONG THOSE COMING FOR CONSULTATION (DM ONLY)

year	nr of 1st prescription	% of 1st prescription	total prescriptions
2010	1161	57%	2052
2011	1537	25%	6109
2012	2069	20%	10408

Comparing DM patients and HPB Patients in the year 2012

TABLE 19 PRICE OF PRESCRIBED MEDICATION IN 2012

Cost of Prescribed Medication paid by Patients		
DM patients	per day Riels	839
DM patients	per month Riels	25,157
DM patients	per month USD	$ 6.29

HBP patients	per day	352
HBP patients	per month Riels	10,549
HBP patients	per month USD	$ 2.64

Frequency of buying: In 2011, 3661 patients bought 18,530 months worth of medication. That is 5.06 months/patient instead of the 12 times if the patient is supposed to refill one time per month. In 2012, 4712 patients bought 21,491 months worth of medication. That is 4.56 months/patient instead of 12 times. However just the existence of the invoice itself does not give us the information about the volume of medicines the patient buys. Some patients buy for half a month and others for 2 months or even 3 months.

ADHERENCE TO PRESCRIBED MEDICAL TREATMENT

The cost of the routine medication on annual basis depends on how often the patient goes to buy his/her medicine. This has been improving, as we can see in the table as in the early years people did not buy sufficient medication. Hypertension patients are still not buying enough.

TABLE 20 TRENDS IN ANNUAL EXPENDITURE ON ROUTINE MEDICATION BY TYPE OF CHRONIC PATIENT

Amounts spent in riels by type of individually registered Patient for their medication at the contracted pharmacies					
year	D	DH	H	Unknown	Average
2008	21,451	21,171	6,500	-	16,374
2009	66,186	48,434	9,245	-	41,288
2010	77,128	65,215	17,313	19,175	59,610
2011	111,944	113,620	7,138	81,250	104,651
2012	101,299	124,248	22,659	56,333	101,513

As will be explained below, increase in expenditure reflects improvement in adherence, not drug price changes.

To calculate adherence, we look at the date of the medical consultation and then calculate the number of days until 31 December 2012. We take this remaining number of days in 2012 and multiply it with the individual patient's daily cost of prescribed medication to calculate the value of medication that this patient should have bought. We do this for all patients with a prescription in 2012 and sum the total. For a detailed explanation of the methodology, see the annex.

Thus in 2012, there are 4,783 individual patients with a prescription who together should have bought 929,857 days of medication for a total of USD 139,240 or 556,961,547 Riels. If we look at the value of their prescribed medication, during 2012, we have supplied the contracted pharmacies USD $138,768 and patients have bought for a total of USD $134,895. Although we have to subtract 15% profits of the pharmacy from the amounts paid by the patients, the remaining level of USD 114,661 (being 82% of our sales at USD 139,240) still suggests good adherence.

The figures in the table below are a comparison of what all Diabetic members should have bought in 2012 according to their 'first prescription since 2010" and what they actually bought in the year 2012: that is 72%. The problem with this method is that in later prescriptions the medicine that the patient has to take has probably increased so it is not an overestimation. The number of Diabetics with a 1st prescription is 4767 persons. However the number who have been buying in 2012 is less: 4395 Diabetics. So 372 DM with a first prescription (=8%) did not even buy once in 2012 their medication. Perhaps they have died, and that means that the actual adherence among the smaller number of actual buyers is a slightly better. Perhaps the negative and the positive compensate each other, so we keep the figure as it is: 72%. As a group they bought 26,020 times. It means that on average these 4,395 diabetics paid USD 28.76 for their medication in the year 2012.

TABLE 21 ADHERENCE IN 2012 AMONG DIABETICS

Year 2012	DM should spend	703,851,324	If 1 USD = 4000 riel
		$ 175,963	
Year 2012	DM did spend	505,667,310	72%
		$ 126,417	

For non diabetic Hypertension patients the situation does not look good at all.

TABLE 22 ADHERENCE IN 2012 AMONG HBP PATIENTS

year 2012	2193 HBP should spend	158,880,869	556 HBP did not buy at all (25%)
		$ 39,720	
year 2012	1637 HBP did spend	61,000,900	38%
		$ 15,250	

In 2011 we made this calculation without properly calculating the number of remaining days in the year. We had by error multiplied for every patient the number of days with 365, which is correct for prescriptions that are older than one year, but not all are. As a result we found adherence at lower levels if there were many patients who received their 1st prescription *during* the period under study (see annex to this report).

The average price of High Blood Pressure HBP medication is lower (USD 3.50) than that of diabetes medication (USD 5.50 per month).

It is not so much a matter of affordability, it seems. We speculate that non diabetic hypertensive people underestimate the importance of taking their daily medication and are confused by conflicting information from different sources.

MoPoTsyo's Revolving Drug Fund

We have contracted 17 private pharmacies and 2 public pharmacies who get our supplies of medicines (including insulin) so they can sell it to our members. Our turn-over has been increasing steadily since we started in 2007.

TABLE 23 SALES AND CREDIT TO PHARMACIES

		Baseline 100	83%	276%	521%	
		2007-2009	2010	2011	2012	Grand-Total
Pharm purchase deliveries by MoPoTsyo	Riel	89,380,850	163,827,300	335,780,858	555,072,456	
	US$	$ 22,345	$ 40,957	$ 83,945	$ 138,768	$ 286,015
Pharmacies paid to MoPoTsyo	Riel	54,730,350	101,846,500	241,333,110	398,501,322	
	US$	$ 13,683	$ 25,462	$ 60,333	$ 99,625	$ 199,103
Patients paid to Pharmacies	Riel	44,242,250	117,520,080	342,432,110	539,578,225	
	US$	$ 11,061	$ 29,380	$ 85,608	$ 134,895	$ 260,943
					Outstanding credit	**$ 86,913**

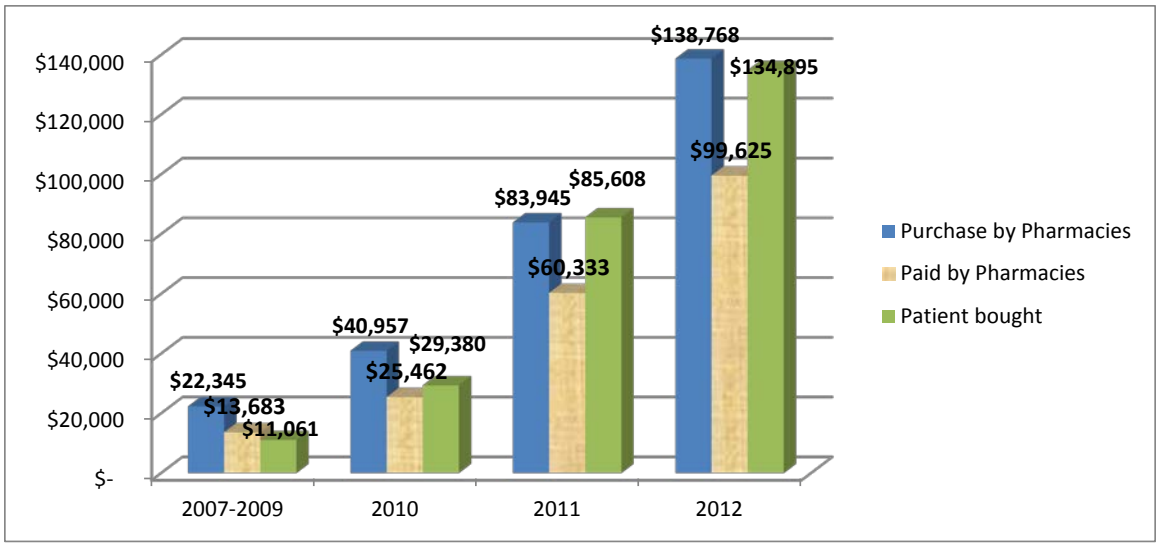
In the year 2012, the speed with which pharmacies paid their bills to MoPoTsyo for supplies of RDF drugs remained the same, ending the year with 72% of bills paid and 28% outstanding bills. The debt is due to only 3 pharmacies who are withholding payment. The others all pay on time.

	Do pharmacies pay on time…level of outstanding credit			
	2007-2009	2010	2011	2012
paid by pharmacie	61%	62%	72%	72%
credit to pharmaci	39%	38%	28%	28%
patients bought	49%	72%	102%	97%

From the beginning in 2007, some pharmacies started to delay paying for the medicines that we supplied to them. In 2011, we intervened and changed the contract. We stipulated that they had to pay a market interest rate over invoices that were more than 100 days old. It took some time to become effective. It was effective in the sense that the level of outstanding credit reduced by 10%. The 28% reflects the value of 100 days not paying bills by some pharmacies because we don't charge interest over the first 100 days to them. Pharmacies do not want to pay for the medicines as long as they have not have sold them to our patients.

Below is a graph that shows how the pharmacies are using their intermediary position between central supply and their proximity to the patient.

FIGURE 23 INCREASE IN MEDICINE SUPPLY TO PHARMACIES & CREDIT



The 3 columns show that the patients are buying what we are supplying. Patients pay for their medication at the moment it is dispensed to them. The pharmacies do not want to pay when they receive the medicines from MoPoTsyo but after they have sold them to our members. Below is a more detailed description of the 3 columns:the value of medicines purchased by the pharmacies from MoPoTsyo and supplied to them by MoPoTsyo based on the contracts that we have with each of pharmacy that dispenses our RDF medicines to our members; MoPoTsyo supplies small amounts of medicine every month or every week because most pharmacies do not have the required air conditioned storage conditions that we have at our central stock;

1) the value of what the pharmacies have paid to MoPoTsyo. They are always behind in paying so we have to keep a pressure system in place;
2) the value of what the patients buy from the pharmacies that we have supplied. This value includes an average mark-up of 15% on top of the value of what we have supplied to the pharmacies, so actual value of the 3rd column in 2012 is USD $ 117,300 (if consider USD 134.895 as 115%). So have supplied medicines for a value of USD 138,768, the pharmacies have received for a value of USD 117,300 from the patients plus they charged another USD 17,595 to these patients for profit, but they delay payment to us as supplier. Only 3 pharmacies a responsible for this and we plan to address this again in 2013.

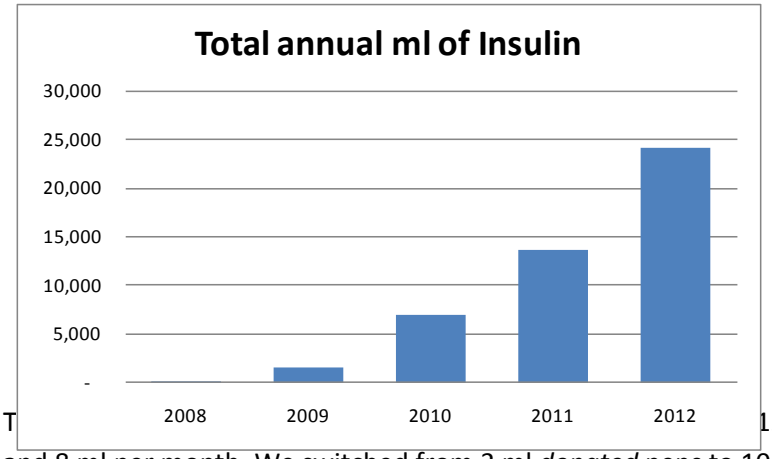
The detailed picture of the year 2011 in khmer riels is as in the table below. You can see the quantities and prices we paid at the supplier, the prices we charge to the pharmacies and the prices that the pharmacies charge to the patients, for each item. The table shows the real quantities MoPoTsyo's supply during the whole year 2011 to the pharmacies. For clarity we have added the unit costs of what we were charged by our suppliers for these medicines. The next 2 columns indicate what MoPoTsyo charged to the pharmacies, and the last 2 columns show what the pharmacies charged to the patients for these medicines.

TABLE 24 THE COST OF REVOLVING DRUG FUND MEDICINES IN 2011

COST OF MEDICINE IN 2011 (IN KHMER RIEL)									
Nr	Items Description	Dosage	QTY	FROM SUPPLIER		TO PHARMACY		TO PATIENT	
				UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
1	GLIBENCLAMIDE	5mg	961,000	13.78	13,242,580	42.50	40,842,500	50.00	48,050,000
2	METFORMINE	500mg	1,144,000	39.92	45,668,480	85.00	97,240,000	100.00	114,400,000
3	HYDROCHLOROTHIAZID	25mg	295,000	15.00	4,425,000	42.50	12,537,500	50.00	14,750,000
4	FUROSEMIDE	40mg	12,000	20.12	241,440	42.50	510,000	50.00	600,000
5	ATENOLOL	50mg	130,000	23.28	3,026,400	85.00	11,050,000	100.00	13,000,000
6	PROPRANOLOL	40mg	62,000	22.56	1,398,720	85.00	5,270,000	100.00	6,200,000
7	ASPIRIN	300mg	39,000	18.24	711,360	42.50	1,657,500	50.00	1,950,000
8	CAPTOPRIL	25mg	216,000	39.08	8,441,280	127.50	27,540,000	150.00	32,400,000
9	ENALAPRIL	10mg	94,000	43.2	4,060,800	127.50	11,985,000	150.00	14,100,000
10	AMITRIPTYLINE	25mg	117,000	23.2	2,714,400	85.00	9,945,000	100.00	11,700,000
11	AMLODIPINE	10mg	157,000	23.16	3,636,120	127.50	20,017,500	150.00	23,550,000
12	SIMVASTATINE	20mg	35,700	176	6,283,200	220.00	7,854,000	250.00	8,925,000
13	GEMFIBROZILE	600mg	30,870	850	26,239,500	950.00	29,326,500	1,000.00	30,870,000
14	THIAMINE	50mg	130,000	26.28	3,416,400	42.50	5,525,000	50.00	6,500,000
15	MULTIVITAMINE	N/A	180,000	11.72	2,109,600	25.50	4,590,000	30.00	5,400,000
16	LOSARTAN	50mg	-				-		-
17	INSULIN ACTRAPID	3ml	873	3576.36	3,122,162	9,350.00	8,162,550	11,000.00	9,603,000
18	INSULIN ACTRAPID	10ml	-				-		-
19	INSULIN LANTUS	3ml	1,475	3576.36	5,275,131	9,350.00	13,791,250	11,000.00	16,225,000
20	INSULIN MIX 30/70	3ml	1,941	3576.36	6,941,715	9,350.00	18,148,350	11,000.00	21,351,000
21	INSULIN MIX 30/70	10ml			-				-
22	INSULIN NPH	3ml	1,008	3576.36	3,604,971	9,350.00	9,424,800	11,000.00	11,088,000
	INSULIN NPH	10ml							
24	INSULIN SYRINGE	N/A	8,595	no charge	0	450.00			
25	INSULIN PEN NEEDLE	N/A	18,105	86.71	1,569,835	170.00			
TOTAL					146,129,094	MoPoTsyo sold to pharmacies	335,417,450	incl. profit for pharmacy	390,662,000
								16%	55,244,550

According to our database, the total amount paid by patients to the pharmacies in the year 2011 was 314,129,540. The difference of 76,532,460 means either that not everything that we supplied was sold (yet) to the patients, or that some is sold without invoices to our members, or to other people or patients. It can be a combination of both. What is thus unaccounted for it amounts to almost 20% of the total.

FIGURE 24 INSULIN USE IN ML



T 12. The average use is between 7 and 8 ml per month. We switched from 3 ml *donated* pens to 10 ml vials that we must purchase. MoPoTsyo supplies the insulin wrapped together with insulin syringes.

Medical Materials

The medical materials used by PE's increase steadily over the years. The majority of the medical materials is used in the projects by the peer educators for the activities that they do. The direct sales of materials to patients are only a small proportion.

