# National coverage and health service utilization by Health Equity Fund members, 2004-2015

ADRA Research Report

# ACKNOWLEDGEMENTS

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## ACRONYMS AND ABBREVIATIONS

ADRA        Australian Development Research Award
AusAID      Australian Agency for International Development
CDHS        Cambodia Demographic and Health Survey
CPA         Complementary Package of Activities (referral hospitals)
CSES        Cambodia Socio-Economic Survey
DFAT        Department of Foreign Affairs and Trade (Australia)
DID         Difference-In-Difference
GAVI        The Global Alliance for Vaccines and Immunization
HC          Health Centre
HEF         Health Equity Fund
HMIS        Health Management Information System
HSS         Health System Strengthening
IPD         Inpatient Department
NGO         Non-Government Organization
NIPH        National Institute of Public Health
OPD         Outpatient Department
PH          Provincial Hospital
RH          Referral Hospital
Riel        Cambodian currency*
Subo        Government Subsidy scheme
URC         University Research Co., LLC (Cambodia)

\* Exchange rate 1 US Dollar = 4000 Cambodian Riels

រៀបរៀងដោយ

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# EXECUTIVE SUMMARY

## Introduction

The national Health Equity Fund (HEF) system is Cambodia's most significant social security scheme, covering the poorest one-fifth of the national population (three million out of 15 million).[1] During the last 15 years, the HEF system has been scaled up from an initial two health districts to national coverage of public health facilities, including every referral hospital (RH) and every health centre (HC).

The HEF system was designed to increase access to health services for the poor, initially only at RHs. While the introduction of user fees at public health facilities in 1996 provided important incentives and operating revenues at the facility level, it also created a barrier to access to health care for the poor. With donor partner support, the Cambodian Ministry of Health (MOH) adopted the HEF system to overcome this barrier by exempting the poor from user fees and directly reimbursing facilities for the cost of exemptions provided. The HEF system therefore acts also as a demand-side financing mechanism for public health facilities (while the health budget remains the main source of funding for these facilities).

HEF beneficiaries are identified either through the national Identification of Poor Households Program (IDPoor) carried out through the Ministry of Planning, which is a standardized process of identifying poor households or through post-identification, which is used at RHs to identify poor patients who have not been pre-identified. HEF beneficiaries now receive: all medical services available at RHs and HCs without user fees; transportation costs for attending RH care or delivery services at HCs; daily food allowances for caretakers of patients admitted to RHs; and a funeral benefit in case of death while receiving treatment at an RH.

The HEF system is described in Figure 1. It is co-funded by government taxation revenues and donor funding pooled nationally and is managed within each district by a local non-government organization (NGO) known as an HEF Operator. The HEF Operator reimburses facilities through cased-based payments. The HEF system is available only at public health facilities, use of which is limited; less than one in four (23.5%) of ill or injured people seek care first at a public facility (64% at a private practitioner and 13% using self-care, traditional healers or other providers).[2]

The scaling up of HEF coverage has been supported by a process of research and analysis of their effectiveness, although some gaps in the literature remain. A 2010 comprehensive literature review[3] suggested that the HEF provided access to services for the poor, raised utilization levels at government facilities, acted as a significant source of additional revenue for public health facilities and reduced (but did not eliminate) debt for health care. This latter finding is consistent with a more recent 2013 analysis of the Cambodia Socio-Economic Surveys, which found that the HEF reduced the amount (but not the incidence) of out-of-pocket expenditure on health by 35% on average with a larger effect for poorer households.[4] While these studies point to the HEF system's positive impact on reducing out-of-pocket expenditure and debt incurred by the poor, to date there has been no comprehensive national assessment of the impact of the HEF on its primary purpose – increased access to health services for the poor.

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[1] Total number of the eligible poor as identified by the IDPoor count, derived from the national HEF Operational Database membership database for the period May 2014 to April 2015.
[2] Cambodia Socio-Economic Survey 2014.
[3] Annear P. 2010. A comprehensive review of the literature on health equity funds in Cambodia 2001-2010 and annotated bibliography. Health Policy and Health Finance Knowledge Hub, Nossal Institute for Global Health. Melbourne.
[4] Flores G, Ir P, Men CR, O'Donnell O, van Doorslaer E. 2013. Financial protection of patients through compensation of providers: the impact of Health Equity Funds in Cambodia. Journal of Health Economics, 32:1180-1193.

## Methods

Our study aimed to assess the impact of the HEF system on utilisation of services at RHs and HCs nationally. We used measures of health service utilisation as the most accurate indicator of access to health care available in existing national data. We contend that if the poor are represented in utilisation numbers through the HEF in proportion to their share in the total population then the HEF is shown to have provided access to care for the poor.

We first made a brief analysis of HEF member characteristics and service utilization to understand more fully the beneficiary population. National utilization data were then analysed in two ways, as summarised in Figure 2:

1. Comparing HEF members and non-members at public health facilities where an HEF was operational;
2. Comparing utilization patterns at public health facilities with and without an HEF.

The second part of the analysis took advantage of the natural experiment that occurred as the HEF system was developing and HEFs had begun to operate in a large number of, but not all, districts.

Two sources of existing, routine data were used: the national HEF Operational Database of member utilization; and the national Health Management Information System (HMIS). Both were used for the first component of the analysis. For the second component, the HEF Operational Database was used to define the presence of an HEF and the HMIS was used to gather data on utilization, defined as visits to the inpatient department (IPD), visits to the outpatient department (OPD) and newborn deliveries at RHs, and as new OPD consultations and newborn deliveries at HCs.

The HMIS provided monthly data for analysis from January 2006 to December 2013, totaling 96 months. These data were available for the following facilities by December 2013:

- 62 out of a total of 79 RHs nationally, 73% of which (45 hospitals) had commenced an HEF scheme at some point during 2006-2013; and
- 1,081 out of 1,088 HCs that were operational by 2013, 40% of which (476 HCs) had commenced an HEF scheme at some point during 2006-2013.

These data provided the opportunity for a rigorous analysis using the difference-in-difference quantitative method. In bivariate analysis, a t-test was used to compare each outcome indicator in aggregate terms (across the whole eight years) and by year between facilities with and without an HEF.

Multivariate analyses were used to investigate HEF impact on utilization. The multivariate analyses controlled for changes in population size, as well as the impact of other interventions, including: vouchers for maternal and child health services; performance-based contracts between the MOH and public health facilities to improve staff performance and service delivery; and the Government's subsidy scheme (Subo) that reimburses public health facilities for the cost of user fee exemptions for the poor (but not other costs such as food, travel and accommodation). Further information on the models used is available in the full research report. The analysis excluded cases where data were missing.
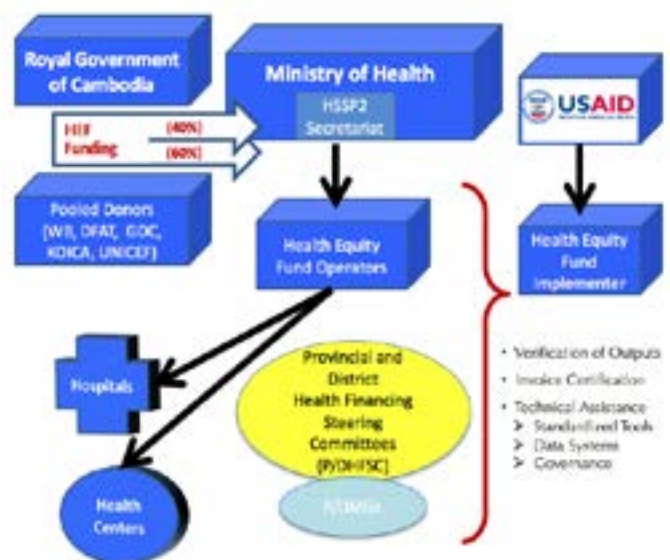


**Structure of the national HEF system c.2015**
Source: University Research Co., LLC

# RESULTS

## Population coverage

In line with population growth, both the number of ODs and HEF facility coverage nationally expanded over time. By April 2015, HEF coverage included 65 out of a total of 81 ODs nationally, scaled up to coverage of all 94 ODs operational by the end of 2015. During May 2014-April 2015, 3,229,044 individuals were identified nationally (across all 94 ODs) through the IDPoor survey as eligible poor (HEF members) and comprised the national cohort for receiving HEF benefits.

## Distance to facility

HEF patients travelled on average less than 10km to a health facility: 38% of all visits where by patients living within 1 km, 75% within 5 km and 98% within ten kilometers. Patients travelled furthest for hospital services: on average, patients travelled 20.7 km for RH inpatient services and 23.3 km for outpatient services. The most common distance travelled to a HC was only 1.6 km, for outpatient care at an RH 4.0 km, and for an inpatient visit 11.7km. The large majority of distances travelled were small, and consequently proximity to a facility may be seen as a decisive factor in raising utilization rates through the HEFs.

## HEF patient profile

On average, HEF patients visiting health facilities were 27 years old, with the outpatient population slightly older (32) and the HC population slightly younger (25). A large number of facility visits were for infants and children, suggesting that HCs are an important sight for maternal and child health care.

For inpatient admissions, the average length of stay was 6.6 days, and only 10% of stays were longer than 10 days. This compares to a national average of 4.9 days nationally for hospitals outside of Phnom Penh, suggesting that HEF benefits may encourage a longer stay in hospital.

The large majority of reported health facility visits (78%) were recorded simply as consultations. Even so, it appears that 12% of inpatient visits and 20% of outpatient visits at RH level were for newborn deliveries. Surprisingly, 8% of inpatient visits were recorded as pneumonia. Almost 10% of HC visits were for antenatal care or reproductive health.

## Health facility visits

Both the increased access to facilities by HEF members and rapid increase in the number of HCs covered by HEFs led to a steep rise in total

### Study Design
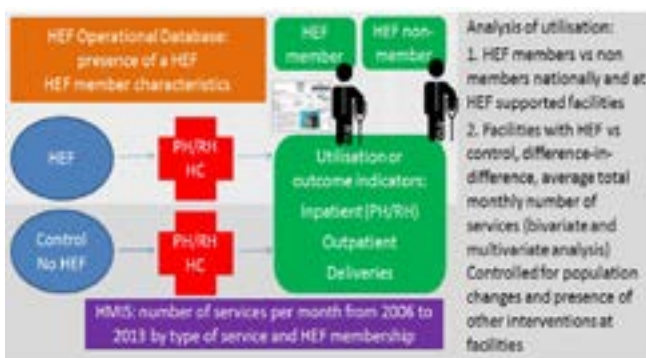


### Total HEF member visits by facility type and year, 2006-2013
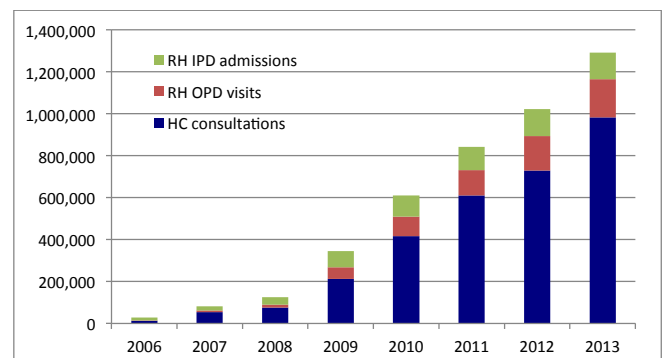
facility visits by HEF beneficiaries during 2006-2013. The total number of RHs covered by the HEF nationally increased from 21/77 to 45/79 during 2006-2013 while the number of HCs covered increased from 16/956 to 476/1,081. Of the total number of facility visits during 2006-2013, 63% occurred at HCs and the remainder was evenly split between RH IPD and OPD departments.

Our analysis showed that 118,406 beneficiaries or 4.6% of HEF members used RH inpatient services between May 2014 and April 2015 across the 45 sampled districts where HEFs operated, compared to 3.3% among the total population who utilized public health services across all 79 districts nationally. This reflected a higher contact rate for RH inpatient services for HEF members compared to the total population (0.14 vs 0.03).[5]

The same was not true for outpatient consultations at HCs; HEF members had a slighter lower contact rate than the total population (0.54 vs 0.66). The reason for this is not known but may potentially reflect the provision of HEF benefits at HCs only relatively recently compared to RHs.

**HEF-supported cases**
The results of the analysis of utilisation by HEF members at HEF-supported facilities are shown in the following table. More than 20% of all services measured at referral hospitals (RH) were supported by HEF, and at or close to 20% for services at HCs. We therefore conclude that HEF members (the poor) access services at hospitals at a greater proportion relative to their population size, and at approximately the same proportion at HCs.

The difference-in-difference analysis showed a significantly higher utilisation of inpatient, outpatient and newborn delivery services both at hospitals and HCs with an HEF compared to those without.  The multivariate analysis also showed that the effect of HEF on utilisation of newborn deliveries at all facility levels was greater when it was combined with voucher programs.

**HEF reimbursements**
The average HEF reimbursement for an IPD admission at an RH was 90,000 riels or approximately USD 22.50 (inclusive, at current exchange rates), while the average family income in Cambodia is little over USD 3 per day.  The average reimbursement for an OPD consultation at an RH was 15,000 riels or USD 3.75. The average reimbursement for an OPD consultation at an HC was 3,000 riels or approximately USD 0.75 (inclusive).

**Summary of findings**

| Service | Proportion of services supported by HEF at facilities with HEF (c.f. of means) | Mean monthly number of services at facilities with HEF vs without HEF (bivariate analysis) |
| --- | --- | --- |
| Hospital IPD | 64% | 468 vs 139 |
| Hospital OPD | 22% | 1,114 vs 259 |
| Hospital newborn deliveries | 31% | 73 vs 24 |
| HC new OPD | 13-20% | 641 vs 518 |
| HC newborn deliveries | 15-20% | 11.19 vs 9.96 |

# DISCUSSION AND CONCLUSION

Based on the results presented above, we found that the presence of an HEF had:

- A positive relationship with increased access to and utilisation of hospital IPD services by the poor, and was particularly strong at district RHs;
- A positive relationship with increased uptake of OPD services at hospitals by the poor;
- A positive relationship with increased utilisation by the poor of hospital newborn delivery services, which was particularly strong at district RHs;
- A positive relationship with an increased level of HC utilisation by the poor for routine consultations and newborn deliveries.

It is clear that proximity to a health facility is an important factor in RH and HC utilization for HEF members (particularly at the HC level). While HEFs have reduced the financial barrier to access to health services, it is the ongoing process of extending the number of HCs and RHs nationally that seems to have reduced the physical barrier to access. This perhaps indicates a virtuous relationship between demand-side and supply-side improvements. Wide variations in travel distance, however, indicate that the process of providing physical access is not yet complete.