TABLE 25 MEDICAL MATERIALS USED BY PEER EDUCATORS

Stock used for each projects and sold to patient						
NR	**ITEMS**	**Unit**	**2010**	**2011**	**2012**	**Total**
1	BP-meter (1=30$)	Set/1kit	**1**	**71**	**77**	**149**
2	BG-meter(1=27$)	Set/1kit	**1**	**85**	**90**	**176**
3	Strips for BG-meter (1=10$)	Box/50	**43**	**1,075**	**1,081**	**2,199**
4	Needle for BG-meter (1=2.5$)	Box/100	**16**	**634**	**536**	**1,186**
5	Urine strips (1=4.5$)	Box/150	**0**	**1,035**	**1,048**	**2,083**
stock sold to patient						
1	BP-meter (1=30$)	Set/1kit		**45**	**40**	**85**
2	BG-meter(1=27$)	Set/1kit		**61**	**53**	**114**
3	Strips for BG-meter (1=10$)	Box/50		**89**	**86**	**175**
4	Needle for BG-meter (1=2.5$)	Box/100		**43**	**42**	**85**
5	Urine strips (1=4.5$)	Box/150		**3**	**3**	**6**
stock Used for projects						
1	BP-meter (1=30$)	Set/1kit	**1**	**26**	**37**	**64**
2	BG-meter(1=27$)	Set/1kit	**1**	**24**	**37**	**62**
3	Strips for BG-meter (1=10$)	Box/50	**43**	**986**	**995**	**2,024**
4	Needle for BG-meter (1=2.5$)	Box/100	**16**	**591**	**494**	**1,101**
5	Urine strips (1=4.5$)	Box/150	**0**	**1,032**	**1,045**	**2,077**

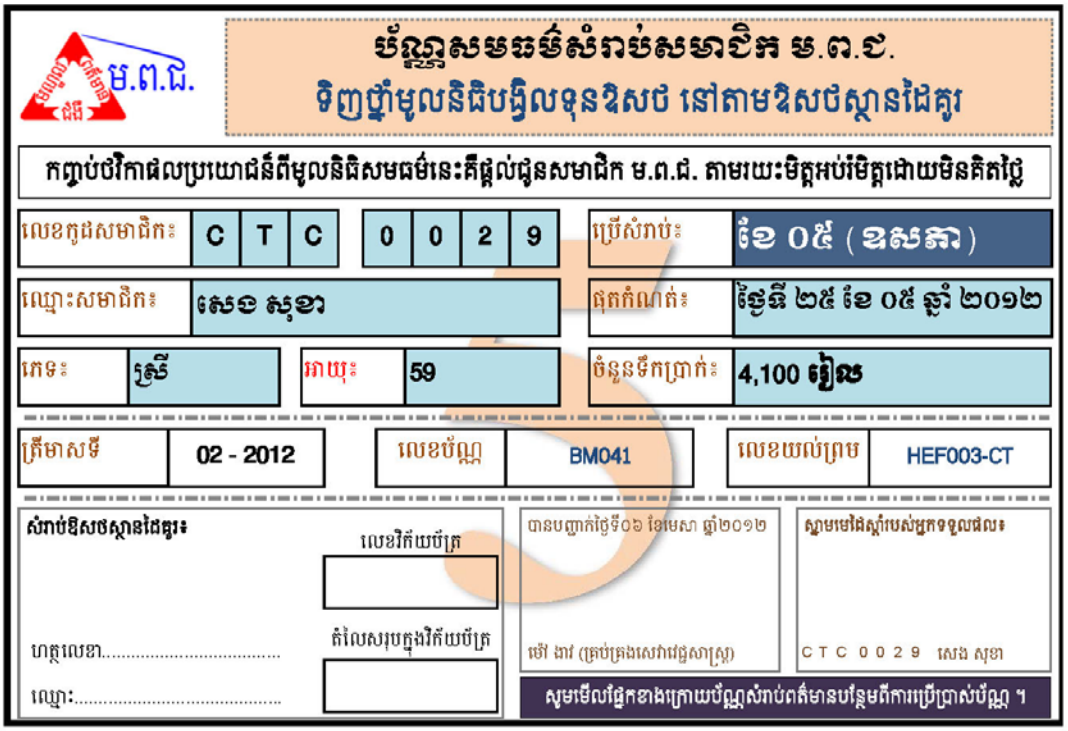
The table shows that the sales of blood glucose strips and urine glucose strips is only a small proportion of the consumption. Most strips are used as part of the follow up by peer educators and for screening.

EQUITY FUND/VOUCHERS

For some patients the medicines are too expensive. They have already been to the Doctor who has prescribed medication. They can join the peer educator gatherings regularly and have adapted their lifestyle. Everything would be ok as long as they to take their medication every day. The cost of their prescription (=the price of what they must pay at the pharmacy for one month routine medication) is too high for them. This cost varies per patient. The information is in MoPoTsyo's database and regularly updated, every time the patient visits the doctor and gets a new prescription.

For those poor diabetic patients, we have created a discount voucher, that entitles them to a 70% to 90% discount on their medication. The peer educator distributes 3 vouchers, each to be used when purchasing one month of medication. In some cases, instead of giving the voucher to the patient, the peer educators buy the medicines with the poor patients prescriptions as this saves the patient the cost and the time to travel to the pharmacy.

FIGURE 25 EXAMPLE OF A DISCOUNT VOUCHER



Voucher distribution started on Q3 of 2011 (June 2011) to 135 poor patients living in Phnom Penh. Next quarter, this voucher system extended to other provinces Takeo, Kampong Speu and Banteay Mean Chey. There are now 2 types of vouchers beneficiaries: discount vouchers for PE's and health equity fund voucher for poor members. The vouchers appear the same but have different financing sources. By letting the PE's benefit from the same system, we make them "agents" of the system so that the poor benefit from their advocacy to make the voucher system work well and on time. The number of voucher distributed to the poor increased from

135 in Q3, 2011 to 189 in Q4, 2011. Compared with 2011 the number of diabetes patients assisted with a voucher more than doubled in 2012.

Voucher Overview in 2011			
	2011-Q3	**2011-Q4**	**2011 year**
Issued numbers of vouchers	135	390	**525**
Assisted numbers of Diabetes Patients	45	130	**45 - 130**
Amount in **Cambodian Riel** made available for assistance	2,404,473	6,558,760	**8,963,233**
Amount in **USD** made available for assistance	**$601**	**$1,640**	**$2,241**
Nr of voucher used	167	187	**354**
Nr of Diabetes patients who used their voucher	56	64	**56 - 64**
Total amount in riels of voucher-assistance used by the patients in Riels	3,713,000	4,260,700	**7,973,700**
Total amount in USD of voucher-assistance used by Diabetes patients	**$928**	**$1,065**	**$1,993**
Total amount of the invoices for which vouchers had been issued (**Cambodian Riels**)	5,450,300	6,503,500	11,953,800
Total amount of the invoices for which vouchers had been issued (USD)	**$1,363**	**$1,626**	**$2,988**
% of voucher used	124%	48%	**86%**
% of patients who used their voucher	124%	49%	**87%**
% of co-payment by patients	**32%**	**34%**	**33%**

All OD's with PEN : Voucher Overview in 2012					
	Q1-12	**Q2-12**	**Q3-12**	**Q4-12**	**whole year 2012**
Issued numbers of vouchers	444	522	777	978	**2721**
Assisted numbers of Diabetes Patients	148	174	259	326	**148 to 326**
Amount in **Cambodian Riel** made available for assistance	7,729,138	8,909,418	13,517,261	16,416,969	**46,572,786**
Amount in **USD** made available for assistance	**$1,932**	**$2,227**	**$3,379**	**$4,104**	**$11,643**
Nr of voucher used	404	428	621	776	**2229**
Nr of Diabetes patients who used their voucher	148	164	242	299	**148 to 299**
Total amount in riels of voucher-assistance used by the patients in Riels	7,227,650	7,706,100	11,246,300	13,105,200	**39,285,250**
Total amount in USD of voucher-assistance used by Diabetes patients	**$1,807**	**$1,927**	**$2,812**	**$3,276**	**$9,821**
Total amount of the invoices for which vouchers had been issued (**Cambodian Riels**)	10,419,950	11,825,900	17,202,700	19,808,550	**59,257,100**
Total amount of the invoices for which vouchers had been issued (USD)	**$2,605**	**$2,956**	**$4,301**	**$4,952**	**$14,814**
% of voucher used	91%	82%	80%	79%	**83%**
% of patients who used their voucher	100%	94%	93%	92%	**95%**
% of co-payment by patients	**31%**	**35%**	**35%**	**34%**	**33%**

RE-ASSESSMENTS AND OUTCOME MEASUREMENT

The 2011 re-assessments were done in July 2011. In 44 areas, samples of 19 patients were randomly selected among patients with diabetes and patients with High Blood Pressure. Both types of patients were separately re-assessed by PE's from other provinces. In 14 areas, the sample of diabetics was not complete. HBP patients were assessed in 20 areas, but only 3 could complete the sample of 19.

15 indicators on Physical outcomes
Nr of patients with improved Blood Glucose level compared with the patients BG at time of their registration (irst assessment)
Is the BG normal (FBG<126mg/dl and PPBG<180 mg/dl) at time of this reassessment's or not
Average: BP (Systolics<130) of the last 3 months in the follow up
Average: BP (Diastolics<80 of the last 3 months in the follow up\
At reassessment: the number of BP-with Systolic <130mmHg
At reassessment: the number of patients with BP-Diastolic <80mmHg
Nr patients with improved Systolic BP compared to at time of their registration/assessment's
Nr of patients with improved Diastolic BP compared to time of their registration assessments
Nr of patients with Pulse<100 at time of re-assessment
Nr of patients with improved Pulse compared to their pulse at the time of registration (first assessment)
Nr of patients with Normal BMI (<23, >18.5) at time of re-assessment
Proportion of patients who have normal BMI compared to the proportion at time of assessment
The proportion of those with improved BMI compared to their assessment BMI
No protein in urine
No food wounds
Average

3 indicators on Record Keeping by the patient
recorded urine test result
recorded blood glucose test result
recorded BP measured result
Average

7 indicators on Nutrition / diet by people with Diabetes
Eats less white rice compared to before registering as patient
Last lunch contained vegetables
Has been eating whole rice during the last 3 months
Has been eating any kinds bean during the last 3 months (but not as sweetened dessert)
Knows that some kind of foods raised/not raise BG (morning glory, watermelon, grilled bread, white rice, fish, egg) (average of detailed questions)
has pyramid food picture in house
Found pyramid is useful
Average

4 indicators on Physical Activity
Last 6 days: AT least 3 hours of exercises/physical activities
Yesterday: AT least 30 minutes of exercises/physical activities
Doing enough exercise/ physical activities
Doing more exercise than before registered
Average

6 indicators on medical care/treatment
Used Lab service at least once during last 12 months
Used medical consultation with doctor at least once during last 12 months
Knows at least 1 name of their DM medicine
has at least 1 urine strip for self test at home at time of reassessment
Knows meaning of changing color of urine strip
can explain process of how to do 24 hours urine-strip-test
Average

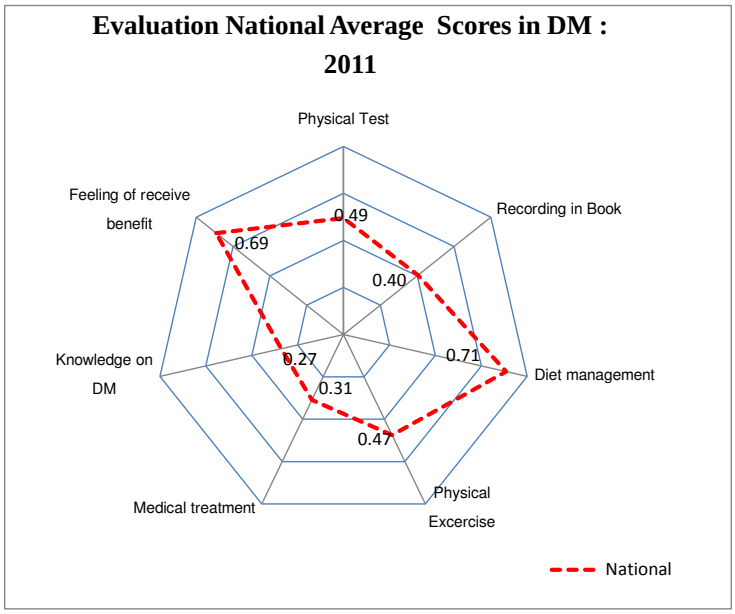
3 indicators on Disease knowledge
Know the two organs functions relates to BG control (Liver and pancreas)
Know the 3 ways to control diabetes
Know the impacts of diabetes
Average

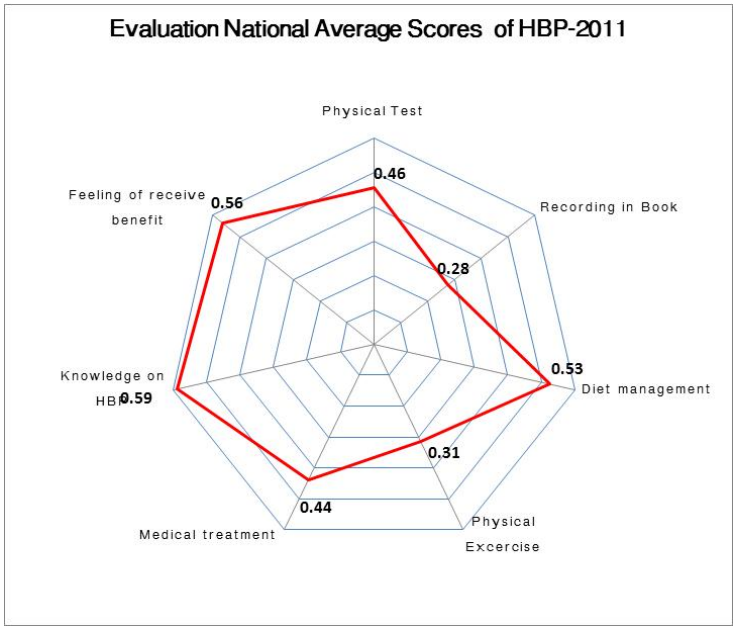
5 indicators on patient's feeling of benefit
Spent out of pocket money less than before registering
Reports to be in better health than before registering
Has learned how to self manage diabetes with PEERs at least once
Finds the informations from Peer Ecucators helpful
Report to be able to control DM better than before registering
Average

In total, 765 randomly selected Diabetic patients were re-assessed and 229 high blood pressure patients, so that is 17.4 DM patient and 11.4 HBP patient per area. There is good cooperation

from the diabetics but it more difficult to mobilise the High Blood Pressure patients. The relationship between PE and the High Blood Pressure patients, who do not have diabetes, is not as strong.

FIGURE 26 DM EVALUATION SCORE 2011





The two spider diagrams give the national average of the all the results. Some PE have a high score, while others have a low score. Some OD's have PE's with high scores and in other OD's the average score per OD is low, or province it is low. It is our aim to reward OD's for better outcomes and make training and funds available for PE's so they can and will do a better job. It is a system of payment for performance that is measured by comparing health outcomes.

Below is an example of how the results of the physical test of Diabetic members is measured through the re-assessment in every health center area with a PE, indicated by the rows that begin with a 3 letter code for rural areas and a 2 letter code for the urban slum areas.