The age distribution of HEF-patient visits to facilities – heavily concentrated in the 0-5 and the 25-35 age groups – suggests the possibility that HEF membership is of particular value to mothers and their children. However, the sex distribution of HEF patients was not recorded in the membership database and this conclusion therefore awaits further investigation.

The patient profile data are very useful in developing current strategies to improve the quality of care at RHs and HCs. The longer average length of stay (ALOS) enjoyed by HEF patients may indicate improved quality of care or may potentially reflect a 'perverse incentive"

to increase revenues by prolonging hospital stays, and this requires further investigation.

Internationally, a significant increase in utilization levels at government facilities has often accompanied the process of removing user fees. In Cambodia, the HEF model shows that providing funded exemption for the poor is a sustainable alternative that has the additional advantage of protecting health facility revenues.

A particular outcome of our study concerned the difficulties in using routine health systems' data for scientific research purposes. While the HMIS data revealed significant results in increased utilisation, the construction of the HEF members' database as a record of beneficiary health facility visits did not provide the structure necessary for broader analysis.

The data suggests that the role of the HEF is particularly significant in supporting IPD hospital costs for the poor, which are the major cause of catastrophic health expenditures, health-related impoverishment and health-related debt. HEF-supported inpatient cases at hospitals remained a high proportion (65%) of IPD visits despite the population of HEF members remaining relatively stable as the total catchment population increased (due to a general decline in the level of national poverty).

This provides strong evidence that the HEF system is effective in fulfilling its design function of removing financial barriers to access, providing access to health services and raising the level of utilization of government-subsidized health services (provided at public health facilities) by the poor. While causality between the presence of an HEF and increased hospital and health centre utilisation could not be demonstrated in this research, the findings are supportive of further consolidation of the HEF system and expansion of population coverage.

It is clear that proximity to a health facility is an important factor in RH and HC utilization for HEF members.

<h1 style="text-align:center">សេចក្ដីសង្ខេប</h1>

## សេចក្ដីផ្ដើម

កំរងមូលនិធិសមធម៌សុខាភិបាល (ម.ស.ស) ផ្ដល់ជាគំរូជាមួយនឹងសុខសង្គមដ៏សំខាន់បំផុតដែលគ្របដណ្ដប់ជនក្រីក្រនៅទូទាំងប្រទេសដែលមានទំនុកខ្វះខ្វាយកាត្រាប់នៃច្បាប់ជាតិជន កម្ពុជាទាំងអស់ ពោលគឺពលរដ្ឋ ក្នុងចំណោម១៩៥លាននាក់។[1] ក្នុងអំឡុងពេល១៥ឆ្នាំចុងក្រោយនេះ កំរង ម.ស.ស ត្រូវបានជ្រុតវិសាលភាពថាប់កាំងដ៏ប្លូប្អូវដែលមាននៅតែក្នុងស្រុកប្រតិបត្តិការហូតដល់គ្របដណ្ដប់ មូលដ្ឋានសុខាភិបាលរដ្ឋទូទាំងប្រទេស ដែលឆ្មបឧបព្ទញលនុត្រម្ភនីរកាទ្យ បង្កូកស្រុក ខេត្ត (ម.ប) និង មណ្ឌលសុខភាព (ម.ស)។

កំរង ម.ស.ស ត្រូវបានថនារឡ្ដីងដើម្បីបង្កើនលទ្ធភាពទទួលសេវាថែទាំសុខភាពសម្រាប់ជនក្រីក្រ ដែលដើមឡ្ដីយមានតែនៅតាម ម.ប ស្រុក និងខេត្ត ប៉ុណ្ណោះ។ ការចាប់ផ្ដើមអនុត្រសារាបង់ថ្លៃ (តម្រូវឱ្យប្រជាជនទូលបង់ថ្លៃនៅពេលគេទៅប្រើសេវា) នៅតាមមូលដ្ឋានសុខាភិបាលរដ្ឋនៅឆ្នាំ១៩៩៦ បានបង្កើតចំណុចរបស់មូលដ្ឋានសុខាភិបាលរដ្ឋឱ្យកត់សម្គាល់សម្រាប់ចំណាយប្រតិបត្តិការ និងលើកទឹកចិត្តបុគ្គលិក។ ទន្ទឹមនឹងនេះ សេវាបង់ថ្លៃបានបង្កើតជាឧបសគ្គចំពោះលទ្ធភាពទទួលសេវាថែទាំសុខភាពសម្រាប់ជនក្រីក្រផងដែរ។ ជាមួយនឹងការគាំទ្រពីដៃគូម្ចាស់ជំនួយ ក្រសួង សុខាភិបាលបានអនុម័ត�យកកំរង ម.ស.ស ដើម្បីជម្រះឧបសគ្គសម្រាប់ជនក្រីក្រក្នុងការទទួលសេវាថែទាំសុខភាព តាមរយៈបង់ថ្លៃសេវារបស់មូលដ្ឋានសុខាភិបាលរដ្ឋជំនួសជនក្រីក្រដែលទៅប្រើសេវា និង ជំនួសផ្ដល់ឡ្ដីងតាមការចាំបាច់។ ការបង់ថ្លៃសេវារបស់មូលដ្ឋានសុខាភិបាលរដ្ឋជំនួសជនក្រីក្រ បានផ្ដើឱ្យកំរង ម.ស.ស ដើរតួជាឧបករ ផ្ដល់ហិរញ្ញប្បទានតាមរយៈអ្នកប្រើប្រាស់សេវាមួយដ៏សំខាន់សម្រាប់មូលដ្ឋានសុខាភិបាលរដ្ឋ (ឧទ.រំដែលចរិកជាតិនៅតែជាប្រភេទចម្បងនៃការផ្ដល់មូលនិធិសម្រាប់មូលដ្ឋានសុខាភិបាលទាំងនេះ)។

បច្ចុប្បន្ននេះ ជនក្រីក្រដែលអាចទទួលជំនួយពីកំរង ម.ស.ស ត្រូវបានកំណត់អត្តសញ្ញាណដោយកម្មវិធីអត្តសញ្ញាណកម្មគ្រួសារក្រីក្ររបស់ក្រសួងផែនការ ដែលជាឧបករណ៍របងប្ញាឯ្លយនៃការកំណត់ អត្តសញ្ញាណក្រីក្រនៅកម្ពុជា ឬ ក៏សេវាយការកំណត់អត្តសញ្ញាណនៅពេលជនក្រីក្រទៅប្រើសេវានៅ ម.ប ពិសេសចំពោះអ្នកដ៏ក្រីក្រដែលពុំទាន់បានកំណត់សញ្ញាណដោយកម្មវិធីអត្តសញ្ញាណកម្មគ្រួសារ ក្រីក្ររបស់ក្រសួងផែនការ។ អ្នកដ៏ក្រីដែលបានកំណត់ថាជាជនក្រីក្រ ឬ សមាជិករបស់កំរង ម.ស.ស អាចទទួលបាននូវ៖

- គ្រប់សេវារដ្ឋសាស្ត្រដែលមាននៅ ម.ប និង ម.ស ដោយមិនបាច់បង់ថ្លៃ
- សោហ៊ុយបញ្ជូនដំណើរ (ទៅមក) សម្រាប់ទទួលការថែទ្យាបាលនៅ ម.ប ឬ សេវាសម្រាលកូននៅ ម.ស
- ប្រាក់ឧបត្ថម្ភអាហារប្រចាំថ្លៃសម្រាប់អ្នកថែទ្យាកដ៏ី់រសម្រាប់ឃ្យាបាលនៅ ម.ប និង
- ជំនួយក្នុងករណីទទួលមរណ:ភាព ដូចជាសោហ៊ុយបូជាសព ឬ ដីកសពត្រឡ្បទៅគេហដ្ឋានវិញជាដើម។

កំរង ម.ស.ស ត្រូវបានពិពណ៌នាក្នុងរបបាំព្រញ្ញទី១។ មូលនិធិសម្រាប់ដំណើរការកំរង ម.ស.ស នេះបានមកពីចំណូលពន្ធដាររបស់រាជរដ្ឋាភិបាល និង ហិរញ្ញប្បទានម្ចាស់ជំនួយបុគ្គលពញ្ញកគ្នាទូទាំង ប្រទេស។ កំរងនេះត្រូវបានគ្រប់គ្រងដំតាមស្រុកប្រតិបត្តិសុខាភិបាលនីមួយៗដោយអង្គការក្រៅរដ្ឋាភិបាលក្នុងស្រុកម្ចាស់ ដែលគេស្គាល់ជាជាប្រតិបត្តិករមូលនិធិសមធម៌។ ប្រតិបត្តិករមូលនិធិសមធម៌ ទូទាត់ប្រាក់បង់ថ្លៃសេវាសម្រាប់ជនក្រីក្រដល់មូលដ្ឋានសុខាភិបាលតាមផ្ទៃសាស្ត្រទាត់តាមការណ៍ៗ។ កំរង ម.ស.ស មាននៅតែតាមមូលដ្ឋានសុខាភិបាលរដ្ឋប៉ុណ្ណោះ ដែលការប្រើប្រាស់ សេវានៅមូលដ្ឋានសុខាភិបាលទាំងនេះដោយឃ្យាជាជនកម្ពុជានៅទានក្រីក្រនៅឡ្ដីយៗ មានតែអ្នកឈ្មី ឬ ងរប្បសិចជាងមួយភាគបួន (២៣.៥%) ស្វេចកការថែទ្ញ្យាបាលដ៏បុខនៅតាមមូលដ្ឋានសុខាភិបាលរដ្ឋ (៦៤% ទៅទ្យូងកជន និង ១៣% ព្យាបាលដោយខ្លួនឯង ទៅក្រុត្រព្យាបាលតាមក្បួបុរាណ ឬ អ្នកផ្ដល់សេវាផ្ដឡ្ដុ ្ងឡ្បៀត)។[2]

ការពន្ធីកការគ្របដណ្ដប់របស់កំរង ម.ស.ស ត្រូវបានគាំទ្រដោយដំណើរការស្រាវជ្រាវ និង វិភាគពីប្រសិទ្ធភាពរបស់កំរងនេះ ថ្មីក្នុងតែកតសុគុតាងដែលបានមកពីការស្រាវជ្រាវនិងវិភាគនៅ មានឧទ្ធោះប្រហាងខ្ទ្ធ ើ្លកដោយ។ ការពិនិត្យម៉ើលអង្កតួស្រាវជ្រាវទ្ធិទ្ទួលឃ្យយនៅឆ្នាំ២០១០[3] បានបង្ហាញថា កំរង ម.ស.ស បានជួយដល់ក្រីក្រឱ្យមានលទ្ធភាពទទួលសេវា បានលើកកម្ពស់កម្រិតប្រើប្រាស់ សេវានៅតាមមូលដ្ឋានសុខាភិបាលរដ្ឋ បានដើរតួភាគប្រភេទចំណូលបង់ផ្ដៀលដ៏សំខាន់មួយសម្រាប់មូលដ្ឋានសុខាភិបាលរដ្ឋ និង បានកាត់បន្ថយ (តែមិនទ្បលុប់បំបាត់) បំណុលសម្រាប់សេវាថែទាំសុខភាព។ ការសិក្សាមួយនៅឆ្នាំ២០១៣ ដែលវិភាគទៅលើទិន្នន័យ៍យ៍នៃការអង្កេតសេដ្ឋកិច្ចសង្គមកិច្ចនៅកម្ពុជា បានបង្ហាញឱ្យឃ្ញើញថា កំរង ម.ស.ស បានកាត់បន្ថយយរិមាណនៃការចំណាយប្រាក់ចេញពីហោប៉ៅទៅលើសុខភាព បានជាមធ្យម ៣៥% ដោយបរិមាណនៃការកាត់បន្ថយនេះមានកំរិតកាន់បញ្ចស់ចំពោះគ្រួសារក្រីក្រ (តែកំរងនេះមិនទ្បំបានកាត់បន្ថយចំន្ធនុលរណៃចំណាយកាត់ចេញពីហោប៉ៅទៅលើសុខភាពទេ)។[4] ថ្មីក្នុងតែការសិក្សា ទាំងនេះចងុលបង្ហាញពីដែលបៈពេលជារដ្ឋមាននៃតំនៃ កំរង ម.ស.ស ក្នុងការកាត់បន្ថយការចំណាយចេញពីហោប៉ៅដោយប្រជាជនកម្ពុជា ពិសេសជនក្រីក្រ មកទល់មានននេះ នៅពុំទាន់មានការអាយតម្លៃផ្ដាច់ជាជាលក្ខណៈ ទ្ធុ់ទ្ញាយស្ដ៍ពីពន្ធិផលរបស់កំរង ម.ស.ស ទៅលើគោលបំណងចម្ បួរបស់មូលនិធិនេះទេ ពោលគឺបង្កើនលទ្ធភាពទទួលសេវាថែទាំសុខភាពសម្រាប់ជនក្រីក្រ។

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[1] ចំន្ទ្នសរុបនៃជនក្រីក្រនៅសិ៍ទ្ធិ៍ទ្ទួលជំនួយពីកំរងមូលនិធិសមធម៌ដូចថានកំណត់អត្តសញ្ញាណរបស់កម្មវិធីអត្តសញ្ញាណកម្មគ្រួសារក្រីក្ររបស់ក្រសួងផែនការ បានមកពីទិន្នន័យសមាជិកនៃនៃជំនួយប្រតិបត្តិការរបស់កំរង ម.ស.ស ថ្លាក់ជាតិសម្រាប់រយៈពេលពីខែមករា ឆ្នាំ២០១៤ ដល់ខែមេសា ឆ្នាំ២០១៥

[2] ការអង្កេតសេដ្ឋកិច្ចសង្គមកិច្ចនៅកម្ពុជាឆ្នាំ២០១៤

[3] Annear P. 2010. ការពិនិត្យម៉ើលឡ្ធ្លុ់ល្ណៃនៃអង្កតួស្រាវជ្រាវមូលនិធិសមធម៌សុខាភិបាលនៅកម្ពុជាឆ្នាំ២០០៩-២០១០ និង គុន្ធនិទ្ធ៍នៃមួលមានវិនាមវរស្ដុ់រ៍ បណ្ដុំចំណោះដីងនៃគោលនយោបាយសុខាភិបាល និងហិរញ្ញប្បទានសុខាភិបាល នៃវិទ្ញ្យាស្ថាន Nossal សម្រាប់សុខភាពពិភពលោក Melbourne

[4] Flores G, Ir P, Men CR, O'Donnell O, van Doorslaer E. ២០១៣។ ការពារហិរញ្ញប្បត្តុអ្នកជំងឺតាមរយ:ការទូទាត់សងអង្កាយលំសរា។ ផលប៉ះពាល់នៃមូលនិធិសមធម៌សុខាភិបាលនៅកម្ពុជា។ ទស្សនាវដ្ដីវិទ្យាស្រោស្ត្រស្ដី់ពីសេដ្ឋកិច្ចសុខាភិបាល 32:1180-1193។