Detail of each indicator		Results of Physical test															
		The Better result of BG (FBG and PPBG) compare to Assessment's	The comparation of Normal result of BG (FBG<126 and PPBG<180) at reassessment's (19 cases)	Average: BP (Skistolics<130) of the last 3 months	Average: BP (Diastolics<80 of the last 3 months	At reassessment: the comparation of BP-Systolics<130	At reassessment: the comparation of BP-Diastolics<80	The Better result of BP-Systolics<130 compares to assessment's	The Better result of BP-Diastolics<80 compares to assessment's	At reassessment: Pulse<100	The Better result of Pulse<100 compares to assessment's	At reassessment: Normal BMI (<23, >18.5)	The Better result of Normal BMI compares to assessment's	The Tendency toward Normal BMI compares to assessment's	No protein in urine	No food wounds	Average
Areas	ARA	0.34	0.41	0.44	0.50	0.59	0.59	0.91	0.98	0.95	0.95	0.47	0.11	0.79			**0.62**
	ARB	0.27	0.42	0.53	0.35	0.43	0.57	0.95	0.95	0.81	0.84	0.32	0.00	0.67			**0.55**
	ARD	0.48	0.33	0.67	0.58	0.55	0.53	0.77	0.73	0.95	0.89	0.32	0.00	0.63			**0.57**
	ARE	0.50	0.28	0.67	0.22	0.53	0.45	0.18	0.18	0.92	0.89	0.26	0.00	0.58			**0.44**
	ARF	0.91	0.68	0.39	0.06	0.34	0.26	0.93	0.91	0.89	0.89	0.37	0.00	0.58			**0.56**
	ARG	0.14	0.61	0.68	0.63	0.50	0.55	0.68	0.55	0.84	0.84	0.26	-0.16	0.42			**0.50**
	ARH	0.68	0.47	0.44	0.78	0.53	0.66	0.80	0.75	0.92	0.95	0.47	-0.11	0.74			**0.62**
	ARI	0.93	0.33	0.43	0.29	0.62	0.54	0.43	0.36	0.92	0.95	0.32	-0.05	0.79			**0.53**
	ARJ	0.59	0.74	0.63	0.42	0.55	0.53	0.86	0.89	0.92	0.89	0.32	0.05	0.68			**0.62**
		0.54	**0.48**	**0.54**	**0.43**	**0.52**	**0.52**	**0.72**	**0.70**	**0.90**	**0.90**	**0.35**	**-0.02**	**0.65**	**#DIV/0!**	**#DIV/0!**	**0.56**
	ADA	0.64	0.42	0.60	0.33	0.57	0.41	0.89	0.84	0.76	0.68	0.32	0.16	0.78		0.95	**0.60**
	ADJ	0.45	0.37	0.27	0.55	0.37	0.42	0.59	0.27	0.84	0.84	0.53	-0.05	0.63		1.00	**0.51**
	ADK	0.80	0.45	0.56	0.33	0.41	0.27	0.23	0.16	1.00	1.00	0.45	0.00	0.64		1.00	**0.52**
	ADO	0.52	0.44	0.14	0.14	0.28	0.22	0.98	0.93	0.72	0.67	0.89	0.22	1.00		1.00	**0.58**
		0.60	**0.42**	**0.39**	**0.34**	**0.41**	**0.33**	**0.67**	**0.55**	**0.83**	**0.80**	**0.55**	**0.08**	**0.76**	**#DIV/0!**	**0.99**	**0.55**
	AVD	0.25	0.00	0.58	0.58	0.29	0.55	0.11	0.09	0.78	0.78	0.32	0.00	0.52	0.71	0.78	**0.42**
	AVG	0.30	0.35	0.20	0.34	0.21	0.63	0.36	0.52	0.74	0.74	0.26	-0.21	0.58	0.87	1.00	**0.46**
	AVL	0.16	0.32	0.54	0.43	0.39	0.63	0.64	0.77	0.74	0.74	0.42	-0.16	0.63	0.89	1.00	**0.54**
	AVO	0.66	0.32	0.43	0.70	0.22	0.32	0.30	0.11	0.78	0.81	0.43	0.05	0.76	0.70	0.97	**0.51**
	AVR	0.20	0.11	0.65	0.65	0.14	0.24	0.27	0.45	0.73	0.70	0.37	0.05	0.60	0.76	0.97	**0.46**
		0.31	**0.22**	**0.48**	**0.54**	**0.25**	**0.48**	**0.34**	**0.39**	**0.75**	**0.75**	**0.36**	**-0.05**	**0.62**	**0.79**	**0.94**	**0.48**
	ABB	0.07	0.32	0.33	0.22	0.32	0.21	0.07	0.00	0.84	0.84	0.37	0.16	0.72		0.53	**0.36**
	ABF	0.86	0.32	0.45	0.45	0.42	0.45	0.82	0.41	0.76	0.79	0.26	-0.21	0.49		0.95	**0.51**
	ABH	0.75	0.42	0.45	0.56	0.24	0.34	0.45	0.50	0.77	0.78	0.42	0.05	0.74		0.79	**0.52**
	ABJ	0.89	0.11	0.29	0.29	0.34	0.34	0.16	0.20	0.84	0.84	0.32	0.16	0.81		0.79	**0.46**
	ABL	0.23	0.36	0.62	0.56	0.39	0.45	0.09	0.80	0.81	0.84	0.30	-0.06	0.60		0.00	**0.43**
		0.56	**0.30**	**0.43**	**0.41**	**0.34**	**0.36**	**0.32**	**0.38**	**0.81**	**0.82**	**0.33**	**0.02**	**0.67**	**#DIV/0!**	**0.61**	**0.45**
	APG	0.73	0.22	0.48	0.70	0.37	0.61	0.37	0.43	0.68	0.68	0.26	-0.21	0.47	0.84	0.95	**0.51**
	APJ	0.00	0.22	0.57	0.32	0.29	0.39	0.33	0.33	0.87	0.84	0.47	0.05	0.79	0.66	1.00	**0.47**
	APH	0.32	0.32	0.73	0.66	0.34	0.42	0.41	0.33	0.92	0.89	0.37	0.05	0.68	0.89	0.95	**0.55**
	APL	0.02	0.11	0.61	0.14	0.42	0.34	0.37	0.50	0.66	0.63	0.42	0.11	0.89	0.70	1.00	**0.46**
	APM	0.41	0.45	0.00	0.07	0.25	0.28	0.37	0.31	0.72	0.72	0.50	0.11	0.67	0.78	0.95	**0.44**
	APN	0.05	0.11	0.52	0.86	0.33	0.49	0.44	0.11	0.66	0.66	0.11	0.11	0.44	0.55	0.66	**0.41**
		0.25	**0.24**	**0.48**	**0.46**	**0.33**	**0.42**	**0.38**	**0.33**	**0.75**	**0.74**	**0.36**	**0.04**	**0.66**	**0.74**	**0.92**	**0.47**
	CTA	0.55	0.16	0.34	0.41	0.37	0.61	0.75	0.61	0.71	0.74	0.32	-0.11	0.47		0.95	**0.49**
	CTB	0.82	0.39	0.50	0.43	0.54	0.62	0.39	0.57	0.73	0.76	0.49	0.22	0.76		0.97	**0.58**
	CTC	0.09	0.00	0.51	0.38	0.23	0.23	0.02	0.02	0.61	0.61	0.08	-0.08	0.53		0.69	**0.28**
	CTD	0.57	0.28	0.67	0.67	0.61	0.66	0.20	0.43	0.87	0.89	0.53	-0.05	0.68		0.84	**0.56**
	CTE	0.39	0.00	0.49	0.49	0.39	0.51	0.66	0.82	0.72	0.72	0.36	0.18	0.60		0.89	**0.51**
	CTF	0.36	0.27	0.84	0.71	0.63	0.79	0.41	0.64	0.76	0.74	0.42	0.05	0.58		0.95	**0.58**
	CTL	0.77	0.26	0.74	0.56	0.51	0.63	0.50	0.59	0.84	0.84	0.30	-0.18	0.42		0.84	**0.54**
		0.51	**0.19**	**0.58**	**0.52**	**0.47**	**0.58**	**0.42**	**0.53**	**0.75**	**0.76**	**0.35**	**0.00**	**0.58**	**#DIV/0!**	**0.88**	**0.51**
	DKD	0.18	0.11	0.32	0.52	0.32	0.39	0.55	0.23	0.79	0.84	0.32	0.00	0.84	1.00	0.97	**0.49**
	DKL	0.95	0.16	0.00	0.00	0.49	0.49	0.84	0.39	0.61	0.57	0.33	-0.16	0.33	0.57	0.65	**0.42**
	DKN	0.43	0.32	0.65	0.70	0.45	0.32	0.70	0.48	0.79	0.84	0.42	-0.05	0.58	0.79	1.00	**0.56**
		0.52	**0.19**	**0.32**	**0.41**	**0.42**	**0.40**	**0.70**	**0.36**	**0.73**	**0.75**	**0.35**	**-0.07**	**0.58**	**0.79**	**0.88**	**0.49**
	AK	0.70	0.42	0.45	0.45	0.24	0.42	0.25	0.25	0.84	0.79	0.32	0.14	0.46	0.74	0.95	**0.49**
	BB	0.98	0.47	0.81	0.65	0.57	0.43	0.32	0.34	0.89	0.92	0.32	-0.05	0.53	0.63	1.00	**0.59**
	BK	0.84	0.53	0.47	0.63	0.29	0.35	0.05	0.05	0.88	0.87	0.05	-0.11	0.42	0.37	1.00	**0.45**
	BR	0.11	0.24	0.50	0.72	0.36	0.42	0.14	0.30	0.84	0.89	0.42	0.06	0.78	0.60	0.89	**0.48**
	BS	0.61	0.58	0.63	0.42	0.24	0.39	0.34	0.68	0.84	0.89	0.21	-0.11	0.47	0.74	1.00	**0.53**
		0.65	**0.45**	**0.57**	**0.57**	**0.34**	**0.40**	**0.22**	**0.32**	**0.86**	**0.87**	**0.26**	**-0.01**	**0.53**	**0.61**	**0.97**	**0.51**
VERAGE per Nationa		**0.48**	**0.32**	**0.49**	**0.45**	**0.39**	**0.44**	**0.46**	**0.46**	**0.79**	**0.79**	**0.35**	**0.00**	**0.62**	**0.69**	**0.86**	0.49
AVERAGE per Takeo		0.46	0.36	0.46	0.40	0.40	0.41	0.52	0.50	0.80	0.79	0.36	0.02	0.65	0.63	0.78	0.49

The average results very per Operational District, as can be seen in the figure below. Interestingly the Phnom Penh slum areas are the best performing.

FIGURE 27 PERFORMANCE BY OD

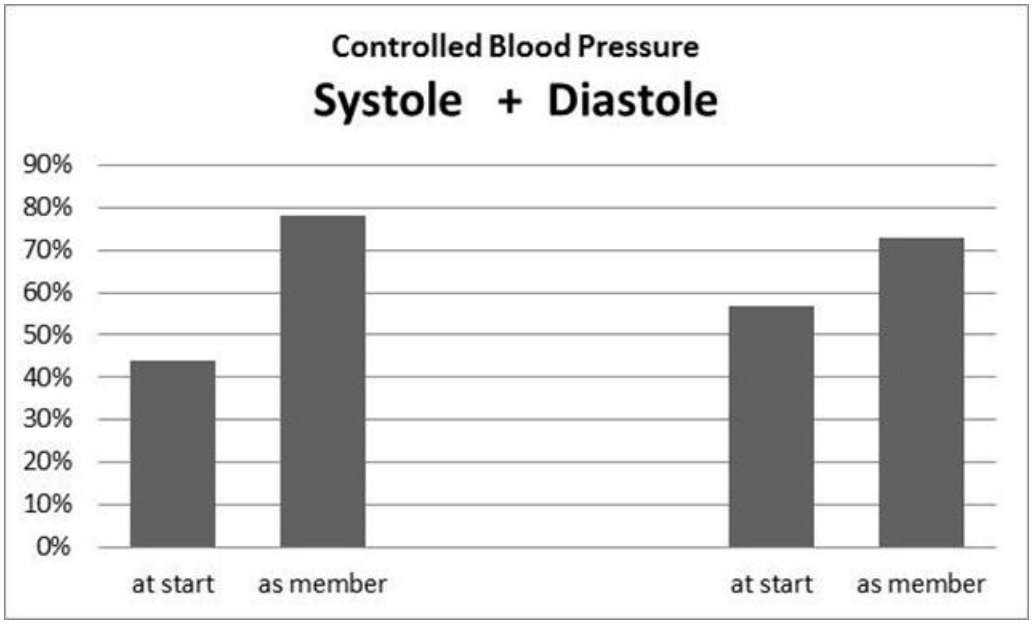
Blood Glucose: new diabetes patients when they register, they have on average Fasting Blood Glucose (FBG) of 200 mg/dl and or Postprandial BG (PPBG) of 300 mg/dl. After 6 months in the program the average FBG and PPBG are reduced significantly to much lower levels at around 130 mg/dl and 220 mg/dl respectively. This has been consistent over the years among all the diabetic members who are in follow up of the peer educators.

For Blood Pressure among people with Diabetes there is also a significant reduction, see table below showing the sum and average Systoles and Diastoles of randomly selected 170 Diabetics who are re-assessed independently, and then have their Blood Pressure values compared with their own data at the time when they registered as member of MoPoTsyo, so at least 6 months earlier.

Jul-11	Random Sample of 170 Members with Diabetes			
Ang Roka OD	Total BP		Average BP	
Blood Pressure	mm / Hg		mm / Hg	
	Systole	Diastole	Systole	Diastole
at enrolment	22,608	14,256	133	84
re-assessment	21,983	13,355	129	79

Another way to present the results is to look at the percentage of diabetics with Blood Pressure under control. Below is a random sample of 481 Diabetics with blood pressure under control, comparing the proportion at the time of the re-assessment with their blood pressure at the time when they became member of MoPoTsyo. The message is that 2 out of 3 patients with diabetes have controlled BP when they remain in follow up.

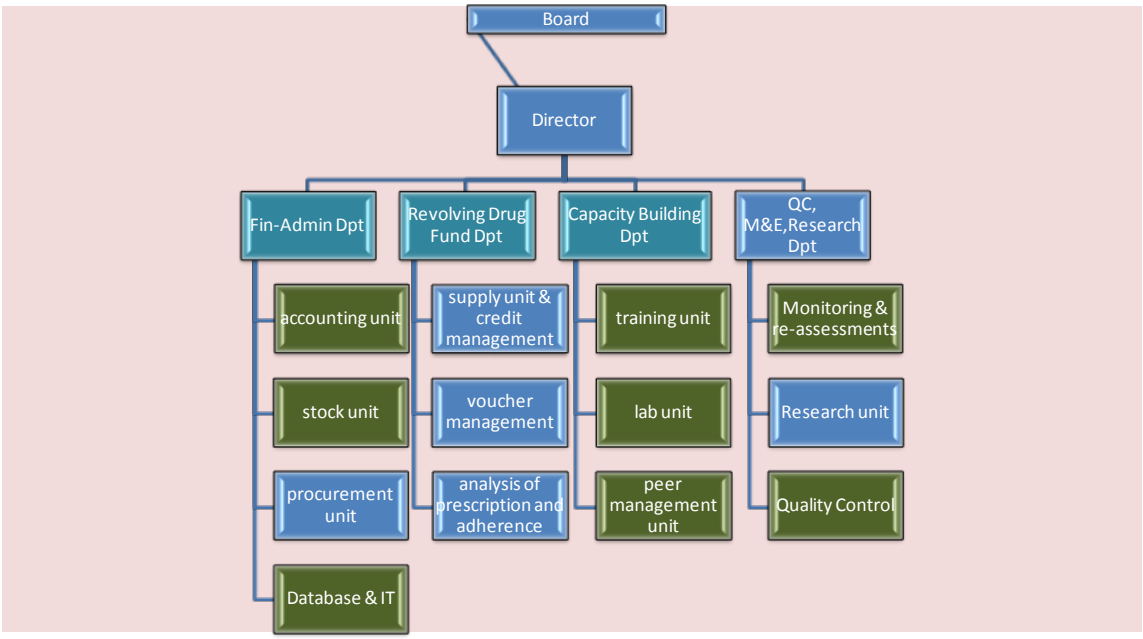
FIGURE 28IMPROVED BLOOD PRESSURE CONTROL



INTERNAL ORGANISATION

In 2012, we changed the organization of our units and departments. The former organogram is in the annex for comparison with the new one below. The Access to Medical Services Department, which had to ensure coherent service delivery of "Medical Consultations", Revolving Drug Fund, and Laboratory Services, was abolished. Instead the Revolving Drug Fund became a separate department, but the Medical Consultations and Laboratory Services Units were moved to the Capacity Building Department, formerly the Program Department. Quality Management, Monitoring and Research remain separate units. The Capacity Building Department now manages the Peer Educator Networks PLUS the coordination and planning of medical consultations and laboratory services . These are responsibilities of which we can foresee that they will be shifted to Operational District Health Directors in the near future.

FIGURE 29 ORGANIZATIONAL CHART MOPOTSYO



The new set up appears to be an improvement.

At the end of 2012, MoPoTsyo has 36 salaried staff, of whom 30 are full time, and 6 are part timers. There are 12 DM patients among the 36, so one third of our staff is a chronic patient. The average salary of the staff is USD 198 per month.

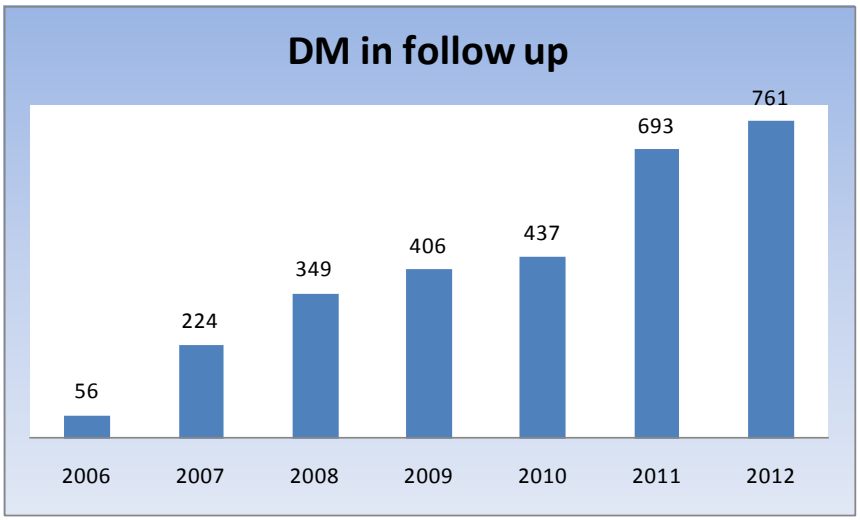
DETAILS PER PEER EDUCATOR NETWORK

THE URBAN SLUMS

Membership growth

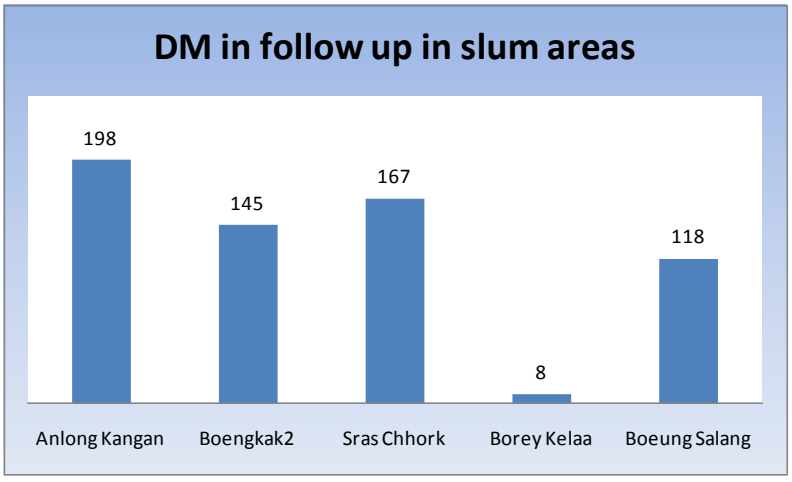
At the end of 2012, there area 761 people with Diabetes in follow up. in Phnom Penh. Among these 761, there are 125 with code PX, which means they are not resident of the slum areas.

FIGURE 30 GROWTH OF URBAN COHORT OF PATIENTS IN FOLLOW-UP



The total number of Diabetics in follow up by PE in the 5 slum areas is (761 – 125=) 636.