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**រូបភាពបង្ហាញទី១៖ របៀបរៀបចំរចនាសម្ព័ន្ធនៃគំនាង ម.ស.ស ថ្នាក់ជាតិ ឆ្នាំ២០១៥**
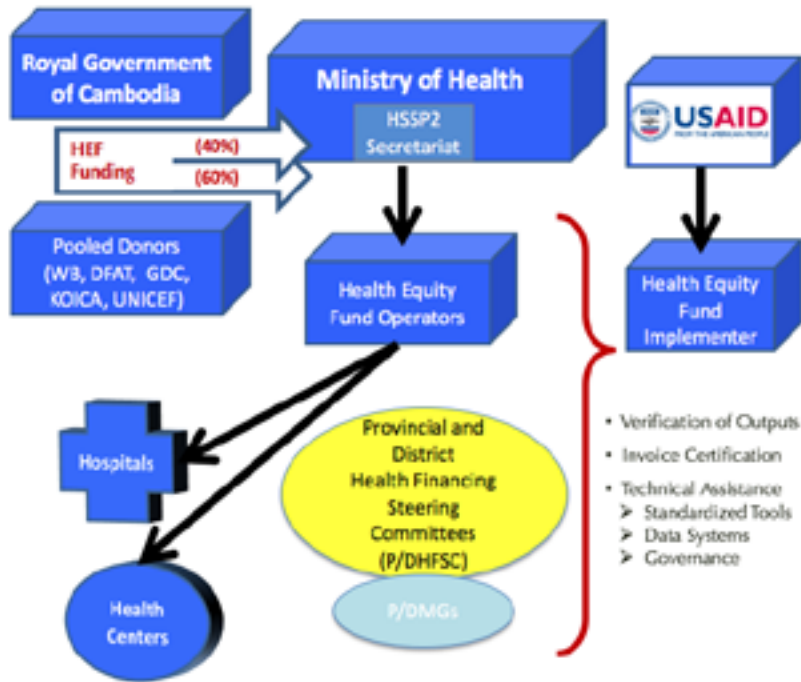


ប្រភព៖ អង្គការ University Research Co., LLC

## វិធីសាស្ត្រ

ការសិក្សានេះមានគោលបំណងវាយតម្លៃផលប៉ះពាល់របស់គំនាង ម.ស.ស ទៅលើការប្រើប្រាស់សេវាថែទាំសុខភាពនៅ�នីពេទ្យបង្អែក (ម.ប) និងមណ្ឌលសុខភាព (ម.ស)ទូទាំងប្រទេស។ យើង
បានប្រើប្រាស់ទ្រង់ទ្រាយនៃការប្រើប្រាស់សេវាថែទាំសុខភាពជាសូចនាករជាមូលដ្ឋាននៃទ្រង់ទ្រាយរួមនៃសេវាថែទាំសុខភាពក្នុងទិន្នន័យជាតិដែលមានឡើយ។ យើងអះអាងថា ប្រសិនបើជនបើក្រីក្រក្នុងចំណោមអ្នកប្រើប្រាស់
សេវាតាមរយ:គំនាងម.ស.ស មានចំនួនសមាមាត្រទៅនឹងចំនួនរបស់ខ្លួនផ្ទៀងនឹងជាជនសរុប នោះមានន័យថា ម.ស.ស បានជួយជនក្រីក្រឱ្យមានលទ្ធភាពទទួលសេវាថែទាំល្អគ្រប់គ្រាន់។

ដូច្នេះ យើងបានធ្វើការវិភាគសង្ខេបមួយទៅលើគុណ:សម្បត្តិសមាជិកគំនាង ម.ស.ស និង ការប្រើប្រាស់សេវាថែទាំសុខភាព ដើម្បីឱ្យដឹងបានកាន់តែពេញលេញពីប្រជាជនដែលបានទទួលជំនួយពីគំនាងនេះ។ បន្ទាប់មក ទិន្នន័យប្រើប្រាស់សេវាទូទាំងប្រទេសត្រូវបានវិភាគក្នុងឆ្នាំផ្សេងៗពីរ ដូចមានសង្ខេបជូនក្នុងរូបភាពទី២៖

១. របៀបផ្ទៀងសមាជិក ម.ស.ស និង អ្នកមិនមែនសមាជិកក្នុងចំណោមអ្នកប្រើប្រាស់សេវា នៅមូលដ្ឋានសុខាភិបាលរដ្ឋដែលមានគំនាង ម.ស.ស កំពុងដំណើរការ

២. របៀបផ្ទៀងលំនាំនៃការប្រើប្រាស់សេវានៅមូលដ្ឋានសុខាភិបាលរដ្ឋដែលមាន និង គ្មាន ម.ស.ស។

ផ្អែកទីពីរនៃការវិភាគបានពេញ្ញាយកគុណប្រយោជន៍នៃការពិសោធន៍លក្ខណ:ធម្មជាតិដែលបានកើតឡើង នៅពេលគំនាង ម.ស.ស កំពុងត្រូវបានអភិវឌ្ឍ ហើយ ម.ស.ស បានចាប់ផ្ដើមប្រតិបត្តិ
ក្នុងស្រុកប្រតិបត្តិជាច្រើន តែពុំមែនទាំងអស់នោះទេ។

ប្រភពពីរនៃទិន្នន័យមានស្រាប់ និង ដែលបានប្រមូលជាប្រចាំត្រូវបានយកមកប្រើ។ ទិន្នន័យប្រតិបត្តិការរបស់គំនាង ម.ស.ស នៃការប្រើប្រាស់សេវារបស់សមាជិកថ្នាក់ជាតិ និង ប្រព័ន្ធព័ត៌មានគ្រប់គ្រង
សុខាភិបាលថ្នាក់ជាតិ។ ប្រភពទាំងពីរត្រូវបានប្រើសម្រាប់សមាសភាគទីមួយនៃការវិភាគ។ ចំពោះសមាសភាគទីពីរ ទិន្នន័យប្រតិបត្តិការរបស់គំនាងម.ស.ស ត្រូវបានប្រើសម្រាប់កំណត់ក្លុមានៃ ម.ស.ស និង
ទិន្នន័យប្រព័ន្ធព័ត៌មានគ្រប់គ្រងសុខាភិបាលថ្នាក់ជាតិត្រូវបានប្រើសម្រាប់ប្រមូលផ្ដុំទិន្នន័យនៃការប្រើប្រាស់សេវា ដែលត្រូវបានកំណត់ជាចំនួនឯងទៅសម្រាប់កប្បាល ទៅពិរដ្ឋាជ័ឌី និង សម្រាប់កូន
នៅisនីពេទ្យបង្អែក (ម.ប) ស្រុក និងខេត្ត ព្រមទាំងជាចំនួនឯងទៅពិរ្ធាជ័ឌីករណីថ្មី និង សម្រាប់កូននៅមណ្ឌលសុខភាព (ម.ស)។

ប្រព័ន្ធព័ត៌មានគ្រប់គ្រងសុខាភិបាលបានដល់ទិន្នន័យប្រចាំខែសម្រាប់ការវិភាគពីខែមករា ឆ្នាំ២០០៦ ដល់ខែធ្នូ ឆ្នាំ២០១៣ ដែលសរុបមាន ៩៦ ខែ។ គិតត្រឹមខែធ្នូ ឆ្នាំ២០១៣ ទិន្នន័យទាំង
មាននៅតាមមូលដ្ឋានសុខាភិបាលនានាដូចតទៅ៖

- ម.ប ស្រុក និងខេត្តចំនួន ៦២ ក្នុងចំណោមចំនួនសរុប ៧៨ នៅទូទាំងប្រទេស ដែលក្នុងនោះ ៧៣% (មន្ទីរពេទ្យ ៤៥) បានចាប់ផ្ដើមកម្មវិធ ម.ស.ស មួយនៅពេលណាមួយក្នុងអំឡុងឆ្នាំ ២០០៦-
  ២០១៣ និង

- ម.ស ចំនួន ១.០៨៧ ក្នុងចំណោម ១.០៨៨ ដែលមានដំណើរការមកទល់ឆ្នាំ២០១៣ ដោយក្នុងនោះ ៤០% (៤៧៦ ម.ស) បានចាប់ផ្ដើមកម្មវិធ ម.ស.ស មួយនៅពេលណាមួយក្នុងអំឡុងឆ្នាំ
  ២០០៦-២០១៣។

ទិន្នន័យទាំងនេះបានផ្តល់ឱកាសសម្រាប់ការវិភាគដ៏ហ្មត់ចត់មួយដោយប្រើវិធីសាស្ត្រវិភាគបែបបរិមាណ Difference-in-difference។ ក្នុងការវិភាគទទេផេរ t-test ត្រូវបានប្រើសម្រាប់ ប្រៀបធៀបស្ទូនាករលទ្ធផលទិន្នន័យរជាទិដ្ឋភាពរួម (ក្នុងពេលប្រាំបីឆ្នាំទាំងមូល) និង តាមឆ្នាំនីមួយៗរវាងមូលដ្ឋានសុខាភិបាលដែលមាន និង គ្មាន ម.ស.ស។

ការវិភាគពហុផេរត្រូវបានប្រើសម្រាប់អង្កេតមើលផលប៉ះពាល់នៃតំណាង ម.ស.ស ទៅលើការប្រើប្រាស់សេវា។ ការវិភាគពហុផេរបានគ្រប់គ្រងចំពោះបម្រែបម្រួលនៃចំនួនប្រជាជន ក៏ដូចជាទិដ្ឋលនៃ អន្តរគមន៍ផ្សេងទៀត ដែលមួយមាន៖ គំរោងបណ្ណសុខភាពសម្រាប់សេវាសុខភាពមាតានិងកុមារ គំរោងកិច្ចសន្យាផ្អែកតាមលទ្ធផលការងាររវាងក្រសួងសុខាភិបាលនិងមូលដ្ឋានសុខាភិបាលរដ្ឋ និង គម្រោង ឧបត្ថកគនរបស់រាជរដ្ឋាភិបាលដែលទ្រទ្រង់តំណមូលដ្ឋានសុខាភិបាលលើថ្លៃសេវាដែលបានលើកលែងបង់ថ្លៃចំពោះជនក្រីក្រ (តែពុំគ្រុបបណ្ណាប់លើថ្លៃចំណាយផ្សេងទៀតដូចជាមួយអាហារ ការធ្វើដំណើរ និងស្នាក់នៅទេ)។ ព័ត៌មានបន្ថែមស្តីពីរបៀប (ម៉ូដែល) នៃការវិភាគអាចរកបានក្នុងបាយការណ៍ស្រាវជ្រាវទាំងមូល។ ការវិភាគនេះមិនរាប់បញ្ចូលករណីដែលទិន្នន័យខ្វះនោះទេ។

### រូបភាពទី២៖ ប្លង់គម្រោងសិក្សា
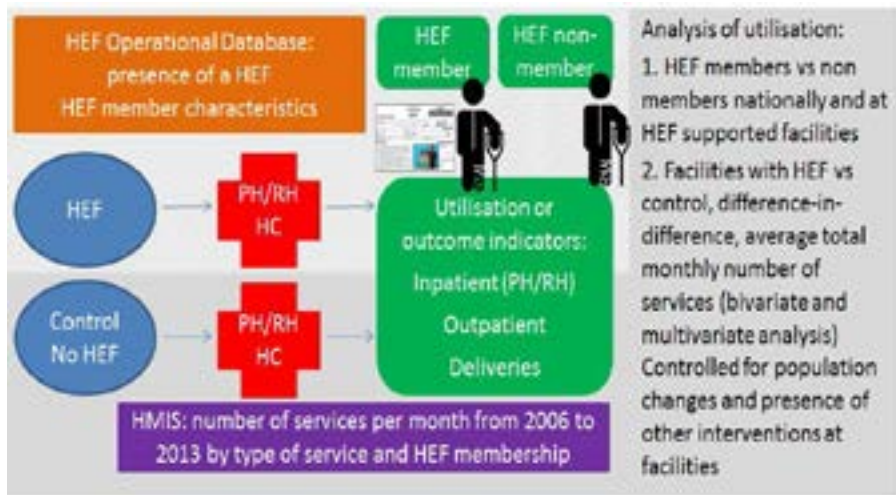


### លទ្ធផល

#### ចំនួនប្រជាជនគ្របដណ្ដប់

ស្របជាមួយនឹងកំណើនប្រជាជន ទាំងចំនួនស្រុកប្រតិបត្តិ ទាំងចំនួនមូលដ្ឋានសុខាភិបាលដែលគ្របដណ្ដប់ដោយតំណាង ម.ស.ស នៅទូទាំងប្រទេសត្រូវបានបង្កើនជាបន្តបន្ទាប់។ គិតត្រឹមខែមេសា ឆ្នាំ២០១៥ តំណាង ម.ស.ស បានគ្របដណ្ដប់លើស្រុកប្រតិបត្តិចំនួន៤៧ក្នុងចំណោមចំនួនសរុប៨១នៅទូទាំងប្រទេស ហើយបានទៅគ្របដណ្ដប់គ្រប់ស្រុកប្រតិបត្តិទាំងអស់ចំនួន៩៤ឆ្លាលនៅដំណើរការមកទល់ចុង ឆ្នាំ២០១៥។ ក្នុងអំឡុងពេលពីខែឧសភា ឆ្នាំ២០១៤ ដល់ខែមេសា ឆ្នាំ ២០១៥ ប្រជាជនកម្ពុជាចំនួន ៣.២៩៤.០៤៤ នាក់ត្រូវបានកំណត់អត្តសញ្ញាណនៅទូទាំងប្រទេស (នៅក្នុងស្រុកប្រតិបត្តិទាំង៩៤) ដោយកម្មវិធី អត្តសញ្ញាណកម្មគ្រួសារក្រីក្ររបស់ក្រសួងផងការ ចាជាជនក្រីក្រពិតប្រាកដ៍ដែលមានសិទ្ធិទទួលជំនួយពីតំណាង ម.ស.ស។