FIGURE 31 DIABETICS IN SLUM AREAS IN FOLLOW UP



The experiment with 7 high blood pressure groups in slum area and peri-urban setting of Anlong Kangan did not deliver the expected results for the 190 high blood pressure patients. The reason given by the staff is that in urban areas people have less “communal spirit” than in the rural villages. It is said to be less common to allow strangers into the house just to use a machine.

Houses are locked and neighbors do not always get on well despite (or because?) living closer together with less space between the shacks than in the rural areas. So we may have run into a structural problem. For the results in the rural areas are slightly more promising as described in the chapters below. In urban areas a solution must be found which is convenient for people who cannot afford to buy their own automatic blood pressure machine. The original idea is to create a place close by where patients with high blood pressure can easily make use of a shared high blood pressure machine to check their blood pressure. The feedback is that the holder of the machine wants money to take care of it and money to allow other people to use it because they do not want all these strangers to come into their house to use the machine. So where to put this machine in the urban low-resource setting so that there are no barriers to its use? That is the question that must still be answered.

Peer Education in urban areas

Peer Education for 125 PX coded members, not residing in slum areas, happens at our office, by 2 experienced diabetic salaried Peer Educators.

The PE in Borey Kelaa stopped in 2011 and no replacer was identified. The patients were redistributed among PE in 2 other areas for follow up.

One more PE was trained to start to work in the slum area Borey Santhepheap, where many evicted people from Sras Chork and Boeungkak have been moved to.

Use of Medical Services facilitated by MoPoTsyo

Laboratory services in urban area:

Despite 2 attempts we have not been able to get an adequate popular hypertension service going. The intervention is in the urban area strongly focused on Diabetes. This is reflected in the use of all the services. MoPoTsyo's own laboratory service started in 2010, as explained above.

TABLE 26 USE OF LAB SERVICES BY URBAN NETWORK

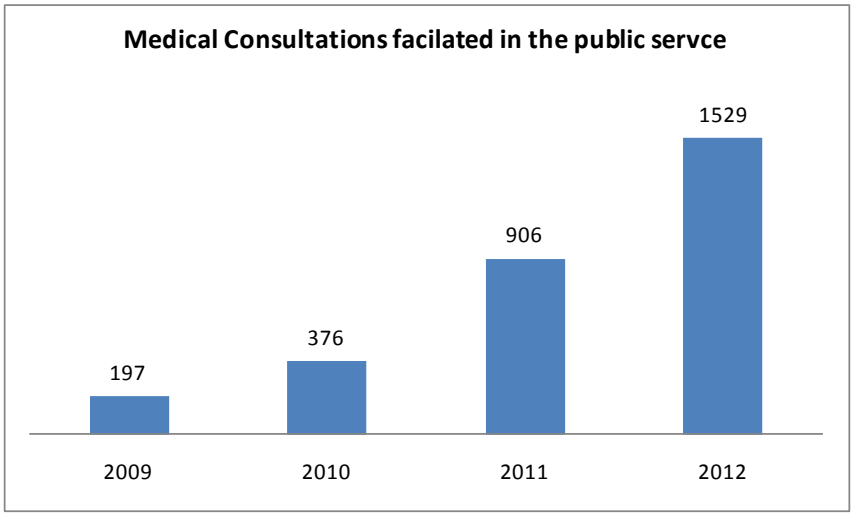
Yearly use of lab services			
Urban network	**Patients with lab test**	Diabetic	non Diabetic HBP
2007	**5**	5	0
2008	**7**	7	0
2009	**17**	17	0
2010	**457**	444	13
2011	**441**	423	18
2012	**1063**	1005	58

A total of 1990 lab profiles belonging to urban members are in our database. They belong to 1102 individuals: 1040 Diabetics and 62 non-diabetic Hypertensive members.

Another way of dividing this group of 1102 individual members is: 738 inhabitants of the 5 slum areas and 364 members who are not living in the slum areas, but who have been admitted anyway. These members get as a code PX.

In the urban area, the laboratory tests are done at our office. There is no blood collection in the community, as in the rural areas. The advantage of doing the blood collection at the office is that we can also do a more complete urine-analysis, instead of the single proteinuria test.

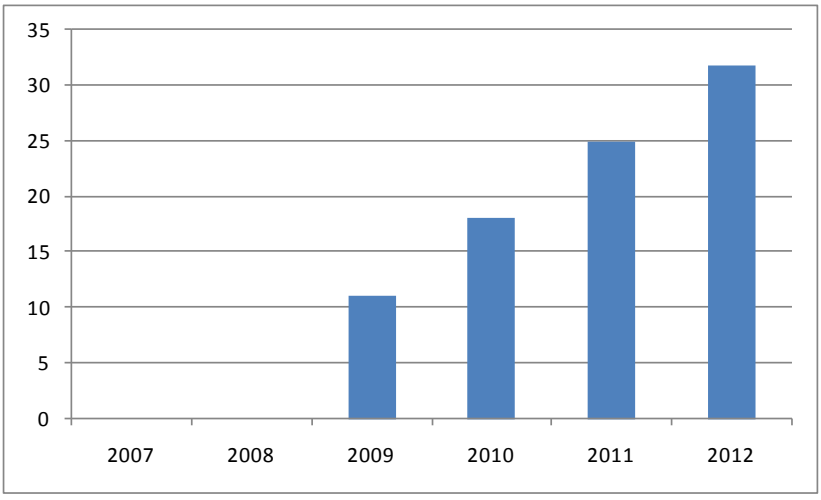
FIGURE 32 DIABETES PATIENTS USING MEDICAL CONSULTATION AT POCHENTONG RH



The 1529 consultations at the Pochentong Referral Hospital in 2012 were provided by the medical doctor to 805 individually registered diabetics during 27 sessions, usually on a Monday or a Tuesday. It is crowded: the doctor sees on average 57 patients.

The average number of monthly “first prescriptions” in the urban area is rising since we have allowed some diabetics to become member although they do not live inside the slum areas but who want to use the services.

FIGURE 33 RISING NUMBER OF MONTHLY FIRST PRESCRIPTIONS



Revolving Drug Fund and Adherence to treatment

There are 1093 diabetics with a first prescription and 38 Hypertensive (non Diabetics) with a prescription in the database since 2009. They should buy, according to their prescription 193,891,942 Riel and 6,788,350 Riel respectively, to a total of 200,680,292 Riels (about USD 50,000) of routine medication.

There are 2 pharmacies that we have contracted in Phnom Penh. They sold 152,694,970 Riels according to 6309 Pharmacy invoices to 932 registered urban diabetic members in 2012. The average invoice was 24,203 Riels. For their medication, these 932 registered diabetics paid on average 163,836 Riel in the year 2012. These diabetic patients bought **79%** of what they should have bought, so good adherence.

These 2 pharmacies also sold 3,790,500 in 247 invoices to 52 registered urban hypertensive members of MoPoTsyo. The average invoice was 15,347 riels. These 52 high blood pressure patients paid on average 72,894 riel for their medication in 2012. Their adherence was **56%**, lower than of diabetics, despite the fact that the cost of their medication is less than half.

Screening for Diabetic Retinopathy

Our collaboration with the NGO Children Surgical Centre (CSC) in Phnom Penh resulted in screening of 309 urban diabetic patients during 2012. Among them 28% were found to have early stages of Diabetic Retinopathy. CSC provides free laser treatment to our patients if that is necessary. Identification of these patients in early stage can help to prevent or delay progress to later stages through information and counseling and regular follow up.

TABLE 27 DIABETIC RETINOPATHY PREVALENCE

REPORT EYE CHECK IN PHNOM PENH 2012

CheckBy	(All)
FollowUpDate	(All)

	Count of Diagnosis	Column Labels		
No	Area	DR	NO SIGN OF DR	Grand Total
1	AK	29	95	124
2	BB	16	69	85
3	BK	25	78	103
4	BR	2	4	6
5	BS	15	55	70
6	PX	1	8	9
	Grand Total	88	309	397
		28%		

Equity Fund/Vouchers

FIGURE 34 VOUCHER DISTRIBUTION IN PHNOM PENH IN 2012

Phnom Penh Only	The year 2012				
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	entire year 2012 Phnom Penh
Issued numbers of vouchers	171	192	303	357	**1023**
Assisted numbers of Diabetes Patients	57	64	101	119	**57 to 119**
Amount in **Cambodian Riel** made available for assistance	3,895,290	4,397,678	6,010,373	7,014,805	**21,318,145**
Amount in **USD** made available for assistance	**$974**	**$1,099**	**$ 1,503**	**$1,754**	**$5,330**
Nr of voucher used	167	187	282	327	**963**
Nr of Diabetes patients who used their voucher	56	64	98	113	**56 to 113**
Total amount in riels of voucher-assistance used by the patients in Riels	3,713,000	4,260,700	5,616,700	6,303,300	**19,893,700**
Total amount in USD of voucher-assistance used by Diabetes patients	**$928**	**$1,065**	**$ 1,375**	**$1,576**	**$4,944**
Total amount of the invoices for which vouchers had been issued (**Cambodian Riels**)	5,450,300	6,503,500	8,947,200	9,607,000	**30,508,000**
Total amount of the invoices for which vouchers had been issued (USD)	**$1,363**	**$1,626**	**$ 2,195**	**$2,402**	**$7,585**
% of voucher used	98%	97%	93%	92%	**95%**
% of patients who used their voucher	98%	100%	97%	95%	**98%**
% of co-payment by patients	**32%**	**34%**	**37%**	**34%**	**35%**

Drop out rate in urban area has been on average 16% per year.

	location of slum		Total DM registered	2011	2010	2009	2008	2007	2006	2005
order	**Phnom Penh**	start date		new DM	new DM	new DM	new DM	new DM	new DM	new DM
2	Anlong Kangan.**AK**	2005-Jul-01	192	29	1	20	25	35	62	20
3	Boeung Kak2.**BB**	2006-Jan-01	197	25	4	20	21	44	83	-
1	Srash Chork.**BK**	2005-Jun-01	242	33	2	41	47	28	49	42
5	Borei Kela.**BR**	2007-Apr-01	123	22	10	21	34	36	-	-
4	Boeung Salang.**BS**	2007-Apr-01	88	17	3	10	8	49	1	-
6	PX		220	102	96	2	0	0	15	5
			1,062	**228**	**116**	**114**	**135**	**192**	**210**	**67**
still in follow up	**2006**		**56**							56
	2007		**224**						176	47
	2008		**349**					161	148	40
	2009		**407**				113	135	124	33
	2010		**437**			96	95	114	105	28
	2011		**693**	228	97	80	80	96	88	24

The PX group is not included in the calculation of the drop-out rate. Drop out is influenced by the evictions in the slum areas Sras Chork (BK) and Boeungkak2 (BB) because the patients had to move out to areas far away where there is no PE follow up yet such as Borey Santhepheap (7NG).

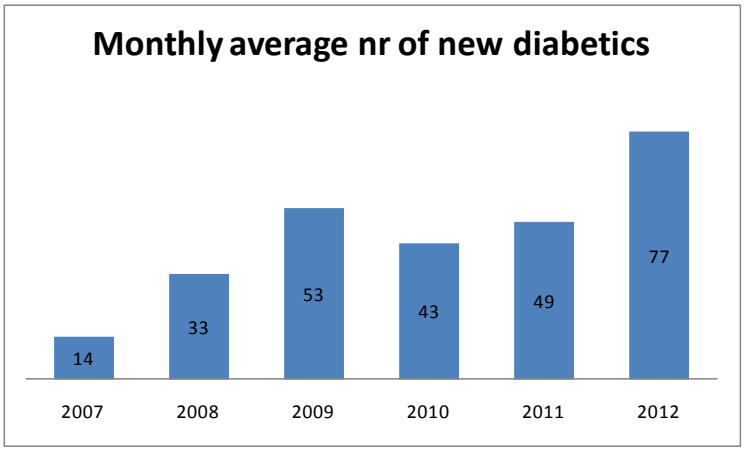
TAKEO PROVINCE WITH 5 OD'S

Screening

From 151,200 adults screened per end of December 2011 the number increased with 130,667 during the year to a total of 281,867 adults at the end of 2012 (more than 10,000 adults per month).

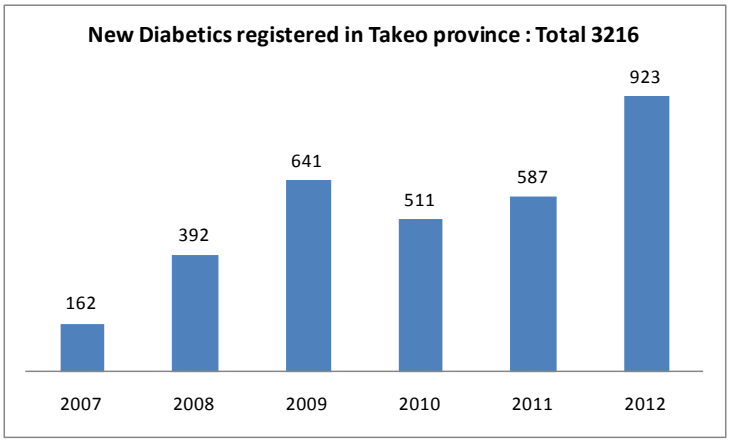
Membership growth

FIGURE 35 MEMBERS WITH DIABETES IN TAKEO PROVINCE (MONTHLY GROWTH)



The intense screening activity by a large number of peer educators led to rapid growth in membership during 2012.

FIGURE 36 YEARLY GROWTH MEMBERSHIP INCREASE TAKEO SINCE 2007



The variation in numbers of new DM year on year is a result of screening activity, except in 2009 when we registered many patients after MSF Belgium closed the Chronic Disease Care clinic in the provincial capital. Without the WDF grant (WDF09-463) we would have registered less people with DM into our continuum of care in 2012.

TABLE 28 NEW DIABETICS REGISTERED BY OD IN TAKEO

Diabetics registered		In each of the 5 OD's in Takeo province					*From outside Takeo*
By year	Takeo total	Bati	Daunkeo	Prey Kabas	Ang Roka	Kirivong	
2007	162	0	0	0	162	0	*0*
2008	392	0	22	7	311	52	*0*
2009	641	147	88	127	145	125	*9*
2010	511	120	81	78	81	119	*32*
2011	587	104	95	89	114	176	*9*
2012	923	202	250	118	134	218	*1*
Total	3216	573	536	419	947	690	*51*
		18%	17%	13%	29%	21%	2%

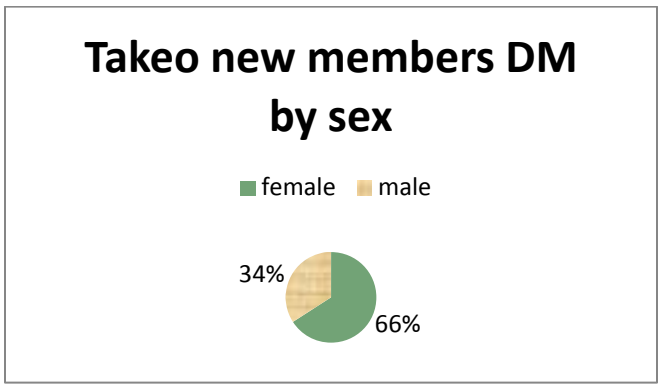
For High Blood Pressure, a first strategy was tried out in 2008 in Ang Roka, then adapted and re-tried in 2010.

TABLE 29 NEW HBP REGISTERED BY OD IN TAKEO

	total whole province Takeo	High Blood Pressure patients registered in 5 OD's in Takeo province					
by year		OD Bati	OD Daunkeo	OD Prey Kabas	OD Ang Roka	OD Kirivong	from outside Takeo
2008	104	0	0	0	104	0	0
2009	1	1	0	0	0	0	0
2010	2019	289	122	411	852	345	0
2011	981	196	93	161	276	254	1
2012	1014	117	392	96	115	294	0
Total	4119	603	607	668	1347	893	1
	100%	15%	15%	16%	33%	22%	0.02%

The effort of the peer educators to register people with diabetes and hypertension shows the same respective proportions, with most registrations in Ang Roka OD, although it has the smallest population. We have been able to keep the proportion of patients from other provinces using the services in Takeo as low as possible, at least according to our data. Apart from a few exceptions we did not admit people who are not resident of Takeo. Anyone who wants to register must present the family book that shows residence in Takeo. However, as everywhere, mostly women are registering as member.