#### ចម្ងាយទៅកាន់មូលដ្ឋានសុខាភិបាល

អ្នកជំងឺរបស់ ម.ស.ស បានធ្វើដំណើរជាមធ្យមតិចជាង ១០គម ទៅកាន់មូលដ្ឋានសុខាភិបាល ក្នុងចំណោមករណីទៅពិនិត្យព្យាបាលទាំងអស់ មានៈ៣៨%គឺជាអ្នកជំងឺដែលរស់នៅក្នុងរយៈចម្ងាយ១គម ៧៥%ក្នុងរយៈចម្ងាយ៥គម និង ៩៨%ក្នុងរយៈចម្ងាយ១០គម។ អ្នកជំងឺបានធ្វើដំណើរឆ្លាយបំផុតសម្រាប់ទទួលសេវាថែទាំព្យាបាលទៅតាមផ្នែកទៅៗ ជាមធ្យម អ្នកជំងឺបានធ្វើដំណើរ ២០.៧៩គម សម្រាប់សេវា សម្រាកពេទ្យ និង ៣៣.៣៧គម សម្រាប់សេវាពិគ្រោះជំងឺក្រៅ។ រយៈចម្ងាយទៅបំផុតក្នុងការធ្វើដំណើរទៅ ម.ស គឺត្រឹមតែ ១.៦គម ប៉ុណ្ណោះ។ ចំណែករយៈចម្ងាយទៅបំផុតក្នុងការធ្វើដំណើរ ទៅពិគ្រោះព្យាបាលនៅ ម.ប គឺ ៤គម និង ១១.៧គម សម្រាប់ការទៅសម្រាកពេទ្យបាល។ រយៈចម្ងាយធ្វើដំណើរភាគច្រើនគឺខ្លី ដោយហាតុនេះហើយ ការទៅដំរមូលដ្ឋានសុខាភិបាលអាចត្រូវបានចាត់ទុកជាកត្តា កំណត់មួយក្នុងការលើកកម្ពស់អត្រាប្រើប្រាស់សេវាតាមរយៈ ម.ស.ស។

#### កម្រងព័ត៌មានអ្នកជំងឺ ម.ស.ស

ជាមធ្យម អ្នកជំងឺ ម.ស.ស ដែលទៅទទួលសេវានៅមូលដ្ឋានសុខាភិបាលមានអាយុ ២៧ឆ្នាំ ដែលក្នុងនោះ អ្នកទៅពិគ្រោះជំងឺក្រៅមានវ័យចាស់ជាងបន្តិច (៣២ឆ្នាំ) និង អ្នកទៅ ទទួលសេវានៅនៅ ម.ស មានវ័យក្មេងជាងបន្តិច (២៥ឆ្នាំ)។ មតិថិជនដែលទៅកាន់ ម.ស ភាគច្រើនគឺទៅរកសេវាសម្រាប់ទារក និង កុមារ ដែលនេះអាចបញ្ជាក់បានថា ម.ស គឺជាទីសំខាន់មួយសម្រាប់សេវាថែទាំ សុខភាពមាតា និង កុមារ។

សម្រាប់ការចូលសម្រាកពេទ្យបាលនៅ ម.ប រយៈពេលសម្រាកពេទ្យបាលជាមធ្យម គឺ ៦.៦ថ្ងៃ ហើយមានតែ៧% ប៉ុណ្ណោះដែលស្នាក់នៅឫយូរជាង១០ថ្ងៃ បើប្រៀបធៀប នឹងរយៈពេលសម្រាកពេទ្យបាលជាមធ្យមផ្អាក់ជាតិ (៤.៦ថ្ងៃ) នៅទូទាំងប្រទេសសម្រាប់មន្ទីរពេទ្យនៅក្រុងភ្នំពេញ លទ្ធផលនេះអាចបញ្ជាក់ថា ជំងឺរបស់តំណាង ម.ស.ស អាចលើកទីកចិត្តឱ្យមានការសម្រាកកាន់តែ យូរនៅមន្ទីរពេទ្យ។

ការទៅទទួលសេវានៅមូលដ្ឋានសុខាភិបាលដែលលាធនាយការណ៍ភាគច្រើន (៧៨%) ត្រូវបានកត់ត្រាដោយគ្រាប់តែដាក់ជាការពិគ្រោះជំងឺប៉ុណ្ណោះ។ តែទោះជាយ៉ាងនេះក្ដី រាមលទៅដូចជាការទៅ សម្រាកពេទ្យបាល 12% និង ការពិគ្រោះជំងឺក្រៅ 20% នៅកម្រិត ម.ប គឺសម្រាប់ការសម្រាលកូន។ ជារៀងរាល់ខ្ញុំមាស់ឡើង ករណីសម្រាកពេទ្យបាល 8% ត្រូវបានកត់ត្រាដាក់ជាករណីជំងឺលាកសូត្រ។ ការទៅ ទទួលសេវានៅ ម.ស ជិត១០% គឺសម្រាប់សេវាពិនិត្យព្យាបាលធ្មេញសម្រាល ឫ សេវាសុខភាពបន្តពូជ។

ទាំងការកើនឡើងនូវលទ្ធភាពទទួលសេវានៅមូលដ្ឋានសុខាភិបាលដោយសមាជិក ម.ស.ស ទាំងកំណើននៃហិរញ្ញវត្ថុចំនួន ម.ស.ស ដែលគ្រប់គ្រងដោយ ម.ស.ស បាននាំឱ្យមានកំណើនយ៉ាងគំហុកមួយ នូវចំនួនសរុបនៃករណីប្រើប្រាស់សេវាក្រោមការរដ្ឋាយបច្ចុប្បន្នពីតំរាង ម.ស.ស ក្នុងអំឡុងឆ្នាំ ២០០៦-២០១៣។ ចំនួន ម.ប សរុបដែលគ្រប់គ្រងដោយ ម.ស.ស នៅទូទាំងប្រទេសបានកើនឡើងពី ២១/៧៧៧ ដល់ ៥៥/៧៣៨ ក្នុងអំឡុងឆ្នាំ ២០០៦-២០១៣ ខណៈពេលដែលចំនួន ម.ស ដែលគ្រប់គ្រងដោយ ម.ស.ស បានកើនឡើងពី ១៦/៥៥៦ ដល់ ៥៧៦/១.០៨១។ ក្នុងចំណោមចំនួនសរុបនៃករណីប្រើប្រាស់សេវាអំឡុងឆ្នាំ ២០០៦-២០១៣ មាន១៦៣%ជាករណីនៅ ម.ស និង ចំនួននៅសល់បង្ហាញចេញស្មើគ្នារវាងករណីសម្រាកពេទ្យ និង ករណីពិគ្រោះជំងឺក្រៅនៅ ម.ប។

**រូបភាពបង្ហាញទី៣៖ ករណីប្រើប្រាស់សេវារបស់សមាជិក ម.ស.ស សរុបតាមប្រភេទមូលដ្ឋានសុខាភិបាល និង តាមឆ្នាំ ចាប់ពីឆ្នាំ ២០០៦ ដល់ ២០១៣**
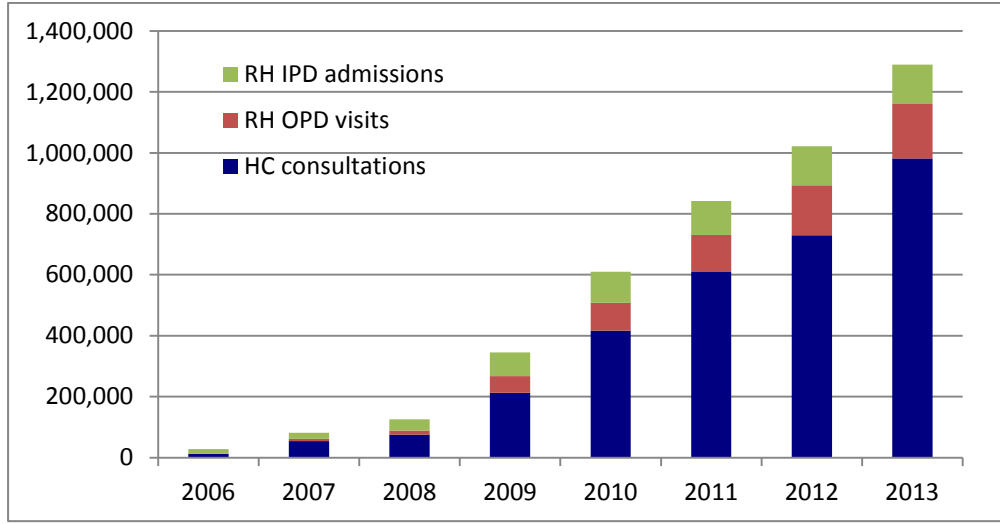


ការវិភាគរបស់យើងបានបង្ហាញថា មានសមាជិក ម.ស.ស ចំនួន ១១៩.៤០៦ នាក់ ឬ ៤,៦% នៃសមាជិក ម.ស.ស ទាំងអស់ បានសម្រាកព្យាបាលនៅ ម.ប នៅចន្លោះខែមករា ឆ្នាំ២០១៤ និង ខែមេសា ឆ្នាំ២០១៤ នៅក្នុងស្រុកប្រតិបត្តិសំណាកគំរូចំនួន៤៥ ដែលមាន ម.ស.សកំពុងប្រតិបត្តិការ ផ្សេងទៀង ៣,៣៣% ក្នុងចំណោមប្រជាជនសរុបដែលបានប្រើសេវានៅមូលដ្ឋានសុខាភិបាលរដ្ឋក្នុងស្រុកប្រតិបត្តិ ទាំង៧នៅទូទាំងប្រទេស។ តួលេខនេះបានឆ្លុះបញ្ចាំងពីអគ្រាប្រើប្រាស់រាងខ្ពស់មួយសម្រាប់សេវាសម្រាកពេទ្យក្នុងចំណោមសមាជិក ម.ស.ស បើប្រៀបធៀបនឹងអគ្រាសម្រាកពេទ្យក្នុងចំណោមប្រជាជនទាំងអស់ (០,១៤ ទល់ ០,០៣)។[5]

ចំពោះករណីពិគ្រោះជំងឺក្រៅនៅ ម.ស វិញគឺមិនដូចគ្នាទេ។ អគ្រាប្រើប្រាស់ក្នុងចំណោមសមាជិក ម.ស.ស មានកម្រិតទាបបន្តិច បើប្រៀបធៀបនឹងអគ្រាប្រើប្រាស់ក្នុងចំណោមប្រជាជនទាំងអស់ (០,៥៥ ទល់ ០,៦៦)។ មិនមានទម្ងួលហាតុពន្យល់ពីលទ្ធផលនេះច្បាស់លាស់ទេ តែគាអាចផ្សេបញ្ចាំងពីការផ្ដល់ជំនួយរបស់ ម.ស.ស នៅ ម.ស ដែលទើបមានថ្មីៗ បើប្រៀបនឹង ម.ប។

**ករណីរ៉ែដែល ម.ស.ស បានជួយ**

លទ្ធផលនៃការវិភាគទៅលើការប្រើប្រាស់ដោយសមាជិក ម.ស.ស នៅមូលដ្ឋានសុខាភិបាលដែលមាន ម.ស.ស គាំទ្រមានបង្ហាញក្នុងតារាងខាងក្រោម។ ជាង ២០% នៃសេវាកម្មទាំងអស់ដែល រាល់ផ្ងែនៅ ម.ប (ស្រុក និង ខេត្ត) គ្រូវរាជួយដោយ ម.ស.ស។ នៅ ម.ស អគ្រាជំនួយរបស់ ម.ស.ស ស្ថិតប្រជិតស្មើ ២០%។ ហេតុដូច្នេះ យើងសន្និដ្ឋានថា សមាជិក ម.ស.ស (ជនក្រីក្រ) ប្រើប្រាស់សេវា ថែទាំសុខភាពនៅ ម.ប រាងច្រើនបើប្រៀបនឹងសមាមាត្ររបស់ពួកគេក្នុងចំណោមប្រជាជនទាំងអស់។ តែតួលេខនេះប្រហាក់ប្រហែលគ្នានៅ ម.ស។

ការវិភាគរបៀប Difference-in-difference បានបង្ហាញថា អគ្រាប្រើប្រាស់សេវាសម្រាកពេទ្យសេវាពិគ្រោះជំងឺក្រៅ និង សេវាសម្រាលកូននៅ ម.ប និង ម.ស ដែលមាន ម.ស.ស គឺខ្ពស់ជាងអគ្រាប្រើប្រាស់នៅមូលដ្ឋានសុខាភិបាលដែលគ្មាន ម.ស.ស។ ការវិភាគតាមបុគ្គលកើតបានបង្ហាញផងដែរថា ផលប៉ះពាល់នៃ ម.ស.ស ទៅលើការប្រើប្រាស់សេវាសម្រាលកូននៅមូលដ្ឋានសុខាភិបាលគ្រប់កម្រិត គឺមានកម្រិតកាន់តែខ្ពស់ជាង នៅពេលដែលមានគំរោងបណ្ណសុខភាព Vouchers។

**សេចក្តីសង្ខេបនៃរបកគំហើញ**

| សេវា | សមាមាត្រនៃករណីរ៉ែដែលជួយដោយ ម.ស.ស នៅមូលដ្ឋានសុខាភិបាលមាន ម.ស.ស (c.f. ខែមធ្យមភាគ) | ចំនួនករណីប្រចាំរ៉ែជាមធ្យមនៅមូលដ្ឋានសុខាភិបាលមាន ម.ស.ស ធៀបនឹងគ្មាន ម.ស.ស (ការវិភាគទូអារ៉ែ) |
|---|---|---|
| ករណីសម្រាកពេទ្យ | ៦៤% | ៥៦៨ ទល់ ១៣៣៩ |
| ករណីពិគ្រោះជំងឺក្រៅនៅ ម.ប | ២២% | ១.១១៤ ទល់ ២៥៩ |
| ករណីសម្រាលកូននៅ ម.ប | ៣១% | ៧៣ ទល់ ២៥ |
| ករណីពិគ្រោះជំងឺក្រៅថ្មីនៅ ម.ស | ១៣-២០% | ៦៤១ ទល់ ៥១៩ |
| ករណីសម្រាលកូននៅ ម.ស | ១៥-២០% | ១១,១៩ ទល់ ៩,៩៦ |

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[5] ដោយសារ ម.ស.ស មានរ៉ែនៅឆ្នែរពេទ្យជាតិមួយ (ខ័ណ្ឌស្បៀត) ប្រជាជននៃក្រុងភ្នំពេញ រួមជាមួយករណីសម្រាកពេទ្យ និង ករណីពិគ្រោះជំងឺក្រៅនៅឆ្នែរពេទ្យជាតិ មិនត្រូវបានរាប់បញ្ចូលសម្រាប់ការវិភាគប្រៀបធៀបទេ។

**ការទូទាត់សងរបស់ ម.ស.ស**

ការទូទាត់សងរបស់ ម.ស.ស សម្រាប់ករណីសម្រាកពេទ្យ ជាមធ្យមមានតម្លៃ ៩០.០០០ រៀល ឬ ប្រហែល ២២,៥០ ដុល្លារអាមេរិក (គិតតាមអត្រាប្តូរប្រាក់បច្ចុប្បន្ន) ខណៈដែលចំណូលគ្រួសារជា មធ្យមក្នុងមួយថ្ងៃនៅកម្ពុជាគឺលើស ៣ ដុល្លារអាមេរិកបន្តិចបន្តួចប៉ុណ្ណោះ។ ការទូទាត់សងសម្រាប់ករណីពិគ្រោះជំងឺក្រៅនៅ ម.ប ជាមធ្យមមានតម្លៃ ១៥.០០០ រៀល ឬ ៣,៧៥ ដុល្លារអាមេរិក។ ការទូទាត់សង សម្រាប់ករណីពិគ្រោះជំងឺក្រៅនៅ ម.ស ជាមធ្យមមានតម្លៃ ៣.០០០ រៀល ឬ ប្រហែល ០,៧៥ ដុល្លារអាមេរិក។

## ការពិភាក្សា និងសេចក្ដីសន្និដ្ឋាន

ផ្អែកតាមលទ្ធផលដែលបានបង្ហាញជូនខាងលើ យើងសង្កេតឃើញថា វត្តមាននៃមូលនិធិសមធម៌ (ម.ស.ស) មាន៖

- ទំនាក់ទំនងវិជ្ជមានជាមួយនឹងការកើនឡើងនៃសេវាភាពទទួល និង ការប្រើប្រាស់សេវាសម្រាកពេទ្យដោយជនក្រីក្រ ហើយទំនាក់ទំនងនេះមានលក្ខណៈខ្លាំងជាពិសេសនៅមន្ទីរពេទ្យបង្អែក (ម.ប) ស្រុក

- ទំនាក់ទំនងវិជ្ជមានជាមួយនឹងការកើនឡើងនៃការទទួលសេវាពិគ្រោះជំងឺក្រៅនៅ ម.ប ដោយជនក្រីក្រ

- ទំនាក់ទំនងវិជ្ជមានជាមួយការកើនឡើងនៃការប្រើប្រាស់សេវាសម្រាលកូននៅ ម.ប ដោយជនក្រីក្រ ហើយទំនាក់ទំនងនេះមានលក្ខណៈខ្លាំងជាពិសេសនៅ ម.ប ស្រុក

- ទំនាក់ទំនងវិជ្ជមានជាមួយនឹងការកើនឡើងនៃករិទ្ធប្រើប្រាស់សេវាពិគ្រោះជំងឺក្រៅ និង សម្រាលកូន នៅមណ្ឌលសុខភាព (ម.ស) ដោយជនក្រីក្រ ។

លទ្ធផលបង្ហាញច្បាស់ថា ការនាំជីតមូលដ្ឋានសុខាភិបាលជាតកត្តាសំខាន់ផ្ដល់មូលក្នុងការប្រើប្រាស់សេវាថែទាំសុខភាពនៅ ម.ប និង ពិសេសនៅ ម.ស ដោយសមាជិក ម.ស.ស។ ខណៈដែលតំណាង ម.ស.ស បានកាត់បន្ថយបញ្ហាឧបរិញតុកត្តក្នុងការទូទាត់សេវាថែទាំសុខភាព ដំណើរការនាំផលុចបន្ថែមចំន្នែទ ម.ស និង ម.ប ទាំងពីរទៅ ហាក់ដូចបានកាត់បន្ថយបញ្ហាភូមិសាស្ត្រសម្រាប់លទ្ធភាពទទួលសេវាវា នេះ ប្រហែលជាដុលបង្ហាញពីចំលាងទាក់ទងនឹងប្រសិទ្ធមួយរវាងការកែមួយភាគី�},ប្រើប្រាស់សេវា និង ភាគីអ្នកផ្ដល់សេវា។ តែទោះជាយ៉ាងណាក៏ដោយ ភាពខុសគ្នាខ្លាំងនៃរយ:ចម្ងាយធ្វើដំណើរចងុលបង្ហាញថា ដំណើរការ កាត់បន្ថយបញ្ហាភូមិសាស្ត្រដើម្បីផ្ដល់លទ្ធភាពប្រើប្រាស់សេវាវាដល់ជនក្រីក្រនៅមិនទាន់គ្រប់គ្រាន់នៅឡើយទេ។

របាយអាយុនៃអ្នកជំងឺដែលបានទទួលការថែទ្យព្យាបាលនៅមូលដ្ឋានសុខាភិបាលក្រោមការជួយឧបត្ថម្ភពីតំណាង ម.ស.ស ភាគច្រើនប្រមូលផ្ដុំនៅក្រុមអាយុ ០-៥ ឆ្នាំ និង ២៥-៣៥ ឆ្នាំ។ លទ្ធផលនេះអាចបង្ហាញថា សមាជិកភាពនៃតំណាង ម.ស.ស មានគំរូជាពិសេសចំពោះមាតា និងកូនរបស់ពួកគេ។ ក៏ប៉ុន្តែ បាយអាងនៃអ្នកជំងឺ ម.ស.ស ពុំមាននៅក្នុងមូលដ្ឋានទិន្នន័យសមាជិកភាពនោះទេ ដូច្នេះ សេចក្ដីសន្និដ្ឋាននេះត្រូវការការអង្កេតបន្ថែមទៀត។

ទិន្នន័យក្រមពត៌មានអ្នកជំងឺមានប្រយោជន៍ណាស់ក្នុងការអភិវឌ្ឍយុទ្ធសាស្ត្រថ្មីបច្ចុប្បន្ន ដើម្បីកែលម្អគុណភាពសេវាថែទាំសុខភាពនៅ ម.ប និង ម.ស។ រយ:ពេលសម្រាប់ការព្យាបាលជាមធ្យមនៃអ្នកជំងឺ ម.ស.ស កាន់តែយូរអាចនឹងឧបលបង្ហាញពីគុណភាពសេវាថែទាំព្យាបាលកាន់តែប្រសើរ ឬ ក៏អាចឆ្លុះបញ្ចាំងពី "ការលើកទឹកចិត្តរបៀបឧស្សាន" មួយដែលជំរុញឱ្យម្ចាស់ពេទ្យព្យាបាលរយ:ពេលសម្រាប់ព្យាបាលដើម្បីបង្កើន ចំណូលរបស់ខ្លួន។ តែបញ្ហានេះត្រូវការការអង្កេតបន្ថែម។

នៅថ្នាក់អន្តរជាតិ កំណើនគួរឱ្យកត់សម្គាល់នៃករិទ្ធប្រើប្រាស់សេវានៅមូលដ្ឋានសុខាភិបាលរដ្ឋ តែងតែកើតឡើងក្រោយពីការលុបបាលប្រព័ន្ធបង់ថ្លៃ។ នៅកម្ពុជា គំរូ ម.ស.ស បង្ហាញថា ការផ្ដល់ ការលើកលែងបង់ថ្លៃដល់ជនក្រីក្រដោយយោនការទូទាត់សងវិញ់ពី ម.ស.ស គឺជាវិធីផ្សេប្រកបដោយនិរន្តរភាពមួយដែលមានគុណប្រយោជន៍បំពេញការការទាំងចំណូលរបស់មូលដ្ឋានសុខាភិបាល។

លទ្ធផលជាកលាភមួយនៃការសិក្សារបស់យើងគឺតាក់ព័ន្ធនឹងភាពជាបាតកក្នុងការប្រើប្រាស់ទិន្នន័យជាប្រចាំនៃប្រព័ន្ធព័ត៌មានសុខាភិបាល សម្រាប់គោលបំណងស្រាវជ្រាវបែបវិទ្យាសាស្ត្រ។ ខណៈដែល ទិន្នន័យនៃប្រព័ន្ធព័ត៌មានគ្រប់គ្រងសុខាភិបាល បានបង្ហាញពីលទ្ធផលការកើនឡើងគួរឱ្យកត់សំគាល់នៃការប្រើប្រាស់សេវា ការបង្កើតមូលដ្ឋានទិន្នន័យសមាជិក ម.ស.ស ជាកំណត់ត្រានៃ ការប្រើប្រាស់សេវានៅមូលដ្ឋានសុខាភិបាលរបស់សមាជិក ម.ស.ស មិនបានផ្ដល់នូវទិន្នន័យគ្រប់គ្រាន់តាមបែបបទចាំបាច់សម្រាប់ការវិភាគទស្សវិទ្យលំណូលប្រឹយ។

លទ្ធផលនៃការសិក្សានេះបង្ហាញថា តួនាទីនៃតំណាង ម.ស.ស មានសារ:សំខាន់ណាស់ក្នុងការទំរុកបម្រុងថ្លៃចំណាយលើការសម្រាកព្យាបាលនៅ ម.ប សម្រាប់ជនក្រីក្រ ដែលថ្លៃចំណាយទាំងនេះជា មូលហេតុចំបងនៃមេបន្ទុកយ៉ាយការចំណាយសម្រាប់ថែទាំសុខភាព (Catastrophic health expenditures) ភាគក្រីក្រ និង ចំណូលទាក់ទងនឹងការចំណាយលើសេវាថែទាំសុខភាព។ ករណីសម្រាក ព្យាបាលនៅ ម.ប ដែលបានជួយដោយតំណាង ម.ស.ស នៅតែមានសមាមាត្រខ្ពស់ (៦៥%) ក្នុងចំណោមករណីសម្រាកព្យាបាលទាំងអស់ ថ្វីបើចំនួនសមាជិក ម.ស.ស ហាក់ដូចនៅតែមិនប្រែប្រួលក៏ដោយ (នៅ ពេលដែលចំនួនប្រជាជនក្នុងតំបន់គ្របដណ្ដប់បន្តកើនឡើង អត្រានៃអ្នកក្រីក្រថាជាតិធ្លយចុះ)។

លទ្ធផលនេះផ្ដល់កស្ដុតាងច្បាស់លាស់ថា តំណាង ម.ស.ស មានប្រសិទ្ធភាពក្នុងការបំពេញមុខងាររបស់ខ្លួន ដោយគឺលុបបំបាត់ជាបាំងបរិញវត្តុ ផ្ដល់លទ្ធភាពទទួលសេវាថែទាំសុខភាព និងលើកកម្ពស់ ករិទ្ធប្រើប្រាស់សេវាដែលបានទទួលការឧបត្ថម្ភនពីរដ្ឋាភិបាលនៅមូលដ្ឋានសុខាភិបាលរដ្ឋដោយជនក្រីក្រ។ ថ្វីបើការសិក្សាស្រាវជ្រាវនេះមិនអាចបង្ហាញពីទំនាក់ទំនងហេតុផលច្បាស់លាស់ណាដែលថា វត្តមាននៃ ម.ស.ស ធ្វើឱ្យមានការកើនឡើងនៃការប្រើប្រាស់សេវាថែទាំសុខភាពនៅ ម.ប និង ម.ស ពិសេសដោយជនក្រីក្រ របកគំហើញនៃការសិក្សាស្រាវជ្រាវនេះជួយគាំទ្រដល់ការបន្តពង្រីក និង ពង្រីកការគ្រប ដណ្ដប់របស់តំណាង ម.ស.ស។

Figure 1. Provinces of Cambodia, 2015

# INTRODUCTION

Cambodia's Health Equity Fund (HEF) system covers a population of three million of the country's poorest people out of a total population of 15 million (2015).[11] The district-based HEFs are the largest and most significant social security scheme in Cambodia in terms of population coverage. During the last 15 years they have been scaled up from an initial two health districts and two referral hospitals (RH) to national coverage of government health facilities in every health district in the country, including every RH and every health centre (HC), by 2015.

Now with 25 provinces and an expanding population (Figure 1), Cambodia is moving towards middle income status after many years of strong and consistent economic growth. The Cambodian health system comprises a pluralistic mix of public providers and various types of private providers (including non-medical providers). The public sector dominates preventative services while a growing and loosely regulated private sector principally provides curative care.

The health infrastructure is expanding, with the number of RHs and HCs growing each year (Table 1). By December 2015 there were 79 RHs (outside the capital Phnom Penh), of which 25 were Provincial Hospitals (PH) and 54 were district-level RHs, with a network of 1,141 HCs for primary care. These facilities are financed through a combination of government taxation funding of salaries, drug supplies and recurrent costs, user fees paid by patients and payments through various demand-side financing schemes.

The use of public health facilities at times of illness is still limited, with the private sector dominating. Only 23.5% of the ill or injured people sought care first at a public facility (64% at a private practitioner and 13% using self-care, traditional healers or other providers.[12] Consequently, the numbers used in this report for utilization of health facilities and for HEF are sometimes small and must be interpreted with some caution.

For public facilities, each RH serves an operational health district of 100,000-200,000 people and 10-20 HCs. RHs are typically staffed by a team of doctors, nurses and midwives. The RH delivers a Complementary Package of Activities (CPA) at three levels, with CPA3 providing the highest level of surgical care and CPA1 a basic package of secondary care. Most provincial referral hospitals (PHs) are classified as CPA3. HCs deliver a Minimum Package of Activities, comprising primary care, maternal health care and newborn deliveries.

The HEFs are funded by government taxation revenues and donor funding. The HEFs are financially sustainable and effective in providing access to government health services for the poorest one-fifth of the population who would most commonly not have access to care otherwise.

From the beginning, the design function and the primary purpose of the HEFs was to provide access to health care for the poor by directly reimbursing government health facilities for user-fee exemptions. The HEFs do not fund all government health service delivery,

**Table 1. Number and type of public health facilities, 2008-2015**

| Facility | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|
| Operational Districts | 77 | 77 | 77 | 77 | 79 | 81 | 83 | 94 |
| Total hospitals | 87 | 88 | 89 | 90 | 91 | 94 | 106 | 107 |
| National Hospitals | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Total Referral Hospitals | 79 | 80 | 81 | 82 | 83 | 86 | 98 | 99 |
| CPA3 hospitals | .. | 17 | 17 | 18 | 18 | 18 | 18 | 19 |
| CPA2 hospitals | .. | 28 | 30 | 31 | 29 | 29 | 29 | 29 |
| CPA 1 hospitals | .. | 34 | 34 | 33 | 36 | 39 | 51 | 51 |
| Total Health Centres | 967 | 984 | 997 | 1,004 | 1,024 | 1,088 | 1,105 | 1,141 |

Source: Annual Health Financing Report 2015, Ministry of Health

[11] Total number of the eligible poor as identified by the IDPoor count, derived from the national HEF Operational Database membership database for the period May 2014 to April 2015.
[12] Cambodia Socio-Economic Survey 2014.

the main part of which is subsidized through the health budget; the HEFs fund the cost of user-fee exemptions for the poor. User fees make up on average approximately 10% of total health expenditures. An indirect benefit of the HEFs is to provide a source of additional financing, on the demand side, to health facilities, though this was not their intended purpose. Nonetheless, the HEFs have become an important component of funding at the facility level. A further indirect effect is to provide revenues through which the facilities make staff incentive payments, thus improving performance.

The HEFs were designed originally to reimburse only RHs (where official user-fees were greater) and not HCs (where official user fees were negligible). The HEFs enjoyed rapid geographic expansion, and began as well to reimburse user-fee exemptions at HCs within the RH catchment area. The motivation for this expansion was related mainly to the functioning of the referral system, but it also addressed a real need among the poor for removing the financial barrier to access to primary care.