FIGURE 37 DM MEMBERS IN TAKEO BY SEX

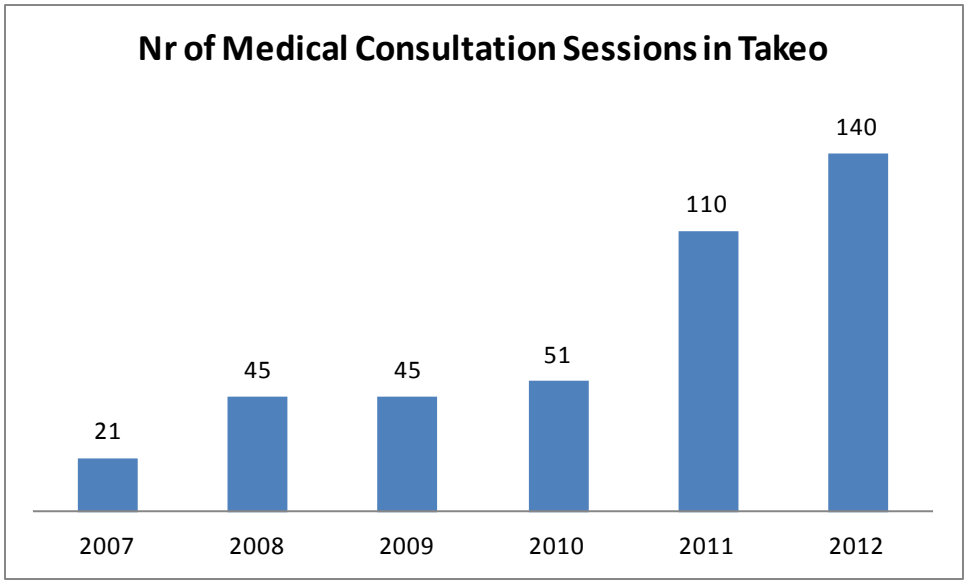


Medical Services

Medical Consultations:

The use of the medical consultations has gradually been increasing over the years in Takeo in each OD, so we have gradually been increasing the number of sessions with an experienced Medical Doctor from Phnom Penh to travels to Takeo for the appointment with 30 to 35 patients. The session is facilitated by the Peer Educator Network at the public hospital in their OD, so the travel costs are relatively low.

FIGURE 38 ANNUAL NUMBER OF CONSULTATION SESSIONS IN ALL OF TAKEO'S PUBLIC HOSPITALS



First we look at the Diabetics, and after that at the non-Diabetic High Blood Pressure patients.

TABLE 30 DIABETIC MEMBERS CONSULT THEIR DOCTOR IN TAKEO BY OD 2007 UNTIL 2012

		Nr of times Diabetic Members of MoPoTsyo consulted the Medical Doctor					
year	Takeo all	Bati OD	Daunkeo OD	Prey Kabas OD	Ang Roka OD	Kirivong OD	*from outside Takeo*
2007	134	0	0	0	134	0	*0*
2008	691	0	1	0	690	0	*0*
2009	982	139	94	73	519	157	*0*
2010	1060	127	213	137	242	308	*33*
2011	2338	270	380	341	409	893	*45*
2012	3674	552	779	476	560	1285	*22*
	8879	**1088**	**1467**	**1027**	**2554**	**2643**	***100***
		12%	17%	12%	29%	30%	1.1%

TABLE 31 NON DIABETIC HIGH BLOOD PRESSURE PATIENTS CONSULTING THEIR DOCTOR IN TAKEO BY OD 2008-2012

		Nr of times HBP Members of MoPoTsyo consulted the Medical Doctor					
year	Takeo all	Bati OD	Daunkeo OD	Prey Kabas OD	Ang Roka OD	Kirivong OD	*from outside Takeo*
2007	0	0	0	0	0	0	*0*
2008	8	0	0	0	8	0	*0*
2009	6	2	0	0	2	2	*0*
2010	189	14	42	56	68	9	*0*
2011	750	132	65	140	190	222	*1*
2012	1157	110	339	152	102	454	*0*
	2110	**258**	**446**	**348**	**370**	**687**	***1***
		12%	21%	16%	18%	33%	0.0%

High Blood Pressure Members of MoPoTsyo consulted the Medical Doctor for the 1st time							
year	Takeo all	Bati OD	Daunkeo OD	Prey Kabas OD	Ang Roka OD	Kirivong OD	*from outside Takeo*
2007	0	0	0	0	0	0	*0*
2008	6	0	0	0	6	0	*0*
2009	6	2	0	0	2	2	*0*
2010	172	10	38	54	62	8	*0*
2011	487	105	46	100	95	140	*1*
2012	564	45	212	69	82	156	*0*
	1235	**162**	**296**	**223**	**247**	**306**	***1***

It is the idea that the Medical Doctor already has the lab profile of the patient at his disposal when he first examines the patient in order to decide on the first therapy. Among those who come for consultation, a larger proportion of diabetics have the lab profile than the non-diabetic High Blood Pressure patients. The details of this problem are shown in the table below.

TABLE 32 NUMBERS OF DIABETICS ARRIVING AT CONSULTATION WITHOUT LAB PROFILE

	Nr of times Diabetic Members of MoPoTsyo consulted the Medical Doctor but WITHOUT having a LAB PROFILE						
year	Takeo all	Bati OD	Daunkeo OD	Prey Kabas OD	Ang Roka OD	Kirivong OD	*from outside Takeo*
2009	244	23	34	21	152	14	*0*
2010	304	28	79	39	75	61	*22*
2011	718	90	130	120	161	179	*38*
2012	1415	234	397	197	226	353	*8*
	2681	**375**	**640**	**377**	**614**	**607**	**68**

The proportion of diabetic patients arriving at the medical consultation without a lab result has sharply increased in 2012. The problem varies per OD and highest in Daunkeo OD where half of the Diabetics have not used the laboratory as shown in the table below.

TABLE 33 PROPORTION OF DIABETICS ARRIVING AT MEDICAL CONSULTATION BUT WITHOUT LAB PROFILE

	% Diabetic Members of MoPoTsyo consulting the Medical Doctor but WITHOUT having a LAB PROFILE						
year	Takeo all	Bati OD	Daunkeo OD	Prey Kabas OD	Ang Roka OD	Kirivong OD	*from outside Takeo*
2009	24%	17%	36%	29%	29%	9%	NA
2010	34%	22%	37%	28%	31%	20%	67%
2011	41%	33%	34%	35%	39%	20%	84%
2012	40%	42%	51%	41%	40%	27%	36%

	Nr of Diabetic Members of MoPoTsyo consulting Medical Doctor but WITHOUT having a LAB PROFILE (individual patients counted only once)						
year	Takeo all	Bati OD	Daunkeo OD	Prey Kabas OD	Ang Roka OD	Kirivong OD	*from outside Takeo*
2009	112	19	26	16	38	13	*0*
2010	171	21	44	26	34	27	*19*
2011	312	60	41	58	63	75	*15*
2012	554	104	170	77	72	131	*0*
	1149	**204**	**281**	**177**	**207**	**246**	**34**

The laboratory service is available for registered members with Diabetes or High Blood Pressure. In the years 2008 and 2009 we facilitated HbA1c test for some members but our own laboratory service that creates our standard biochemistry profile for our members with Diabetes and or High Blood Pressure did not start until the end of 2009, as can be seen in the table below. The use of the service by patients with high blood pressure is much lower than by diabetics. There was some improvement in 2012 but most patients have not yet been reached in Takeo.

TABLE 34 USE OF LABORATORY SERVICES IN TAKEO

		DIABETIC members getting laboratory profiles					
year	**Takeo**	Bati OD	Daunkeo OD	Prey Kabas OD	Ang Roka OD	Kirivong OD	*from outside Takeo*
2008	12	0	1	0	10	1	*0*
2009	49	7	7	4	22	9	*0*
2010	932	157	59	137	421	158	*0*
2011	229	9	19	7	102	92	*0*
2012	1091	191	172	131	276	321	*5*
total	**2313**	**364**	**258**	**279**	**831**	**581**	***5***

	Year 2012	diabetic members of MoPoTsyo in each OD in Takeo of whom we have at least 1 Lab profile in our database					
	Prov Takeo	Bati OD	Daunkeo OD	Prey Kabas OD	Ang Roka OD	Kirivong OD	*from outside Takeo*
has lab profile	**1435**	257	186	169	467	351	*5*
Nr DM registered	**3165**	573	536	419	947	690	
% with lab profile	**45%**	45%	35%	40%	49%	51%	

	Year 2012	(Non-diabetic) High Blood Pressure members of MoPoTsyo in each OD in Takeo of whom we have at least 1 Lab profile in our database					
	Prov Takeo	Bati OD	Daunkeo OD	Prey Kabas OD	Ang Roka OD	Kirivong OD	*from outside Takeo*
has lab profile	**616**	64	74	98	135	245	*0*
Nr HBP registered	**4118**	603	607	668	1347	893	
% with lab profile	**15%**	11%	12%	15%	10%	27%	

		(Non diabetic) High Blood Pressure members getting laboratory profiles					
year	**Takeo**	Bati OD	Daunkeo OD	Prey Kabas OD	Ang Roka OD	Kirivong OD	*from outside Takeo*
2008	0	0	0	0	0	0	*0*
2009	1	1	0	0	0	0	*0*
2010	125	39	2	57	2	25	*0*
2011	158	1	6	0	107	44	*0*
2012	449	34	68	57	57	233	*0*
total	**733**	**75**	**76**	**114**	**166**	**302**	***0***

TABLE 35 USE & COST OF MEDICAL CONSULTATIONS IN 6 REFERRAL HOSPITALS IN TAKEO IN 2011 AND 2012

Takeo province in 2011

Total cost of consultations in Takeo	**$11,843**
Number of consultations 6 Hospitals	**3524**
cost per consultation in Takeo	**$3.36**
consultation sessions (mornings)	**123**
nr of patient per session	**29**
our cost per session in Takeo	**$96.28**

In 2012, the use of the medical consultation service has become more efficient resulting in a lower cost at which the service can be sustained financially.

year 2012	Ang Roka	Doun Keo	Bati	Prey Kabass	Kirivong	TOTAL
1. Nr of patients who consulted Doctor	662	1118	662	628	1739	4809
2. Cost [(nr3+nr4)*nr5]	$ 1,782.00	$ 1,620.00	$ 1,215.00	$ 2,299.00	$ 3,751.00	$ 10,667.00
3. Transportation expenses	$ 45.00	$ 45.00	$ 45.00	$ 85.00	$ 85.00	
4. Fee for Doctor per consult session	$ 36.00	$ 36.00	$ 36.00	$ 36.00	$ 36.00	
5. Nr of consultation sessions	22	20	15	19	31	107
6. Average Nr of patients per session	30	56	44	33	56	45
cost per consulting patient (nr2/nr1)	$2.69	$1.45	$1.84	$3.66	$2.16	$ 2.22

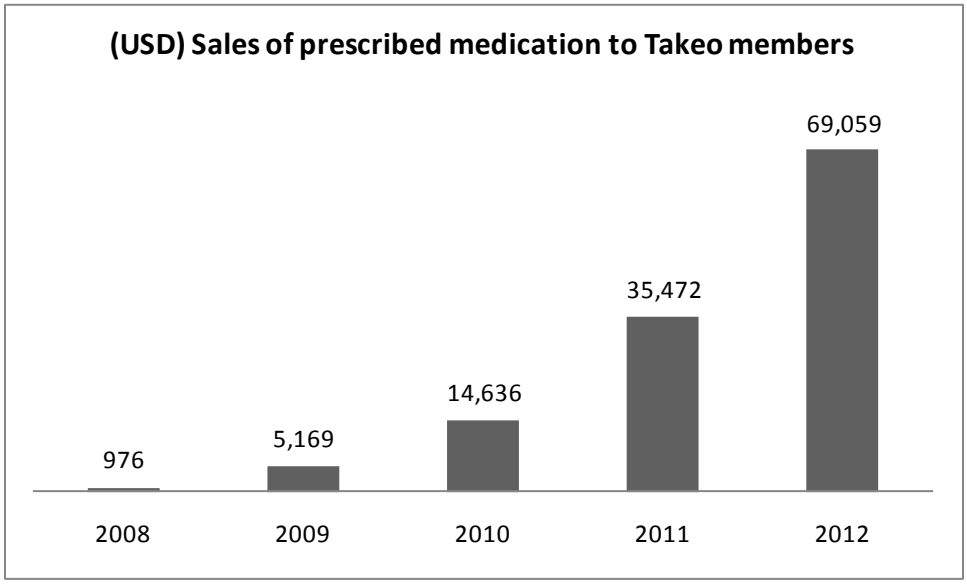
The costs vary between Operational Districts. In Kirivong OD, we held consultation at 2 different locations: at the Referral Hospital but also at Rominh Hospital, a former District Hospital.

By involving Peer Educator Networks in the referral mechanism and in the planning and organisation of the medical consultations, both overcrowding and underutilization of the specialised Physician who travels to the hospital to prescribe can be avoided.

Revolving Drug Fund in Takeo

There are 9 pharmacies contracted by MoPoTsyo in the province. The table shows 10 because one was being replaced during the year. The graph above, shows the revenue that MoPoTsyo should receive from these pharmacies. However, some pharmacies try to use MoPoTsyo as a bank by delaying payments.

FIGURE 39 REVOLVING DRUG FUND GROWTH IN TAKEO (5 OD)



The average price has not risen and that is probably because the proportion of people with a prescription for high blood pressure is increasing. This compensates for the fact that an older cohort of people with DM needs more medication.

TABLE 36 FREQUENCY OF SALES AND AVERAGE PRICE 2008 - 2012

Year	Members bought	Numbers of invoices	Average Price per invoice
2008	3,902,800	204	19,131
2009	20,676,800	1307	15,820
2010	58,542,500	3533	16,570
2011	141,886,490	9052	15,675
2012	276,234,450	15097	18,297
total	**501,243,040**	**29193**	***17,170***

The total value of invoices of the medicines sold to our members in Takeo since 2008 is 501,243,040 Riels or USD 125,311 (if 4000 Riel is 1 USD). This figure is not the same as what the pharmacies in Takeo received because some patients go to buy in Kampong Speu province is that pharmacy is closer. Also some patients who are not from Takeo, go to Takeo to buy their medicine there.

As soon as MoPoTsyo hands over all 5 Peer Educator Networks, the whole intervention in Takeo, including the Revolving Drug Fund to the Ministry of Health, then this means an annual loss in revenue of at least 300,000,000 riels (USD 75,000) or more if the growth has continued in 2013.

We compare the volume of our supply to each pharmacy, with the volume shown on the invoices that we receive back from those pharmacies.

TABLE 37 COMPARISON OF SUPPLY AND INVOICES IN 10 PHARMACIES IN TAKEO

Year 2012	MoPoTsyo supplied to pharmacies in 2012	Names of 10 Takeo Pharmacies	Value of Patient Invoices in 2012	Nr Invoices	AVERAGE amount per invoice	Difference between our supply and value of invoices produced by pharmacies (Negative means MISSING	Estimated number of missing invoices	% of clients who did not get invoice from pharmacy
1	32,914,450	Ang Roka	32,806,000	1,530	21,442	(108,450)	-5	-0.3%
2	33,764,000	Ang Seng	35,536,500	2,202	16,138	1,772,500	110	5%
3	2,835,250	Lalin	4,560,100	323	14,118	1,724,850	122	38%
4	44,351,050	Osot Tep	43,146,640	3,135	13,763	(1,204,410)	-88	-2.8%
5	12,908,200	Pet Hem	15,775,870	1,211	13,027	2,867,670	220	18%
6	7,654,700	Prey Romduol	3,135,800	205	15,297	(4,518,900)	-295	-144%
7	47,694,500	Rominh	49,847,930	2,458	20,280	2,153,430	106	4%
8	22,207,500	Sok San	23,306,600	1,095	21,285	1,099,100	52	5%
9	29,665,800	Sorya	31,013,960	1,875	16,541	1,348,160	82	4%
10	3,390,000	Thida Pao	638,450	45	14,188	(2,751,550)	-194	-431%
Totals	237,385,450		239,767,850	14,079				

Year 2012	MoPoTsyo supplied to pharmacies in 2012+5%	Names of 10 Takeo Pharmacies	Value of Patient Invoices in 2012	Nr Invoices	AVERAGE amount per invoice	Difference between our supply and value of invoices produced by pharmacies (Negative means MISSING INVOICES)	Estimated number of missing invoices	% of clients who did not get invoice from pharmacy
1	34,560,173	Ang Roka	32,806,000	1,530	21,442	(1,754,173)	-82	-5%
2	35,452,200	Ang Seng	35,536,500	2,202	16,138	84,300	5	0%
3	2,977,013	Lalin	4,560,100	323	14,118	1,583,088	112	35%
4	46,568,603	Osot Tep	43,146,640	3,135	13,763	(3,421,963)	-249	-8%
5	13,553,610	Pet Hem	15,775,870	1,211	13,027	2,222,260	171	14%
6	8,037,435	Prey Romduol	3,135,800	205	15,297	(4,901,635)	-320	-156%
7	50,079,225	Rominh	49,847,930	2,458	20,280	(231,295)	-11	0%
8	23,317,875	Sok San	23,306,600	1,095	21,285	(11,275)	-1	0%
9	31,149,090	Sorya	31,013,960	1,875	16,541	(135,130)	-8	0%
10	3,559,500	Thida Pao	638,450	45	14,188	(2,921,050)	-206	-458%
Totals	249,254,723		239,767,850	14,079				

The difference between the 2 tables is that the lower includes a 5% profit margin on all the medicines sold by MoPoTsyo to the pharmacies. In fact this margin is between 5 and 15% depending on the kind of medicine. If we do not add this, we cannot make the comparison between the volumes. It shows that in fact only pharmacies 6 and 10 are not writing invoices as they should, but all the other ones are normally writing them. As these 2 non-compliers are small this means that our analysis on adherence should be reliable in Takeo.