*contracted health providers must first meet quality criteria for service delivery*

## User fees and the Health Equity Fund

The right to charge user fees at government health facilities was approved officially in 1996 and has become an important source of staff incentives and operating revenues at the facility level. Initial HEF efforts emerged in 2000 piloting a demand-side health financing mechanism to address the barrier of user fees encountered by the poor at government health facilities. The fundamental aim of the HEF is to provide access to health care for the poor. The HEF functions at the Operational District (OD) level and has steadily increase its geographic scope reaching full national coverage in May 2015.  The level of services has also expanded over time starting with coverage for RH services and later expanding to cover HCs. In January 2012, the Ministry of Health (MOH) issued a standard HEF benefit package and provider payment mechanism policy which is inclusive of all available public health services and reimburses facilities using cased-based payments. HEF benefits include:

• Services provided at contracted public RHs and HCs;
• Transportation reimbursements paid to beneficiaries who access RH level care or delivery services at HCs;
• Daily food allowances for caretakers of poor patients admitted to RHs; and a
• Funeral benefit in case of death while receiving treatment at a RH.

HEF beneficiaries are identified through a national poverty targeting process implemented by the Ministry of Planning and through on-demand poverty assessment interviews at hospitals. In Cambodia, the targeting process has been shown to be of comparable quality to other countries at the time of identification, though less so in following years.[13] Originally, the HEF Operators (described below) pre-identified the poor through separately funded household surveys every few years using similar asset-based poverty assessment tools. These pre-identification efforts resulted in the increased utilization of public health services.[14] Starting in 2006, the Ministry of Planning established the national Identification of Poor Households Program (IDPoor) which standardized the process of identifying poor households, instituted a rolling three-year schedule for conducting the process nationwide, and made the results available to all social sectors. There is also a process of post-identification which is used at RHs to identify poor patients who have not yet been identified under the IDPoor process.

The HEF is managed within each Operational District by a local non-government organization (NGO) known as a HEF Operator. Within an Operational District, each HEF Operator has three key roles: identification of HEF beneficiaries seeking care, provision of social and financial support to HEF patients while receiving care and payment to facilities for services delivered. HEF Operators are contracted by the secretariat of the MOH Second Health Sector Support Project (HSSP2) to manage the field level operations of the HEF in a cluster of Operational Districts. To enter the HEF system, contracted health providers must first meet quality criteria for service delivery and are required to provide a level of health service of the same quality to HEF clients as they do with fee-paying patients. The HEF Operator monitors on a day-to-day basis the provision of services to identified poor patients and interfaces with the facility to improve care.

The HEF system is monitored nationally by an independent third-party HEF Implementer (currently the University Research Co. LLC (URC), an international non-government agency), which works under a memorandum of understanding with the Ministry of Health and funding from the United States Agency for International Development (USAID). The HEF Implementer has the responsibility of providing independent verification of the benefits provided to individual HEF supported patients. The verification process is driven by a team of

13 See, for example, Por I, Decoster K, Hardeman W, Horemans D and Van Damme W. 2008. Challenges in identifying the poor: An assessment of household eligibility for Health Equity Fund after four years of pre-identification in Oddar Meanchey, Cambodia. Studies in HSO&PI, 23 pp.385-407.
14 Jordanwood T and Van Pelt M. 2009. Evaluation Report: Health Equity Funds Implemented by URC and supported by USAID. University Research Co., LLC

field-based monitors who conduct household interviews, bedside monitoring, document reviews, and work with key stakeholders to that benefits invoiced to the system are the actual benefits delivered to poor patients. Based on the information collected during verification, each monthly invoice generated by the system is certified before payments are made.

The national administration of the HEF system combines funding from both government and donors, implementation and management by national and local third party agencies, oversight by Ministry of Health (MOH) offices at all levels of the system, and contractual relationships between the active parties. Administrative overheads remain relatively low. The system is illustrated in Figure 2 below. The HEF is financed by the MOH/HSSP2 through pooled contributions from the Royal Government of Cambodia (currently 40%) and donors (currently 60%). Funding of the system is channeled through the HEF Operators who are responsible for ensuring payment of health facilities at the end of each month and distribution of the non-medical benefits of transportation reimbursements, caretaker food allowances and funeral benefits.

The scaling up of HEF coverage has been supported by a process of research and analysis of evidence on their effectiveness, which has also provided a basis for the national policy making process. A 2010 comprehensive review of 92 items of published and grey literature summarized the evidence on the operation and effectiveness of the HEF and identified the remaining gaps in the evidence.[15] The review found there was sufficient evidence to suggest that the HEF provides access to services for the poor, raised utilization levels at government facilities, reduced (but did not eliminate) debt for health care and provided a significant source of additional revenue for public health facilities. The review also recognized there had been no national assessment of HEF implementation.

A more recent study analyzed retrospective data from the Cambodia Socio-Economic Surveys (CSES) 2004, 2007, 2008 and 2009. Using a difference-in-difference (DID) approach, the authors compared health districts with a HEF (intervention districts) and districts with no HEF (comparison districts) and found that the HEF reduces the amount (but not the incidence) of out-of-pocket expenditure on health by 35% on average, with a larger effect for poorer households.[16]

**Figure 2. Structure of the national HEF system c.2015**
Source: University Research Co., LLC
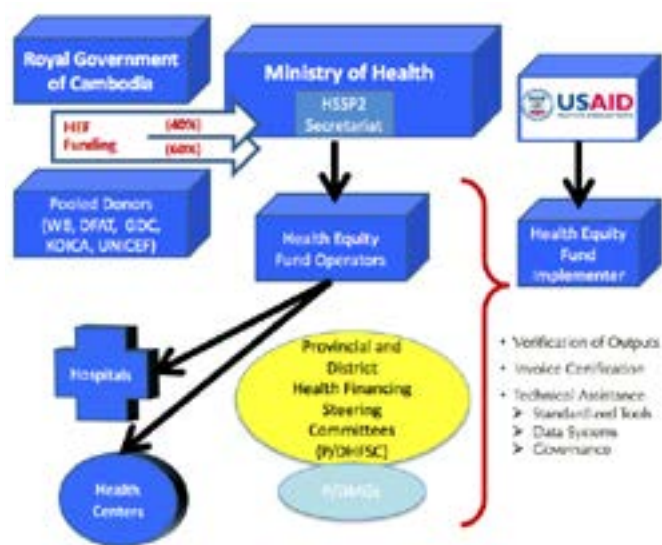
[15] Annear P. 2010. A comprehensive review of the literature on health equity funds in Cambodia 2001-2010 and annotated bibliography. Health Policy and Health Finance Knowledge Hub, Nossal Institute for Global Health. Melbourne.
[16] Flores G, Ir P, Men CR, O'Donnell O, van Doorslaer E. 2013. Financial protection of patients through compensation of providers: the impact of Health Equity Funds in Cambodia. Journal of Health Economics, 32:1180-1193.

## Research aims

This study was carried out between 2013 and 2015 using time-series data for the period January 2006 to December 2013. This research was designed to assess the national impact of the presence of the HEF at health-district level using utilization data. It is the first to analyze HEF beneficiary and facility-utilization data using comprehensive routine national data. The study made a description of HEF beneficiary characteristics using the HEF Operational Database and of changes in the utilization of HCs and RHs services as recorded in the Health Management Information System (HMIS) of the MOH.

## Conceptual framework

The conceptual framework for this study is illustrated in Figure 3. The HEF system is designed principally to provide access to care by reducing financial barriers for the poor, increasing access to care and raising the utilization of government health services. On the demand side, the HEF in each Operational District provides support for the poor to access both RHs and HCs. On the supply side, the HEF has the indirect effect of raising facility operating revenues, providing for staff incentives and raising the level of staff performance as a consequence.

**Figure 3. Conceptual framework for the research study**
Source: the authors
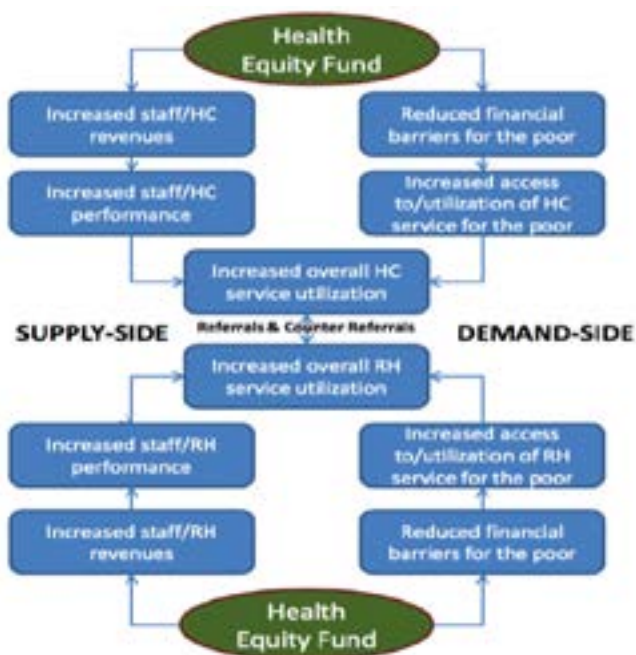
# DATA SOURCES AND METHODS OF ANALYSIS

The study analyzed national data in three ways:

1. The level of national HEF population coverage and the characteristics of HEF health service users were derived from data provided by the HEF Implementer and the national HEF Operational Database;
2. Changes in the utilization of RHs as a result of HEF implementation were derived from an analysis of the national HMIS database;
3. A similar analysis of changes in HC utilization nationally was carried out using HMIS data.

Our approach was to adopt measures of health facility utilization as the most accurate indicator of access to health care available through existing national data. We contend that if the poor are represented in utilization numbers through the HEF in proportion to their share in the total population then the HEF is shown to have provided access to care for the poor.

## Sources of HEF beneficiary data

The HEF Operational Database was developed by the HEF Implementer, URC, and the MOH in consecutive versions over a number of years as an administrative tool to track HEF beneficiaries and health service utilization for the purposes of making payments and auditing facilities. Using this database, obtained as a series of backup files from URC, the various beneficiaries files were merged to make a complete data set that included 2.6 million admissions between 2004 and June 2013.

Extensive work on the HEF Operational Database was not successful in producing a consistent set of data suitable for the analysis of household benefit from HEF or one that could be linked to wider national databases, including the CSES or the Cambodia Demographic and Health Surveys (CDHS). Linking would have made possible quantitative analysis of household benefits related to poverty, out-of-pocket spending, and household health costs, but this proved to be impossible.

Population coverage provided through the HEF was calculated otherwise using URC records of households identified and enrolled as members of the schemes. The HEF Operational Database was used to analyze descriptive admission-level information for HEF members at government facilities, including indicators related to visits to health facilities covered under the HEF schemes. Descriptive statistics of beneficiary health facility utilization – available for the first time – were calculated for type of facility visit (in-patient, out-patient, health clinic), benefits paid (visit cost, transport, food), and basic categories of diagnosis and services received.

**Figure 4. Timing of commencement and number of referral hospitals covered by various schemes, 2006-2013**
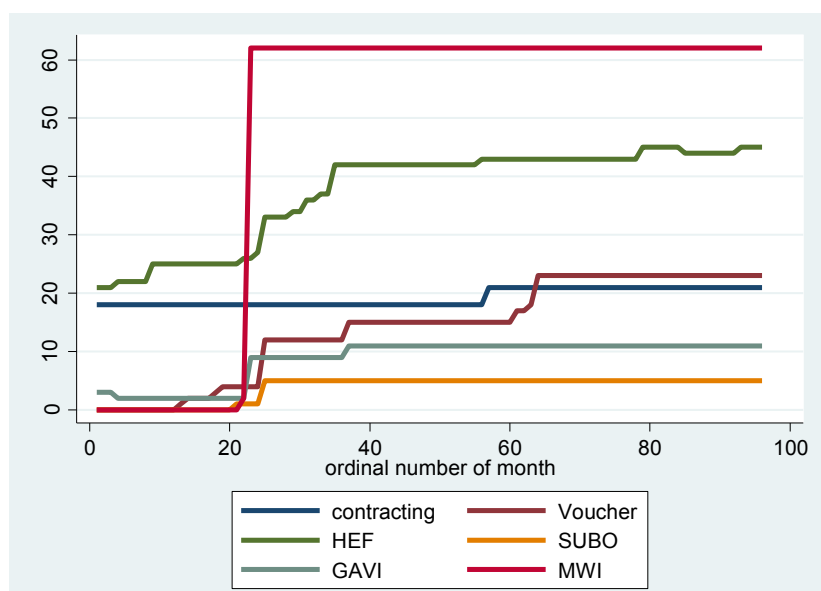


| | |
|---|---|
| Contracting: | Performance-based contracting scheme within the MOH |
| HEF: | Health Equity Fund |
| GAVI: | health system strengthening scheme funded by the GAVI Alliance |
| Voucher: | pre-paid voucher offered to the poor for maternal health services |
| SUBO: | a government subsidy scheme to reimburse user fee exemptions in some districts |
| MWI: | the national midwife incentive payment for live maternal deliveries |

**Table 2. Number of referral hospitals with different interventions, 2006-2013***

| Year | HEF | Contracting | Gavi HSS | Vouchers | Subo |
|------|-----|-------------|----------|----------|------|
| 2006 | 25 | 18 | 3 | 0 | 0 |
| 2007 | 27 | 18 | 9 | 4 | 1 |
| 2008 | 42 | 18 | 9 | 12 | 5 |
| 2009 | 42 | 18 | 11 | 15 | 5 |
| 2010 | 43 | 21 | 11 | 15 | 5 |
| 2011 | 43 | 21 | 11 | 23 | 5 |
| 2012 | 45 | 21 | 11 | 23 | 5 |
| 2013 | 45 | 21 | 11 | 23 | 5 |

* Total number of RHs in the dataset was 62.

## Utilization of Referral Hospital services

The study of RH service utilization analyzed retrospective data extracted from the MOH HMIS; the HEF Operational Database supplied by URC; and from the web-based Social Health Protection module of the MOH/HMIS. The data were compiled for each RH as 96 monthly time points over a period of eight years from January 2006 to December 2013 as this provided the most complete and reliable record. The number of RHs increased over time. By the end of 2013 there were 24 PH and 55 DH (79 RH in total, excluding National Hospitals and NGO hospitals).[17] All RH for which data were available were included. Sixty-two hospitals were included in the study, of which 45 had HEF schemes at some time during 2006-2013.

RHs were supported by various supply-side and demand-side financing schemes in addition to the HEF, which were potential confounders in the analysis. The main schemes are listed in Table 2 and the timing of their introduction in the study area illustrated in Figure 4. A national midwife incentive payment was universal to all RHs and is therefore not considered a confounder.