We conclude therefore that we can analyse adherence by patients in Takeo using the database!

If the pharmacies fill out the invoices, we can we measure adherence overall and per patient.

We also compare the adherence per patient per OD. Some OD's do a good job and other OD's do not such a good job. The red figures in the tables below on DM and on HBP show that these OD's are performing below the provincial average in Takeo.

It is the role of the Ministry of Health and of the Provincial Health Department to make sure that OD's try to do a good job with regards to adherence and improve the situation in Takeo with regards to adherence to High Blood Pressure medication.

TABLE 38 ADHERENCE DIABETICS IN TAKEO

		Adherence to prescribed treatment in Takeo by Diabetic Members of MoPoTsyo who come to buy their medicines prescribed by the Doctor in their patient book							
	Diabetics and Diabetics who also have high blood pressure	OD Bati	OD Daunkeo	OD Prey Kabas	OD Ang Roka	OD Kirivong	*from outside Takeo and no code*	Among all the diabetics from Takeo who are member of MoPoTsyo	
	Diabetics	AB	AD	AP	AR	AV	*TX*	**Total times per year**	
	2008	0	0	0	202	1	*0*	203	
	2009	246	137	47	513	353	*0*	1296	
	2010	698	486	301	904	781	*28*	3198	Times they bought
	2011	1326	982	845	2007	1832	*366*	7358	
	2012	2345	2207	1447	2348	2829	*558*	11734	
	total per OD	**4615**	**3812**	**2640**	**5974**	**5796**	***952***	**23789**	
5 years	Nr of Diabetics who bought during 5 years	507	444	324	624	590		2489	Diabetic people
	Average per Diabetic in 5 years	9.1	8.6	8.1	9.6	9.8		9.6	Times they bought
The year 2012	Nr of Diabetics who bought in 2012	420	443	324	624	590		2401	Diabetic People
	average per diabetic in 2012	5.6	5.0	4.5	3.8	4.8		**4.9**	Times they bought
	Diabetics spent at pharmacy in 2012	39,707,150	35,409,450	26,641,210	43,394,420	65,118,320		**210,270,550**	Cambodian Riels
	Average expenditure per diabetic person (2012)	94,541	79,931	82,226	69,542	110,370		87,576	Cambodian Riels
	If 100% adherent to 1st prescription	61,707,150	54,978,435	46,135,211	85,353,775	85,179,262		**333,353,833**	Cambodian Riels
	adherence % 2012	**64%**	**64%**	**58%**	**51%**	**76%**		**63%**	Average in Takeo
	Nr of Diabetics with 1st prescription	424	451	326	648	579		2428	Diabetic People
	If 100% adherent they should spend	145,536	121,903	141,519	131,719	147,114		**137,296**	Cambodian Riels

The table above shows adherence to the first prescription instead of adherence to the last prescription, so the actual adherence level may be lower. On the other hand, maybe some pharmacies are not filling out all the invoices for us, so the adherence may also actually be better.

The table below shows the same figures but for High Blood pressure, among those who do not have Diabetes.

TABLE 39 ADHERENCE HBP PATIENTS IN TAKEO

Adherence to prescribed treatment in Takeo by HIgh Blood Pressure (non diabetic) Members of MoPoTsyo, who come to buy their medicines at a contracted pharmacy						
	Bati	Daunkeo	Prey Kabas	Ang Roka	Kirivong	Total times
Year	AB	AD	AP	AR	AV	per year
2009	3	-	1	8	-	12
2010	52	70	59	96	69	346
2011	297	135	301	600	377	1,710
2012	504	695	498	731	945	3,373
Total invoices	**856**	**900**	**859**	**1,435**	**1,391**	**5,441**
Nr of HBP who bought at least once in 2012	117	236	138	166	254	911
Average times per HBP in 2012	4.3	2.9	3.6	4.4	3.7	3.7
HBP spent at the pharmacy in 2012	5,094,250	9,074,420	6,404,550	8,061,950	10,095,400	38,730,570
Average expenditure per HBP in 2012	43,541	38,451	46,410	48,566	39,746	42,514
If 100% to 1st prescription, then should have spent	13,340,193	23,143,258	21,768,639	25,729,012	23,705,473	107,686,575
Average adherence in 2012	38%	39%	29%	31%	43%	**36%**
Nr of HBP with a 1st prescription	162	296	223	247	306	1234
If 100% adherent they would have spent on average for the whole year	82,347	78,187	97,617	104,166	77,469	**87,266**

Primary Prevention

In Takeo province our Primary Prevention team of 6 PE's has organised primary prevention sessions in every commune in Ang Roka OD. 408 local authorities were exposed to information about risk factor control. This was one in 10 communes.

Also the same group of PE's held primary prevention sessions in 49 schools, reaching more than 800 teachers of the more than 1000 who will be reached when this activity ends. It is funded by the World Diabetes Foundation. Both these types of activities are successful and will be replicated to other areas in the coming years when funding becomes available. A second round of primary prevention started in December 2012, to prepare for 2 drawing competitions to be held in 2013 at the end of the WDF09-463 grant (ends on 30 June 2013). Another 9 Schools will be covered in Ang Roka (833 teachers) and another 28 schools in Prey Kabas (328 teachers). The second primary prevention team for Prey Kabas was trained in order to prepare for this second round.

Health Outcomes

For details on health outcomes see the chapter on Re-assessments above. Below is a table on blood sugar reproduced here because it is not part of the routine re-assessments.

Blood sugar control

HbA1C RESULT		NAME OF AREA									TOTAL	
		ARF	DKK	ADJ	ARE	APL	AVL	AK	BK	ARH		
AVERAGE		7.8	7.4	8.1	8.4	7.7	7.3	7.5	7.3	6.7	7.6	
Nr OF STUDIED CASES		21	25	53	72	28	77	69	77	70	492	
>7.8	Case	8	7	21	34	9	17	23	23	11	153	
	%	38%	28%	40%	47%	32%	22%	33%	30%	16%	31%	
>9.0	Case	4	4	16	27	4	7	10	10	6	88	BAD control
	%	19%	16%	30%	38%	14%	9%	14%	13%	9%	18%	
<7.01	Case	9	13	23	24	9	40	27	36	49	230	very good control
	%	43%	52%	43%	33%	32%	52%	39%	47%	70%	47%	
<7.0	Case	8	13	22	20	7	38	24	36	47	215	
	%	38%	52%	42%	28%	25%	49%	35%	47%	67%	44%	

The table above shows the HbA1c values of random samples of diabetics (492 in total sample) who are being followed by the busiest Peer Educators in Cambodia, 6 of whom are based in Takeo (ARF, ADJ, ARE, APL, AVL, ARH) . The results show, as usual, that blood sugar control among the great majority (69%) of diabetics is good enough (less than 7.8%).

BANTEAY MEANCHEY PROVINCE WITH 1 OD: THMAR POUK

During the year 2012, the membership grew from 647 chronic patients to 908 members in total. Among all the members there are 249 patients with High Blood Pressure (up from 199). There are 659 Diabetics (up from 443) registered. 75% of members are women. That is of course disproportionate. It indicates a problem with the screening process in the sense that the men may not have access to it. This in turn may be the result of the fact that this is a district that is bordering Thailand. There is a lot of migration. More than 80% reports to be farmer when they register. There are 20 insulin patients among the diabetics in this area.

Peer Educators

Three more peer educators were trained, so there are 10 peer educators active in Thmar Pouk OD in 2012 and the network is complete.

Screening

At the end of 2012, the number of villages where screening was completed is 96, with a total of 50,887 adults having benefited from diabetes screening, up from 44,508 at the start of the year. The set up of Village High Blood Pressure Groups was not part of the project in this area. Yet 6 of such groups have been set up.

Use of the Medical Services organized by MoPoTsyo

Laboratory Services

TABLE 40 USE OF THE LAB SERVICES BY PATIENTS IN THMAR POUK OD

Yearly use of lab services			
	Patients with lab test	Diabetic	non Diabetic HBP
2009	**4**	4	0
2010	**153**	124	29
2011	**7**	7	0
2012	**143**	107	36

The percentage of chronic patients who have used the lab service grew from 22% in 2011 to 28% in 2012, still a low proportion of the total: only 255 of the 908 registered patients have a lab profile in our database.

Medical Consultations

In 2012 the number of consultation sessions remained roughly the same as in 2011, usually 2 or 3 times per month.

2010: 21 sessions

2011: 30 sessions

2012: 32 sessions

TABLE 41 USE OF MEDICAL CONSULTATION SERVICE IN THMAR POUK OD

	Use of the medical consultations by type				
	Diabetics	Different DM patients		Non Diabetic HBP	Different HBP Patients
2010	262	163		73	56
2011	452	279		142	114
2012	864	318		213	92

Contact rate per Registered Diabetic Member			
	Diabetic patients coming for consultations	1st Prescriptions	Contact rate per diabetic per year
2010	262	163	1.6
2011	452	201	1.2
2012	864	200	1.5

Contact rate per Registered HBP Member			
	High Blood Pressure patients coming for consultation	1st Prescriptions	Contact rate per diabetic per year
2010	73	56	1.3
2011	46	102	0.3
2012	213	200	0.6

When we compare our supply to the 4 pharmacies with the invoices that we receive back from them, we can see that number 3 and 4 are doing a perfect job, and number 2 is problematic because about one in five members does not get the invoice when they buy their medicine at

Boeung Trakoun pharmacy. The turnover of that pharmacy is small, but it is a pity that they make our figures on adherence suboptimal.

TABLE 42 FOUR PHARMACIES IN THMAR POUK OD

Year 2012	MoPoTsyo supplied to pharmacies in 2012	Names of 4 Pharmacies in Banteay Meanchey	Value of Patient Invoices in 2012	Nr Invoices	AVERAGE amount per invoice	Difference between our supply and value of invoices produced by pharmacies (Negative means MISSING INVOICES)	Estimated number of missing invoices	% missing invoices
1	8,958,350	Banteay Chhmar	9,121,400	726	12,564	163,050	13	
2	6,622,250	Boeung Trakoun	5,914,000	548	10,792	(708,250)	-66	-12%
3	14,449,000	Svay Chek	16,981,890	1,141	14,883	2,532,890	170	
4	23,163,550	Thmar Pouk	28,148,980	2,009	14,011	4,985,430	356	
Totals	**53,193,150**		**60,166,270**	**4,424**			473	-12.0%

Year 2012	MoPoTsyo supplied to pharmacies in 2012+7% profit	Names of 4 Pharmacies in Banteay Meanchey	Value of Patient Invoices in 2012	Nr Invoices	AVERAGE amount per invoice	Difference between our supply and value of invoices produced by pharmacies (Negative means MISSING INVOICES)	Estimated number of missing invoices	% missing invoices
1	9,585,435	Banteay Chhmar	9,184,900	726	12,651	(400,535)	-32	-4.4%
2	7,085,808	Boeung Trakoun	5,876,900	548	10,724	(1,208,908)	-113	-21%
3	15,460,430	Svay Chek	16,956,690	1,141	14,861	1,496,260	101	
4	24,784,999	Thmar Pouk	28,148,030	2,009	14,011	3,363,032	240	

For the calculation method of the adherence figures below see the detailed explanation in the annex.

TABLE 43 ADHERENCE AND EXPENDITURE ON PRESCRIBED MEDICATION BY DIABETICS IN THMAR POUK OD

% adherence by Diabetics	The DM patients should have spent if 100% adherent	Year	Riels spent by Diabetics on medication	yearly growing cohort of DM	Riels average per actual buying DM patient per year	Nr of Actual DM Buyers	Nr of times they bought
		2010	11,170,200	163	55,026	203	893
		2011	35,576,450	364	95,893	371	2348
66%	77,935,040	2012	51,423,620	564	97,764	526	3551

TABLE 44 ADHERENCE AND EXPENDITURE ON PRESCRIBED MEDICATION BY HBP IN THMAR POUK OD

% adherence by High Blood Pressure Patients	The HBP patients should have spent if 100% adherent	Year	Riels spent by HBP on medication	yearly growing cohort of HBP	Riels average per actual buying HBP patient per year	Nr of Actual HBP Buyers	Nr of times they bought
		2010	1,291,100	56	20,173	64	177
		2011	5,155,700	158	38,475	134	579
39%	17,602,280	2012	6,937,850	204	48,858	142	743

The adherence to prescribed medication in Thmar Pouk by Diabetics is better (66%) than by non-diabetic High Blood Pressure patients (39%), despite that the medication is double the cost for diabetics.

TABLE 45 USE OF RDF BY SEX IN THMAR POUK OD

Female	78%	1162
Male	22%	337
	100%	1499

Clearly, the men in Thmar Pouk OD have problems accessing and using the Revolving Drug Fund service and are seriously disadvantaged when compared to access by women.

Primary Prevention activities:

Using the experience from Takeo, we added a primary prevention activity to the project, although this was not part of the original proposal for the donor ICCO KIA. To strengthen the awareness of the risk factors for chronic NCD, we have carried out during 2012 Primary Prevention activities in 10 communes in this area. A total of 456 commune leaders were reached through this activity.

KOMPONG SPEU PROVINCE

By September 2012, we had spent all the funds of the AusAID grant that we had received in 2010 to set up the first Peer Educator Network in that province, namely in Kong Pisey OD.

On October 1, 2012 the GIZ funding for this area began (as one of 4 Peer Educator Networks in 4 Operational Districts in Cambodia). This allows us to continue to fund the activity. This is necessary because it is not yet completely self-financing.

Also, it allowed us to start a second Peer Educator Network: in Kampong Speu OD. Apart from having signed official agreements with the authorities and the identification of a first group of diabetes patients who were selected as candidates to become peer educator, there is not much to report yet about Kampong Speu OD. So this section of the annual report deals with Kong Pisey OD only.

Membership growth

Per 31 December 2012, there are 685 DM- and 646 HBP-patients (who are not diabetic) registered, up from 372 and 379 respectively at the start of 2012.

Peer Educators

In order to create the Peer Educator Network, in total 20 peer educators have been trained and equipped. One has died and one has become the Manager of the Peer Educator Network in this Operational District. Only 4 (20%) were women, although we actively tried to find female candidates for the positions.

Screening

During the year 2012 55,998 adults were screened for Diabetes, so that at the end of December 2012, a total of 106,197 adults have been reached directly.

Medical Services

Use of Laboratory Services in Kong Pisey OD is proportionally and absolutely better by the diabetics than by the non-diabetic HBP patients.

TABLE 46 USE OF LAB SERVICES IN KONG PISEY OD

Yearly use of lab services			
Kong Pisey OD	**Patients with lab test**	Diabetic	non Diabetic HBP
2010	**113**	66	47
2011	**248**	150	98
2012	**454**	324	130

At the end of 2012, 370 Diabetics **(54%)** have a lab profile in our database, compared with only 230 **(36%)** pf the registered members with High Blood Pressure. Use of Medical Consultation Service in Kong Pisey:

TABLE 47 USE OF MEDICAL CONSULTATION BY DM IN KONG PISEY OD

Kampong Speu - Kong Pisey OD use of Medical Consultations					
year	Medical Consultation sessions	DM patients	Average DM patients per session	First time Prescription for DM patient	Consultation rate per DM patient
2010	10	63	6.3	58	1.1
2011	44	1082	24.6	322	2.8
2012	59	1648	27.9	254	2.6

As expected, the use of the consultation service by Diabetics is better than by non-diabetic hypertensives (HBP). What was not expected is that the use (consultation rate) would deteriorate in 2012 compared with 2011 for both DM and HPB.

TABLE 48 USE OF MEDICAL CONSULTATION BY HBP IN KONG PISEY OD

Kampong Speu - Kong Pisey OD use of Medical Consultations by HBP					
year	Medical Consultation sessions	HBP patients	Average HBP patients per session	First time Prescription for HBP patient	Consultation rate per HBP patient
2010	10	28	2.8	28	1.0
2011	44	439	10.0	239	1.6
2012	59	515	8.7	177	1.2

In 2012 it happened more often that there were no High Blood Pressure patients (non Diabetics) using the session, despite the great medical needs in for better hypertension control in the district.

TABLE 49 SESSIONS NOT USED BY HYPERTENSION PATIENTS IN KONG PISEY

	Medical Consultation Sessions		
year	Nr Sessions	DM present	HBP present
2010	10	100%	20%
2011	44	100%	89%
2012	59	100%	81%

Revolving Drug Fund & Adherence

During the year 2012 the registered members with a prescription bought 4,459 times their medication at one of the 2 pharmacies, contracted by MoPoTsyo in Kong Pisey OD. Together they spent 81,383,720 to buy their medication from the Revolving Drug Fund.

Because our database has the data on prescription, and the cost of the prescription and the sales of the pharmacies to each patient, thanks to the invoice system, we can analyse adherence.

TABLE 50 ADHERENCE TO ROUTINE MEDICATION IN KONG PISEY OD

Adherence %	What the patients SHOULD have spent		Expenditure for prescribed medication by DM patients	Times bought	DM patients	Average per patient per year	Invoices per DM ptient per year
		2010	1,465,330	85	61	24,022	1.4
		2011	36,401,500	1800	351	103,708	5.1
73%	93,770,554	2012	68,619,020	3493	542	126,603	6.4
		Total	106,485,850	5378		Better and better	
			Expenditure for prescribed medication by HBP patients	Times bought	HBP patients	Average per patient per year	Invoices per HBP Patient per year
		2010	321,050	26	26	12,348	1.0
		2011	9,583,500	575	227	42,218	2.5
24%	52,490,272	2012	12,764,700	966	265	48,169	3.6
		total	22,669,250	1567		some progress	

As everywhere, there is a large difference in adherence among diabetics and non-diabetic hypertensive patients. The precise reasons must be investigated so the Ministry of Health can begin to do something about it.