Of the additional schemes:
- Contracting schemes are supply-side performance-based incentive agreements designed to improve staff performance and service delivery. The agreements are implemented in government health districts designated as Special Operating Agencies, under which the MOH is the principal and uses internal contracting arrangements (relational contracts) with lower levels of the administration (provincial and district) as agents.

- During the study period, Gavi funded performance contracting in primary health care level in a number of districts under its system strengthening (HSS) program. Gavi-HSS contracted HCs for the immunization, antenatal care and consultations and child-health activities.

- Vouchers are demand-side schemes implemented through international NGOs that have the primary purpose of increasing access to and utilization of public maternal and child health services by the targeted population.

- The Subsidy operator scheme (Subo) is a government-sponsored supply-side scheme that directly reimburses health facilities for user-fee exemptions for the poor but does not subsidize patients for transport, food or other costs; the RH itself acts both as fund manager and service provider.

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[17] All provincial hospitals are designated as CPA 1 while district referral hospitals are normally designated as CPA2 or CPA3.

The Social Health Protection module of the MOH/HMIS database contained outcome variables related to the number of contacts at inpatient departments (IPD), outpatient department (OPD) and newborn deliveries aggregated by month and identified those funded by the HEF, as well as population in the RH catchment area, the number of HCs and the number of HEF members. The average population in RH catchment areas, as illustrated in Figure 5, increased over time while average number of HEF beneficiaries per Operational District remained at approximately 50,000 per RH catchment area. This was due to reductions in poverty and not shortcomings in HEF coverage. The official level of poverty in Cambodia (population living below the national poverty line) decreased during the study period from 35% in 2006 and 30% in 2010 to slightly less than 20% in 2013. The reason for the decline in the mean HEF beneficiaries per Operational District during the period of January to August 2009 was due to an expansion of the system to new geographic areas that had not yet been covered by the Ministry of Planning IDPoor Program and thus had lower numbers of HEF beneficiaries.

**Figure 5. Average population and number of HEF beneficiaries per district, 2006-2013**
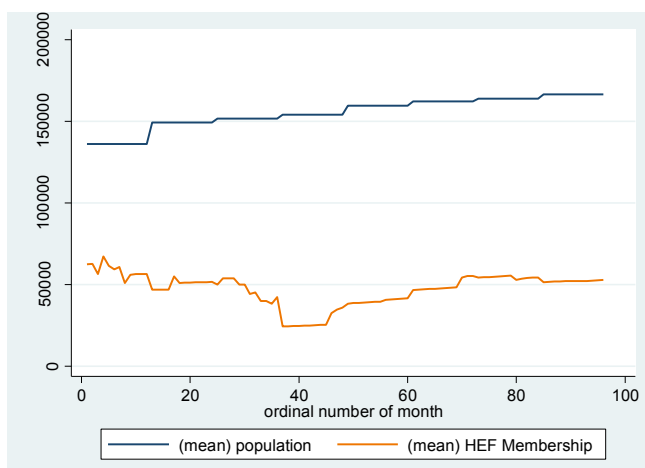


The study of RH utilization used the DID approach to assess the impact of HEF. The study employed a combination of descriptive statistics, bivariate analysis and multivariate analysis. For each outcome indicator, descriptive statistics (codebook, summary statistics) were generated by hospital and by year to examine trend of the services over eight years. In bivariate analysis, a t-test was used to compare each outcome between hospitals with and without a HEF intervention in aggregate terms (the whole eight years) and by year. Multivariate correlations were run to investigate the relationship between variables and identify HEF impact using two different regression models. The analysis excluded cases where data was missing.

*The multivariate regression without control is represented in Model 1 – HEF alone:*
(1) Outcome = HEF + hospital fixed effect + time Fixed Effect + error (cluster option)
A time fixed effect was used because the outcomes were influenced by the time at which HEF were introduced into each RH. A hospital fixed effect was used because to identify the impact of HEF within respective RHs, which varies over time. Each RH has unique characteristics, including the number of medical staff, resources available or unique leadership and management capabilities.

As changes in population may affect utilization of public health facilities, the analysis controlled for the population in the RH catchment area. The analysis also controlled for the presence or absence of contracting schemes, voucher schemes and Gavi HSS. Previous studies indicate that voucher influenced utilization of maternal health services.[18,19] Deliveries that required a hospital stay (that is, delivery by C-section) were counted as inpatient care. The analysis also included a variable to control for co-linearity, which occurs when two or more variables have a high degree of correlation.

*Model 2 – with controls is represented by the following equation:*
(2) Outcome = HEF + hospital fixed effect + time Fixed Effect + control + error (cluster option)

[18] Ir P, Horemans D , Souk N and Van Damme W. 2010. Using targeted vouchers and health equity funds to improve access to skilled birth attendants for poor women: a case study in three rural health districts in Cambodia. BMC Pregnancy Childbirth, 10: p. 1.
[19] Ir, P. and Chheng K. 2012. Evaluation of Government Midwifery Incentive Scheme in Cambodia: An exploration of the scheme effects on institutional delvieries and health system. National Institute of Public Health, Ministry of Health. Phnom Penh.

Multivariate regression models were run using fixed effect for hospital and time (month) variations and correcting for heteroskedasticity and serial correlation in the data. Two separate data sets were analyzed and compared: a data set with all 62 RHs covered by HEFs; a data set of 48 district level RHs, excluding PHs, which operate with additional resources.

## Utilization of Health Centre services

The analysis of HC service utilization during 2014 used the DID approach with HMIS data to make an impact evaluation of the HEF.[20] Data for the monthly number both of new case consultations and of deliveries at HCs between January 2006 and December 2013 were extracted from the HMIS database by URC (96 data points). New case consultations are the most commonly used service at HCs while deliveries are the most important and most expensive service provided.[21]

These data were routinely collected by individual health facilities and collated at the district level on a monthly basis using a purpose-built software package and sent to the provincial health office, which in turn forwarded the reports to the central MOH. Data were selected for the period 2006-2013 as reporting for these years were more complete and reliable and available through the computerized HMIS system.

The number of functioning HCs rose from 960 in 2006 to 1,081 in 2013 (Table 3). To control for the effect of additional interventions and changes in population structure on the performance of HCs (for both utilization and assisted deliveries) we included control variables in the regression analysis (1 for presence and 0 for absence) for service contracting arrangements, the use of vouchers for reproductive health and population in model 2 below.[22]

Data were collected for all HCs made functional at any time during 2006-2013 (with at least one month of reported data). Seven HCs were excluded from the study, as these were not fully functional. The commencement dates of the HEF at each HC (for those covered by a HEF) were provided by the HEF Implementer (URC) and were used to define the presence of a HEF for the purposes of the DID analysis. During the period under review, the number of HCs with a HEF also increased from 16 (1.5% of all functioning HCs) in December 2006 to 476 (40% of all functioning HCs) in December 2013.

**Table 3. Number of health centres—functional status and HEF status, 2006-2013**

|  | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|
| Total no. of HCs | 960 | 963 | 967 | 984 | 997 | 1,004 | 1,024 | 1,088 |
| No. of functioning HCs | 956 | 959 | 960 | 962 | 970 | 995 | 1,019 | 1,081 |
| No. of HCs with HEF | 16 | 17 | 81 | 168 | 246 | 277 | 301 | 476 |
| HEF as % (of functioning HCs) | 1.5 | 1.6 | 7.5 | 15.5 | 22.8 | 25.6 | 27.8 | 40.0 |
| No. of HCs with vouchers | 0 | 44 | 200 | 272 | 272 | 405 | 405 | 405 |
| % (of functioning HCs) | 0 | 4.1 | 18.5 | 25.2 | 25.2 | 37.5 | 37.5 | 37.5 |
| No. of HCs with contracting | 328 | 437 | 437 | 467 | 509 | 509 | 509 | 509 |
| % (of functioning HCs) | 30.3 | 40.4 | 40.4 | 43.2 | 47.1 | 47.1 | 47.1 | 47.1 |

[20] Gertler PJ, Martinez S, Premand P, Rawlings LB and Vermeersch CMJ. 2011. Impact Evaluation in Practice. The World Bank. Washington DC (available at www.worldbank.org/pdt).

[21] Ir P. 2015. Impact of Health Equity Funds on Health Centre Services Utilization Draft report. Assessment of household benefits and national implementation costs of Health Equity Funds for the poor in Cambodia Research Project (Australian Development Research Award). Health Systems Research and Policy Support Unit, the National Institute of Public Health. Phnom Penh

[22] Khim K, Annear PL. 2013. Strengthening district health service management and delivery through internal contracting: Lessons from pilot projects in Cambodia. Social Science and Medicine, Vol 96, November 2013, Pages 241–249; Loevinsohn B and Harding A. 2005. Buying results? Contracting for health service delivery in developing countries. The Lancet, 366:676-681; Matsuoka S, Obara H, Nagai M, Murakami H and Chan Lon R. 2013. Performance-based financing with Gavi health system strengthening funding in rural Cambodia: a brief assessment of the impact. Health Policy and Planning, July;29(4):456-65; Soeters R and Griffiths F. 2003. Improving government health services through contract management: a case from Cambodia. Health Policy and Planning, 18:74-83.

*it appears that the presence of a HEF is associated with the increased utilization of public facilities, in particular public referral hospitals.*

# RESULTS:

## A. CHARACTERISTICS OF HEF BENEFICIARIES

### Population coverage

All individuals who are identified as poor through the national IDPoor survey (Ministry of Planning) were eligible to receive HEF benefits. The IDPoor count is carried out over time province-by-province. During May 2014-April 2015 3,229,044 individuals were identified nationally (across 94 ODs) as eligible poor and comprise the national cohort eligible for HEF benefits.

During May 2014-April 2015 a total of 65 ODs had HEF coverage (scaled up to 94 ODs by the end of 2015). During this period, the national HEF monitoring system identified 118,406 individuals (unique patients) who used RH services from an eligible population of 2,571,603 in the ODs covered by the HEF (Table 4).

While consistent statistics are difficult to access, Table 4 includes the main averages for the proportion of the catchment population using public facilities and the facility utilization rates the HEF beneficiaries and the general population.

### Health facility visits

From the data available for analysis, it appears that the presence of a HEF is associated with the increased utilization of public facilities, in particular public referral hospitals (Table 5). As HEF coverage is available at only one National Hospital (Khmer Soviet), the population of Phnom Penh and National Hospital IPD discharges and OPD consultations have been excluded for the sake of comparative analysis.

While 4.6% of HEF beneficiaries use RH services, only 3.3% of the national population uses hospital services (including Phnom Penh). Comparing the use of public facilities outside Phnom Penh, the contact rate for RH services among HEF beneficiaries was 0.14 per person per year compared to only 0.03 for the population as a whole. For HC services, at 0.66 the national rate is above that for HEF beneficiaries, at 0.54, possibly reflecting the later arrival of HEF coverage at HCs compared to RHs. As the data are not consistent, further investigation of these averages is recommended.

The number of health facility visits by HEF beneficiaries increased each and every year

**Table 4. Membership and number of facility visits by individual HEF members for 65 health Operational Districts covered by HEF, May 2014-April 2015**

| Target group | # of HEF eligible individuals and total population | # using public hospitals | % using public hospitals | # of facility visits by individuals | Contact rate (visits/ person/ year) |
|---|---|---|---|---|---|
| **HEF members** (total May 2014-April 2015 for 65 ODs with HEF):* | | | | | |
| - Hospital level services | 2,571,603 | 118,406 | 4.6% | 352,168 | 0.14 |
| - Health Centre services | 2,571,603 | n.a. | .. | 1,325,263 | 0.54 |
| **National population** (2013, for all 81 ODs): | | | | | |
| - Total population** | 15,328,136 | 511,500 | 3.3% | .. | .. |
| - Population excluding Phnom Penh*** | 12,988,551 | n.a. | .. | .. | .. |
|   - Contacts per person per year**** | | | | | |
|     Referral Hospital IPD discharges | 12,988,551 | .. | .. | 377,385 | 0.03 |
|     Referral Hospital OPD consultations | 12,988,551 | .. | .. | 783,267 | 0.06 |
|     Health Centre consultations | 12,988,551 | .. | .. | 8,557,220 | 0.66 |

Sources:
*National HEF membership database (MOH/URC)
**Cambodian Socio-Economic Survey 2014
***Inter-censual Population Survey 2013
****National Health Statistics Report 2011

from HEF inception, reaching an annual 1,289,920 visits at RHs and HCs during 2013 (Table 5) and totaling 2.6 million during 2004-2013 (Table 6). Of the total number of facility visits during 2004-2013 when reliable data were availabel, 63% occurred at health centres, and the remainder was evenly split between RH inpatient and outpatient departments (Table 6, Figure 6).

The rapid rise in total facility visits (Figure 6) reflects both increased access to facilities by HEF members and a steep rise in the number of HCs covered by HEF schemes. The total number of RHs covered by the HEF nationally increased from 21/77 to 51/86 during 2006-2013 while the number of HCs covered increased from 16/956 to 476/1,081.

**Figure 6. Total HEF member visits by facility type and year, 2006-2013**
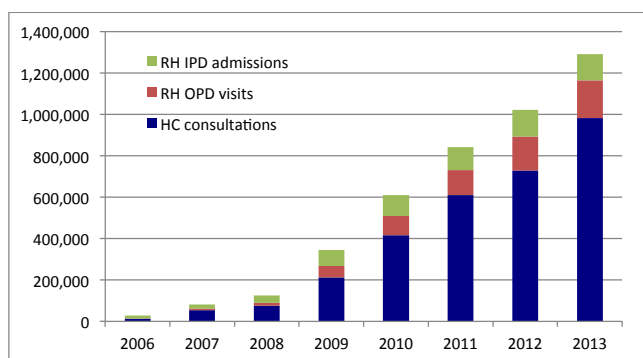


**Table 5. HEF member visits to facilities by facility type and year, 2006-2013**

| Year | HC | OPD | IPD | Total |
|------|-----|-----|-----|-------|
| 2006 | 11,982 | 1,735 | 13,926 | 27,643 |
| 2007 | 54,434 | 6,830 | 20,332 | 81,596 |
| 2008 | 75,266 | 13,445 | 37,206 | 125,917 |
| 2009 | 213,056 | 54,865 | 77,529 | 345,450 |
| 2010 | 416,487 | 91,546 | 102,185 | 610,218 |
| 2011 | 610,834 | 120,076 | 111,023 | 841,933 |
| 2012 | 729,172 | 164,157 | 128,781 | 1,022,110 |
| 2013 | 982,035 | 180,808 | 127,077 | 1,289,920 |

NB. The first two district-based HEF scheme became operational during 2000
Source: University Research Co., LLC, HEF Operational Database

**Table 6. HEF member visits to facilities by frequency and percent, 2004-2013**

| Department | Frequency | Percent |
|------------|-----------|---------|
| HC | 1,651,627 | 62.66 |
| IPD | 485,472 | 18.42 |
| OPD | 498,938 | 18.93 |
| Total | 2,636,037 | 100.00 |

## Distance to facility

In general, HEF patients travelled less than 10km to a health facility: 38% of all visits where by patients living within 1 km, 75% within five kilometers and 98% within ten kilometers (Figure 7). Patients travelled furthest for hospital services: on average, patients travelled 20.7 km for RH inpatient services and 23.3 km for outpatient services (Table 7). There were in some cases, though, outliers with very long travel distances that raised the average, reflected in a wide standard deviation on distance travelled. The large majority of distances travelled were small, and consequently proximity to a facility may be seen as a decisive factor in raising utilization rates through the HEFs. The most common distance travelled to a HC was only 1.6 km, for outpatient care at a RH 4.0 km, and for an inpatient visit 11.7km.