Other:

A 20-minute documentary has been produced about the lives of one man and one woman in Kong Pisey OD, called "Diabetes in the Paddy Fields". They and others compare how the intervention has had an impact on their lives.

KAMPONG THOM PROVINCE

At the end of 2011 we had signed a partnership agreement with Louvain Coopération to set up a PEN in Baray Santuk OD in Kampong Thom. In January 2012, we organized a visit by the OD authorities from Kampong Thom to an OD with a functional PEN so they could get an idea of what they can expect. They went to see Kong Pisey OD in Kampong Speu province. After that the agreements were signed with the health authorities in Baray Santuk OD. The Provincial Health Department approved the project and wrote a letter of support.

In February 2012 a peer educator from Takeo was sent to Baray Santuk OD to begin to identify diabetes patients in Baray Santuk OD who were suitable and willing to be trained as peer educator. With 19 health center areas to cover, a suitable candidate must be found for each one. After completing their six week training in Phnom Penh and Takeo, and after 9 out of 11 had passed their exam, the first group of 9 PE's was able to begin screening in June 2012.

TABLE 51 GROWTH OF MEMBERSHIP IN KAMPONG THOM

	Baray Santuk	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12
	per month plan	63	63	63	63	63	63
	accumulative plan	63	126	189	252	315	378
New cases	in reality accum	94	183	308	355	432	544
Diabetes	% of LD target	149%	145%	163%	141%	137%	144%
	glucose screened	4900	7608	14329	14868	18149	21289

HBP Groups		0	4	8	12	24	27
	Baray Santuk	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12
	per month plan	125	125	125	125	125	125
New cases	accumulative plan	125	250	375	500	625	750
High Blood	in reality accum	85	187	309	368	424	599
Pressure	% of LD target	68%	75%	82%	74%	68%	80%

The screening by peer educators distributing urine glucose strips has started at the end of June 2012: 21,289 adults were screened for diabetes by the end of December 2012, so they screen at around 3500 per month on average. The screening has been done in 83 villages so far. We have begun to establish Village High Blood Pressure Groups. There are now 27 villages with such a group. They have to facilitate self-screening for HBP by people in the village so people will come forward and register as HBP patient. This requires concerted public health campaign work.

Medical Consultations were first organized at the end of July 2012. The OD Baray Santuk is the first OD where the medicines are being dispensed at the Referral Hospital Pharmacy, after a contract was signed between MoPoTsyo, the OD and the Hospital Pharmacist.

At the end of December 2012, there are in total 1144 patients registered as member. Among them there are 544 DM registered and in total 599 HBP patients registered.

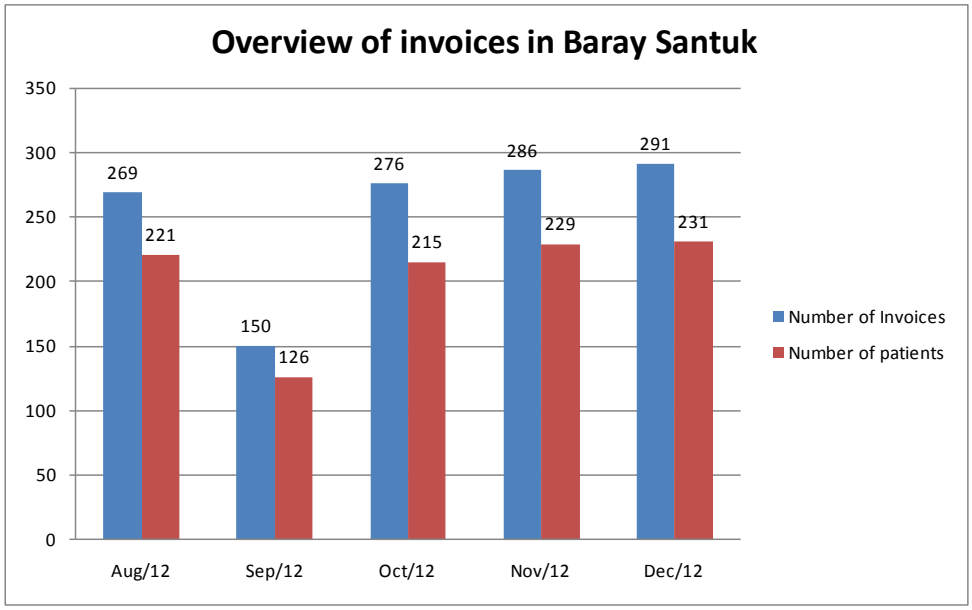
MoPoTsyo has been working with 3 different Doctors hired to train the local Doctor in Baray Santuk OD. These external trainers are hired in a private capacity to train the counterpart plus perform the consultation. This occurs several times per month, usually on a weekend. The hired consulting doctor travels to the referral hospital in Baray Santuk OD from Phnom Penh, in a journey that takes about 5 hours. That creates an extra cost to the program for which a solution must be found in the future. The preferred solution is that 2 Hospital Doctors at Baray Santuk will have received sufficient training from the visiting consultant that they can do the consultations themselves. One Doctor now feels confident to do the consultations by himself.

785 Medical consultations were given during 2012 (counting from start at end of July 2012) and reached a total of 614 different individual patients, so it shows a ratio of 1.3 per 5 months and this appears efficient: Only 28% came again to see the Doctor. We aim for an average of 1 to 2 times per year per patient.

614 individually registered patients received medical examination and a prescription for routine medication from our Revolving Drug Fund. Among the 785 medical consultations there were 475 for diabetes and 310 for High Blood Pressure patients who are not diabetic. Among the 785 medical consultations, there were 572 for women (73%). This is not unusual when compared to other project locations. It suggests that women are more risk averse when it comes to their health than men. Counting from August 2012, in total 1272 invoices for medicine dispensing have been paid by 591 different members of MoPoTsyo based on their prescription that they have received from the medical doctor.

On a monthly basis the dispensing of medicines is quite steady. There is an un-explained dip in September 2012, perhaps due to the installation of the software around that time. The graph below is the purchasing behavior related to 591 different individual patients, some buy for a month, others for 2 months, others for half a month.

FIGURE 40 BUYING AT PUBLIC HOSPITAL PHARMACY BARAY SANTUK OD



It is not meaningful to make an analysis of adherence to prescribed treatment based on such a short period, so this will first become available during the second half of 2013.

MoPoTsyo Peer Educator Network organised regular blood drawings at the local health centers. In total 699 different patients gave blood. In total 705 laboratory profiles were created for the registered patients.

MoPoTsyo has negotiated contracts with 3 public facilities in Baray Santuk for dispensing RDF medicines to the members. Firstly the pharmacy at the referral hospital and similar contracts with 2 other Health Centers located far away from the referral hospital, namely at HC Treal and HC Taing Krasang to dispense the prescribed medication to patients who live close by their health center. We have put the first automated system in place with a bar code reader in one HC only. The internet and VPN system has been problematic and we have been working on the technical solution in quarter 4 but the issue is not solved yet.

PLANNING FOR 2013

- Hand over PEN in 5 OD's which are Special Operating Agencies in Takeo
- Negotiate with MoH about setting up PEN in other Cambodian OD's
- Develop web based solution for pharmacy automation system for OD's
- Expand patient database with Revolving Drug Fund management
- Implement recommendations from evaluation of laboratory
- Reform the Financial & accounting system
- Strengthen data collection for database
- Second assessment of the Bridges research on the effect of SMS on Diabetes outcomes
- Start research on screening methodologies in collaboration with PATH USA.

ANNEXES

Annex on Adherence Calculation

How to calculate adherence over a one year period until a specific date of analysis in the past:

Database of MoPoTsyo contains the data on prescription (P), and on Invoices (I).

P: The record of a prescription contains Patient ID, a code D, H or DH, indicating whether the patient is diabetic or non-diabetic hypertensive, date of the prescription, the daily cost of the medicine that is prescribed, the types of medicine and dosages per day, the name of the contracted pharmacy.

I: The invoice contains the ID of the patient, the date of buying medicines, the name of the pharmacy, the amount spent that day at the pharmacy.

The analysis is done by :

STEP 1: exporting the data to EXCEL by period and by area in 2 different files P and I.

The records can be connected through the patient ID. Every patient has her/his own ID. This ID consists of 3 letters (province, OD, Health Center area) and followed by a 4 digit number.

The Excel file P:

1. Note the total number of prescriptions for all patients in the area of study.
2. Split the files in 2 by Disease Type in to Diabetic and Non-Diabetic Hypertensive
3. Note the total number of Diabetics, sort by date of prescription from old to new
4. Note the total number of non Diabetic Hypertensives, sort by date of prescription, from old to new
5. Remove duplicates in file Diabetics and keep : 1st prescription DM, sort by date of prescription
6. Remove duplicates in file Hypertensives and keep: 1st prescription HBP, sort by date of prescription
7. insert 3 empty columns left of the total amount spent at the pharmacy by the patient
8. First column put as Header date of analysis: in the first column if more than one year ago, put nothing. If one year or less than one year ago, type the date until which you want to analyse the adherence;
9. copy the same data of analysis until the last row.
10. Second column at the top of the file put Header : Number of consumption days. Put number 365 in the top row, because the date of prescription is more than one year ago and we analyse over one year,
11. Draw down (copy formula) until you reach the row at the left of which you have typed the date of analysis. Then type subtract the date of prescription from the date of analysis so that it appears in column 2 there. It will be number less than 365.

12. Copy the cells until the last row of the file.
13. At the top of empty column 3 put header : Should have Spent: and in the first cell multiply the daily cost by the number of days (normally 365 at the top) and then copy the formula down until the last row.
14. Sum all the amounts in column 3. You now have the amount of what the patients should have spent during one year until the date of analysis.
15. You do this for DM, and also for HBP.
16. Now you finished with P and you go to work on Invoices so you will be able to compare this with what they really spent, based on the invoices I.
17. Make sure you compare the same category of patients, the same period, the same ID's from the same area;
18. Sum the total
19. Compare by dividing the total P by total I = ….%.

What this method does not do, is adjust for patients who have died, for patients who have received a second prescription that instructs to take more medicine than the first prescription. It compares money so strictly speaking it is possible that a pharmacy sells other things instead of the medication, but this does not appear to happen. Also, it is possible that pharmacies do not always provide an invoice when they dispense invoices. That has happened a lot in the past but it is improving. We can control it by comparing the volume and amounts of what we sell to the pharmacies with the value of the invoices that they produce.

The method above just explains how to calculate adherence. There are many other things can be studied because there are many more columns with important data, such as the name of the prescribing Doctor, the number of laboratory tests that are available, the age, sex of the patient, the BMI etc.

Annex on Expenditure

Expenses by category according to MoPoTsyo's accounts year by year.

Expenses for activities as accounted in the bookkeeping of MoPoTsyo Patient Information Centre	Cost as in bookkeeping by PRODUCT or BENEFICIARY (2004 - 2012)										TOTAL (cost Vs product) excluded (*5)
	2004	2005	2006	2007	2008	2009	2010	2011	2012		
1. Earlier Diagnosis & awareness of NCD	$0	$179	$3,500	$11,268	$13,139	$31,380	$37,872	$29,739	$64,909		$191,986
Actions that benefit the general population;											
PE doing Screening (Diabetes)			$1,475	$1,882	$3,339	$5,187	$9,500	$6,096	$26,098		$53,577
PE doing Screening (Hypertension)					$342			$1,205	$2,095		$3,641
Equipments and Materials for Screening		$179	$1,321	$2,614	$1,716	$9,113	$10,462	$4,624	$6,560		$36,588
Primary prevention (Community Leader)					$4,883	$7,625	$1,711	$2,933	$1,354		$18,506
Primary prevention (Primary School Teacher)									$3,321		$3,321
Events and World Diabetes Day			$704	$6,771	$2,861	$9,456	$16,199	$14,881	$25,481		$76,352
2. Capacity of Peer Educators & their networks	$0	$0	$566	$5,591	$10,899	$19,002	$24,446	$34,595	$54,532		$149,630
Building the network ;											
Training of new Peer Educators (PE)				$806	$1,990	$3,204	$4,032	$2,412	$7,198		$19,642
PE doing Patient follow up (Diabetes)				$3,510	$5,710	$8,943	$12,125	$18,795	$17,605		$66,689
PE doing Patient follow up (Hypertension)								$3,436	$503		$3,940
Village High Blood Pressure Group created									$150		$150
Capacity Building Peer Educator Networks (PEN)			$566	$1,274	$3,199	$6,854	$8,290	$9,952	$29,075		$59,209
3. Delivery of Continuum of Care	$0	$500	$4,217	$12,217	$29,422	$58,835	$90,382	$207,551	$141,550		$544,675
All materials for self-management, consumables and equipment and the expenses related to the Revolving Drug Fund and Laboratory Services;											
Materials for patient follow up (DM)		$500	$4,217	$8,982	$14,838	$19,038	$28,051	$23,548	$25,964		$125,138
Materials for patient follow up (HBP)						$4,710	$12,020	$5,892	$32,626		$55,248
Laboratory services						$4,054	$10,978	$19,456	$15,508		$57,630
Consultation services				$3,235	$4,399	$20,473	$32,130	$150,436	$23,821		$235,808
Revolving Drug Fund (only medication)					$8,947	$6,747			$26,416		$33,163
Material and Equip for sales to members						$3,812	$7,204	$8,218	$17,215		$37,687
Others support to RDF project and distribution					$1,237						
4. Equity Fund Provision	$0	$1,002	$3,808	$4,037	$7,481	$3,933	$3,185	$3,139	$5,157		$31,742
Paying health services for poor patients (vouchers);											
***5. Capacity building to manage risk factor control**	$7,361	$8,236	$11,958	$26,696	$70,784	$76,623	$104,560	$147,120	$235,877		$689,217
OD Capacity building to manage risk factor control in primary care;											
Staff		$705	$6,199	$14,484	$28,509	$41,154	$49,847	$66,992	$97,398		$305,289
Administration & Equiptment	$7,361	$7,531	$5,759	$11,803	$25,185	$28,586	$43,990	$70,570	$106,426		$307,211
Evaluation				$408	$6,740	$5,883	$8,922	$7,794			$29,747
Research & Study							$601	$565	$24,003		$25,169
Audit					$1,000	$1,000	$1,200	$1,200	$8,050		$12,450
Others					$9,350						$9,350
TOTAL EXPENSES	**$7,361**	**$9,917**	**$24,049**	**$59,808**	**$131,725**	**$189,773**	**$260,446**	**$422,145**	**$502,025**		**$1,607,250**

Numbers of PRODUCTS or BENEFICIARIES													
*Early diagnosis/People who have self-screened for **DM*** (1)	1	2,479	5,505	21,351	41,994	42,766	42,766	83,690	219,688	460,240
*Early diagnosis/People who have self-screened for **HBP*** (2)							21,383	41,845	109,844	173,072
*Commune leaders exposed to **primary prevention*** (3)							37	408	558	1,003
*School teachers exposed to **primary prevention*** (4)							161	202	959	1,322
Total (3+4)	***0***	***0***	***0***	***0***	***0***	***198***	***610***	***1,517***	***2,325***
*Village High Blood Pressure Group (**VHBPG**) **created*** (5)									495
*Members **registered/counseled/trained DM** each year* (6)		60	199	359	525	722	695	1,397	2,238	6,195
*Members **registered/counseled/trained HBP** each year* (7)							2,298	1,821	1,859	5,978
Total DM + HBP registered each year (6+7)	***0***	***60***	***199***	***359***	***525***	***722***	***2,993***	***3,218***	***4,097***	***12,173***
*Accumulate number of **Staff Employed*** (8)	2	4	5	6	14	20	28	31	36	146
*Accumulate number of **Peer Educators trained*** (9)	0	2	3	11	17	29	58	74	108	302
Total Staff + Peer Educaotrs each year (8+9)	***2***	***6***	***8***	***17***	***31***	***49***	***86***	***105***	***144***	***448***
*Accumulate members registered **follow up DM*** (10)		52	225	538	994	1,623	2,227	3,443	5,390	14,492
*Accumulate members registered **follow up HBP*** (11)							1,999	3,584	5,201	10,784
Total Accumulate of DM + HBP follow up (10+11)	***0***	***52***	***225***	***538***	***994***	***1,623***	***4,226***	***7,026***	***10,591***	***25,275***
*Members **receiving Lab Test** at least once* (12)				8	19	43	1,481	968	3,881	6,400
*Members **receiving Medical Consultation** at least once* (13)				26	85	284	687	2,593	2,853	6,528
*Members **Buying Prescription Medication** at least once* (14)					180	652	1,334	3,365	4,729	10,260
*Accumulate members who **Injected Insulin*** (15)					14	14	14	108	257	407
*Accumulate members **receiving monthly HEF*** (16)					110	86	86	130	216	628
*Accumulate number of **OD covered*** (17)		1	1	2	6	7	8	8	11	44
Cost per PRODUCT or BENEFICIARY (US$)										
*Early diagnosis/People who have self-screened for **DM*** (1)			$0.51	$0.21	$0.12	$0.33	$0.47	$0.13	$0.15	$0.20
*Early diagnosis/People who have self-screened for **HBP*** (2)								$0.03	$0.02	$0.02
*Commune leaders exposed to **primary prevention*** (3)							$46.26	$7.19	$2.43	$18.45
*School teachers exposed to **primary prevention*** (4)							$0.00		$3.46	$2.51
Total (3+4)							***$46.26***	***$7.19***	***$5.89***	***$20.96***
*Village High Blood Pressure Group (**VHBPG**) **created*** (5)									$0.30	$0.30
*Members **registered/counseled/trained DM** each year* (6)				$34.80	$39.14	$38.76	$57.81	$30.31	$19.47	$30.96
*Members **registered/counseled/trained HBP** each year* (7)								$1.89	$0.27	$0.66
Total DM + HBP registered each year (6+7)								***$32.20***	***$19.74***	***$31.62***
*Accumulate number of **Staff Employed*** (8)		$176.25	$1,239.84	$2,414.05	$2,036.36	$2,057.70	$1,780.26	$2,161.04	$2,705.51	$2,091.02
*Accumulate number of **Peer Educators trained*** (9)				$73.29	$117.06	$110.49	$69.51	$32.59	$66.65	$65.04
Total Staff + Peer Educaotrs each year (8+9)				***$2,487.34***	***$2,153.42***	***$2,168.19***	***$1,849.77***	***$2,193.63***	***$2,772.16***	***$2,156.06***
*Accumulate members registered **follow up DM*** (10)				$6.53	$5.74	$5.51	$5.44	$5.46	$3.27	$4.60
*Accumulate members registered **follow up HBP*** (11)								$0.96	0.10	0.37
Total Accumulate of DM + HBP follow up (10+11)								***$6.42***	***$3.36***	***$4.97***
*Members **receiving Lab Test** at least once* (12)						$109.54	$8.12	$6.09	8.41	$8.63
*Members **receiving Medical Consultation** at least once* (13)				$124.42	$51.75	$14.28	$15.98	$7.50	$5.44	$8.83
*Members **Buying Prescription Medication** at least once* (14)					$56.58	$37.25	$29.49	$47.15	$8.68	$26.66
*Accumulate members who **Injected Insulin*** (15)										N/A
*Accumulate members **receiving monthly HEF*** (16)					$68.01	$45.73	$37.03	$24.15	$23.87	$50.54
*Accumulate number of **OD covered*** (17)		$1,681.16	$12,090.61	$16,555.93	$10,156.83	$16,164.29	$19,485.66	$34,378.11	$24,195.24	$20,864.37

In the table above the expenses per product or per beneficiary is presented as it was accounted in the bookkeeping: it excludes the NGO office cost, see category 5 (previous page) which is the total expenses for the NGO's office since the year 2004 (USD 689,217) must be also allocated to each of the products.

Annex with Cost analysis by service unit in 2011 (last available year of audited expenditure)

COSTING ANALYSIS

MoPoTsyo-Patient Information Centre (2011)

	Cost Description	Total Expenditure	1 Mgt. and Admin. /HQ	2 Peer Education / ODs	3 Laboratory	4 Medical Consultation	5 Revolving Drug Fund	i. Diabetes Screening	ii. Peer Education	iii. Treatment Diabetes	iv. Treatment Hypertension
a	Personnel cost	$71,425	$42,655.04	$15,209.34	$3,054.02	$7,591.38	$2,915.40				
b	Training	$2,789	$377.00	$2,411.61							
c	Materials (Non Med + Med)	$31,432	$4,572.17	$18,343.41	$5,892.49			$2,624.25			
d	Depreciation ($22,314.9 X 20%)	$4,463	$2,242.18		$2,220.80						
e	Rent Office	$11,520	$11,520.00								
f	Drugs incl Insulin&syringes	$46,016								$45,008.17	$1,007.77
g	Travel and delivery	$23,218	$1,663.64	$3,541.47		$11,865.00	$6,148.14				
h	Allowances Peer Educators	$31,368		$25,272.32				$6,095.52			
i	Other Cost	$56,123	$49,816.72	$4,593.83			$1,712.35				
	Total Expenditure	**$278,354**	**$112,846.75**	**$69,371.98**	**$11,167.31**	**$19,456.38**	**$10,775.89**	**$8,719.77**	**$0.00**	**$45,008.17**	**$1,007.77**
	Mgt. and Admin. /HQ		-$112,846.75	$28,211.69	$28,211.69	$28,211.69	$28,211.69				
			$0.00	$97,583.67	$39,379.00	$47,668.07	$38,987.58	$8,719.77	$0.00	$45,008.17	$1,007.77
	Peer Education / ODs			-$97,583.67					$97,583.67		
				$0.00	$39,379.00	$47,668.07	$38,987.58	$8,719.77	$97,583.67	$45,008.17	$1,007.77
	Laboratory				-$39,379.00					$29,534.25	$9,844.75
					$0.00	$47,668.07	$38,987.58	$8,719.77	$97,583.67	$74,542.42	$10,852.51
	Medical Consultation					-$47,668.07				$30,030.88	$17,637.18
						$0.00	$38,987.58	$8,719.77	$97,583.67	$104,573.30	$28,489.70
	Revolving Drug Fund						-$38,987.58			$32,749.57	$6,238.01
	Total cost of service units:						$0.00	$8,719.77	$97,583.67	$137,322.87	$34,727.71
	Number of Service Units:							**83,690**	**74**	**3,159**	**2,066**
	Cost per Service Unit per year:							$0.10	$1,318.70	$43.47	$16.81
	cost per Service Unit per month:								**$109.89**	**$3.62**	**$1.40**

Definitions of service units

Definitions

i. A Diabetes screening unit is the adult who through the action of the peer educator has received knowledge and materials for self measurement of presence of urine glucose (one urine glucose strip per adult in the household + pregnant women of any age) and who, if one of the adults in the household has positive urine glucose, receives without charge a confirmation blood glucose test from the peer educator who uses a handheld glucometer and about which the peer educator reports using the standard screening form to fill the screening result with all the adults' name, age, sex and full address of the household he has visited and provided the opportunity to self screen for diabetes.

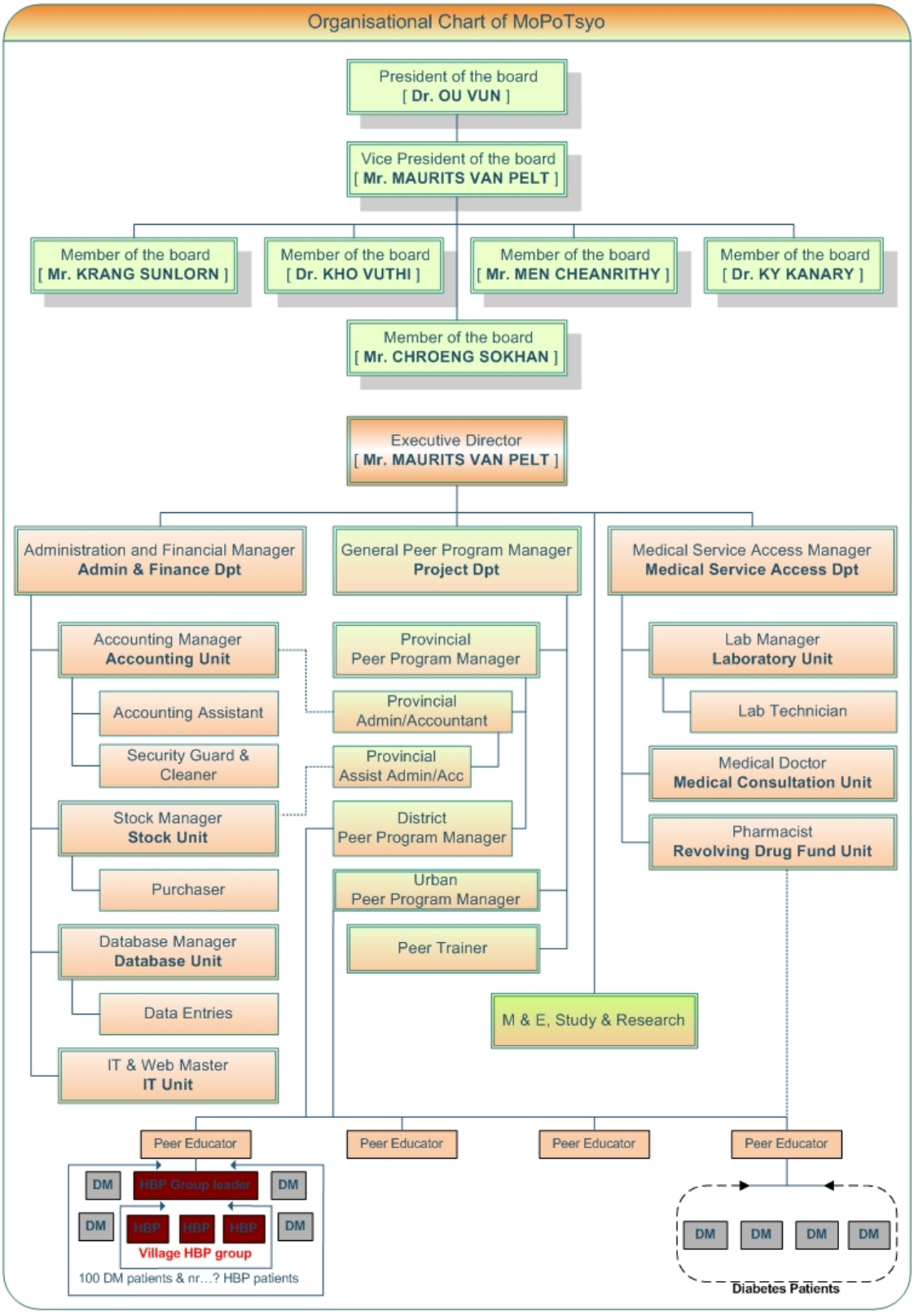
ii. Peer Education unit is the collective of services provided by 1 Peer Educator (PE) to all his/her patients (=new patients + old patients getting counseling, registration, training, materials for self-management plus peer educator's explanation on how to use it and encouragement individually and in groups) who are in their follow-up according to the database, getting check-up services from peer educator according to the peer educator training manual and reported in detail by PE invoice signed by PE and approved by the OD. It includes the maintenance (not set up) of the Village High Blood Pressure Groups. This excludes activities for the general population such as screening and primary prevention and it also excludes activities that are related to the organisation of the laboratory team work and the revolving drug fund monitoring;

iii. Treatment Diabetes unit is the combined total of 3 medical services (medical consultations, laboratory tests and routine prescribed medication, plus the related cost to organize the delivery of these services to the Diabetes patient **per registered Diabetic patient who has used medical service least 1 time during 2011.** It includes special tasks of peer educators who monitor the pharmacies and/or deliver medicines to pharmacies as part of the Revolving Drug Fund distribution and monitoring and revenue collection system. For the laboratory services it includes the special tasks carried out to organize blood draw sessions at local health centers at convenient times for the patients to give venous blood, spin it on location and separate serum from whole blood and put the collected samples in the rightly labelled tubes on ice and transport them to the central laboratory for testing and for creating the biochemistry lab profile, enter the results into database, print the results together with previous results of the patient so they can be compared and explain the results and the trend in results to the patient who has given blood so they are motivated to use the medical consultation service and the revolving drug fund service to treat their health problems.

iv. Treatment Hypertension unit is the combined total of 3 medical services (medical consultations, laboratory tests and routine prescribed medication, plus the related cost to organize the delivery of these services to the hypertension patient per registered Hypertension patient **who has used medical service at least 1 time during 2011.** It includes special tasks of peer educators who monitor the pharmacies and/or deliver medicines to pharmacies as part of the Revolving Drug Fund distribution and monitoring and revenue collection system. For the laboratory services it includes the special tasks carried out to organize blood draw sessions at local health centers at convenient times for the patients to give venous blood, spin it on location and separate serum from whole blood and put the collected samples in the rightly labelled tubes on ice and transport them to the central laboratory for testing and for creating the biochemistry lab profile, enter the results into database, print the results together with previous results of the patient so they can be compared and explain the results and the trend in results to the patient who has given blood so they are motivated to use the medical consultation service and the revolving drug fund service to treat their health problems.

ANNEX

Organisational Chart in 2011, including the Board



Laboratory test application form, with consent formula at the bottom

ផ្នែកសេវាវិភាគមន្ទីរពិសោធន៍មិនស្វែងរកប្រាក់ចំណេញ Not for profit laboratory service

ផ្នែកមន្ទីរពិសោធន៍ Laboratory Unit

លេខកូដសមាជិក Member ID			កាលបរិច្ឆេទ (Date) :………………/………………/………………
ឈ្មោះសមាជិក Member Name			លេខប័ណ្ណ voucher Nr
ភេទ Sex		អាយុ Age	លេខទូរស័ព្ទ Telephone

លរ	បរិយាយតេស្ត Description	ស្នើសុំ	បរិមាណ Unit	តំលៃ Price in Riels	ផ្សេងៗ
01	កូលេស្តេរ៉ុលសរុប (Total Cholesterol)	☐	1 តេស្ត	1,500 រៀល	
02	អេចឌីអែលកូលេស្តេរ៉ុល (HDL Cholestero	☐	1 តេស្ត	3,000 រៀល	
03	គ្រេអាទីនីន (Creatinine)	☐	តេស្ត+លទ្ធផល eGFR	2,000 រៀល	
04	ស្ករក្នុងឈាម មុនហូប (FBG)	☐	1 តេស្ត	1,000 រៀល	
05	ប៉ូតាស្យូម (Potassium)	☐	1 តេស្ត	4,000 រៀល	
06	ទ្រីគ្លីសេរីដ (Triglyceride)	☐	1 តេស្ត	2,500 រៀល	
07	ត្រង់សាមីណាស (Transaminase)	☐	2 តេស្ត(SGOT&SGPT)	4,000 រៀល	
08	ប្រូតេអ៊ីនក្នុងទឹកនោម (Proteinuria)	☐	1 ស៊ីក	500 រៀល	
09	តេស្តទឹកនោមលើដោយម៉ាស៊ីន (Urinalys	☐	1 ស៊ីស (មានលទ្ធផល4 តេស្តប្រូតេអ៊ីន គ្រេអាទីនីន អាល់ប៊ុយមីន និង Ratio A:C)	4000 រៀល	
លទ្ធផលប្រូតេអ៊ីនក្នុងទឹកនោម: ResultUrine Protein Test (crosses):			សរុបទាំងអស់ជារៀល total		

ផ្នែកមន្ទីរពិសោធន៍ជាផ្នែកមួយនៃសេវាវេជ្ជសាស្ត្រមិនស្វែងរកប្រាក់ចំណេញរបស់អង្គការ ម.ព.ជ ដើម្បីអោយមានលទ្ធផលពិសោធន៍ដែលមានគុណភាព ក្នុងតម្លៃសមរម្យសម្រាប់សមាជិក និងអោយសេវានេះមាននិរន្តរភាពដោយការប្រមូលចំណូលមកវិញ: The laboratory service is a not profit service organised by MoPoTsyo for the members to have good quality laboratory results for affordable prices so that the service can be sustained in the future through revenue generation .

សំគាល់៖ សូមសមាជិករក្សាទុកប័ណ្ណនេះ ដើម្បីយកលទ្ធផលតេស្តឈាម ក្នុងរយៈពេល4ថ្ងៃ បន្ទាប់ពីស្រង់ឈាម Please bring your proof of payment in order to collect your lab result within 4 days from blood collection	ហត្ថលេខាសមាជិកបង់ប្រាក់៖ thumb of Member	ហត្ថលេខាអ្នកទទួលប្រាក់៖ sign by receiver of the money	ហត្ថលេខាអ្នកបំពេញប័ណ្ណនេះ sign by the filler of this application
Designed by Medical Services Access Dept Form L01	ឈ្មោះ…………………………	ឈ្មោះ…………………………	ឈ្មោះ…………………………

ខ្ញុំយល់ព្រម / ប្រសិនបើយល់ព្រម I agree	លទ្ធផលតេស្តមន្ទីរពិសោធន៍របស់ខ្ញុំមានសារប្រយោជន៍សម្រាប់ការស្រាវជ្រាវ ដើម្បីបង្កើតភស្តុតាងសម្រាប់ពង្រឹងប្រព័ន្ធសុខាភិបាល ... The result of my lab tests has utility for research so evidence is generated to strengthen our care system so we can use this result and share with researcher who collaborates with MoPoTsyo but MoPoTsyo must guarantee that any information or data related to my identity (such as my name and address) is removed and the researcher cannot contact me directly . **តើអ្នកយល់ព្រមអោយអង្គការ ម.ព.ជ. ប្រើប្រាស់លទ្ធផលរបស់អ្នកទេ? Do you agree that MoPoTsyo uses your result ?**	ខ្ញុំមិនយល់ព្រម / ប្រសិនបើមិនយល់ព្រម I do not agree