*proximity to a facility may be seen as a decisive factor in raising utilization rates*
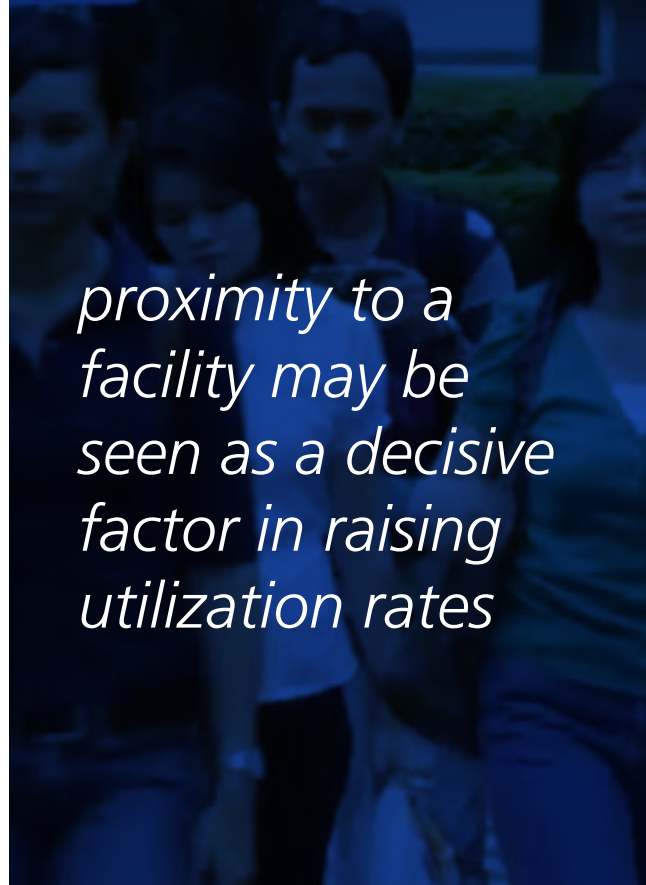
**Table 7. Distance travelled to facility by HEF patients by type of service, in km**

| Department | Mean | S.D. | Median |
|---|---|---|---|
| HC | 3.3 | 10.8 | 1.6 |
| IPD | 20.7 | 62.4 | 11.7 |
| OPD | 23.3 | 138.2 | 4.0 |

**Table 8. HEF reimbursements by cost category and type of facility, in Riels**

| Facility type | Statistic | Sub-category | | | | Total HEF payment |
| | | Fee | Transport | Food | Non-food | Total |
|---|---|---|---|---|---|---|
| HC | Mean | 3,744 | 154 | 7 | 3 | 3,908 |
| | Median | 3,000 | 0 | 0 | 0 | 4,000 |
| | S.D. | 5,745 | 1,418 | 230 | 285 | 6,180 |
| OPD | Mean | 7,558 | 9,509 | 10 | 28 | 17,105 |
| | Median | 5,500 | 0 | 0 | 0 | 8,200 |
| | S.D. | 13,688 | 20,999 | 381 | 1,165 | 24,866 |
| IPD | Mean | 98,827 | 17,589 | 23,323 | 462 | 140,202 |
| | Median | 61,000 | 10,000 | 20,000 | 0 | 105,100 |
| | S.D. | 114,505 | 28,494 | 28,862 | 5,319 | 128,724 |
| Total | Mean | 18,084 | 4,332 | 3,357 | 74 | 25,847 |
| | Median | 4,000 | 0 | 0 | 0 | 4,000 |
| | S.D. | 55,088 | 15,451 | 13,659 | 2,094 | 68,809 |

**Figure 7. Distance travelled to facility by HEF patients, % of visits**
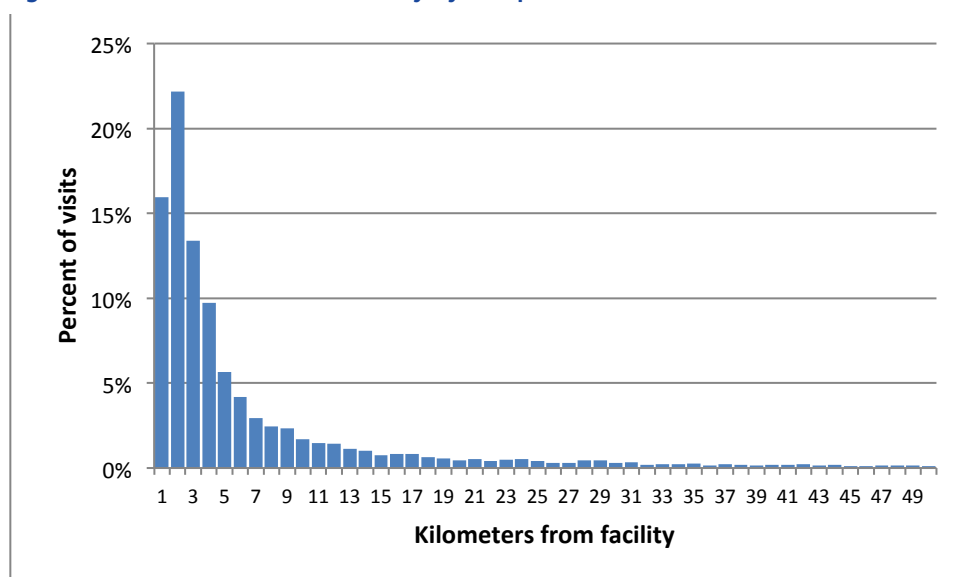
## HEF beneficiary profile

On average, HEF members visiting health facilities (HEE beneficiaries) were 27 years old, with the outpatient population slightly older (32) and the HC population slightly younger (25). A large number of facility visits were for infants and children, suggesting that HCs are an important sight for maternal and child health care. Of all patients visiting facilities in the period 2000-2012, 21% were five years or younger and 25% were 15-30 years or age (Figure 8).

For inpatient admissions, the average length of stay was 6.6 days, and only 10% of stays were longer than 10 days. This compares to a national average of 4.9 days nationally for hospitals outside of Phnom Penh,[23] suggesting that HEF benefits may encourage a longer stay in hospital. Further investigation is needed. Within the HEF Operational Database, facility codes for diagnosis and service delivery identified a diagnosis only for approximately 30% of the visits. The large majority of reported health facility visits (78%) were recorded simply as consultations. Even so, it appears that 12% of inpatient visits and 20% of outpatient visits at RH level were for newborn deliveries. Surprisingly, 8% of inpatient visits were recorded as pneumonia. Almost 10% of HC visits were for antenatal care or reproductive health.

## HEF reimbursements

For a single HC visit, the most common user-fee reimbursement was 3,000 Riels (or US$0.75); at the current level used for the calculation of the poverty line in Cambodia, the average family income for one day would be little more than US$3. Official user fees provide only 10% of government health expenditures nationally but can be a very significant source of operating revenue at facility level, and in many cases heavily subsidized by the HEF reimbursements. At HC level, there is no HEF reimbursement for patient transport or food costs as patients generally live in close proximity to the facility and the length of stay is short.

For a hospital visit, costs were greater, though most commonly only 5,000 Riels user-fee reimbursement for an outpatient visit, with almost 10,000 Riels for transport (Table 8). For inpatient services, the most common cost was approximately 60,000 Riels in user-fee reimbursement with 10,000 Riels for transport and 20,000 Riels for food costs reimbursed to the patient. Total inpatient costs, however, could be as high as 170,000 Riels per visit.

**Figure 8. Distribution of HEF patients by age at admission, 2000-2012**
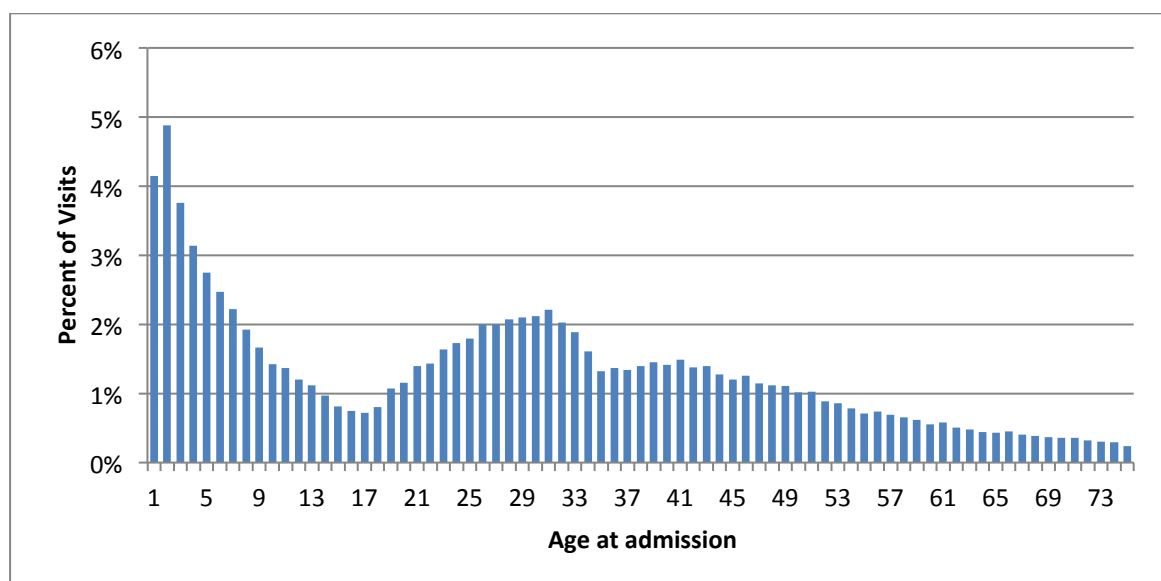
[23] MOH, National Health Statistics Report 2011

# B. UTILIZATION OF REFERRAL HOSPITAL SERVICES

The HEF system was originally designed to provide access to care at RHs within coverage districts, though coverage has subsequently been extended to HCs. RH utilization therefore provides the best indicator of the effectiveness of the HEFs. Within the public health system, it is expected that HCs act as primary care facilities, with referral to higher levels as required. While this is not consistently the case, outpatient services are nonetheless concentrated at HC level and OPD admissions at RHs remain at a relatively lower, though still significant, level. The most important role of the RH is in the provision of inpatient care. When interpreting the results from the analysis of hospital utilization it must be kept in mind that only one-in-four of all visits to health providers are at public facilities according to the CSES 2014. For this reason, some numbers in the analysis – for example the average number of newborn deliveries at some referral hospitals – may appear to be quite small. The results suggest that the role of the HEF is particularly significant in supporting IPD hospital costs for the poor, which are the major cause of catastrophic health expenditures, health-related impoverishment and health-related debt. The effect of the HEF on RH outpatient utilization appears to be positive but is less clearly evident in the data. Table 9, Figure 9 and Figure 10 describe the patterns of utilization during the period 2006-2012.

**Figure 9. Annual number of Health Centre consultations, 2006-2012 (all HC nationally)**
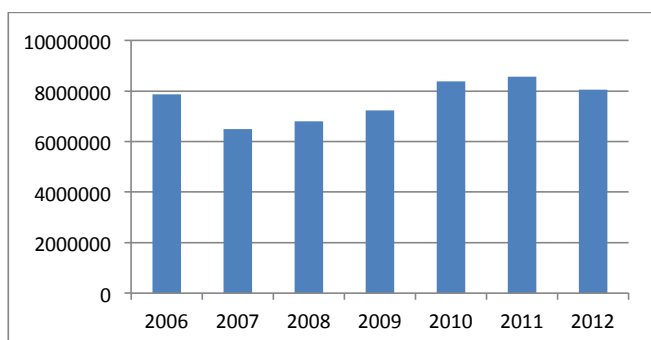


**Figure 10. Annual number of Referral Hospital inpatient discharges and outpatient consultations, 2006-2012 (all RH outside Phnom Penh)**
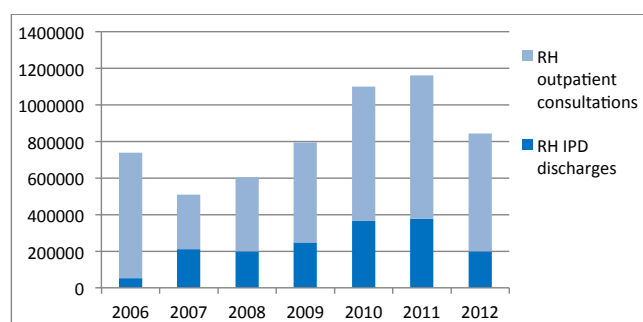


**Table 9. Number of visits annually at Health Centres and Referral Hospitals outside Phnom Penh, 2006-2012**

|  | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| RH IPD discharges | 52,937 | 211,864 | 199,196 | 247,597 | 364,229 | 377,385 | 198,820 |
| RH OPD consultations | 685,466 | 297,418 | 405,922 | 545,667 | 736,218 | 783,267 | 643,260 |
| HC consultations | 7,870,810 | 6,502,920 | 6,803,534 | 7,232,813 | 8,389,940 | 8,557,220 | 8,046,501 |
| Outpatient contacts/person/year | 0.58 | 0.44 | 0.47 | 0.50 | 0.64 | 0.60 | 0.59 |

Sources: MOH, Annual National Health Statistics Reports for 2006-2013

**Table 10: Comparisons of average IPD by type of hospital**

| Service provided | N | Mean | SD | Range |
|---|---|---|---|---|
| Total IPD consultations | 5,011 | 332 | 314 | 14-3,017 |
| Total IPD supported by HEF | 2,614 | 214 | 131 | 4-856 |
| IPD consultations at Provincial Hospitals | 931 | 742 | 446 | 68-3,017 |
| IPD consultations supported by HEF | 811 | 289 | 165 | 15-856 |
| IPD consultations at district RHs | 4,080 | 293 | 182 | 14-1,151 |
| IPD consultations supported by HEF | 1,803 | 181 | 94 | 4-563 |

Note: N = data points

## Inpatient department

There was a statistically significant positive relationship between the presence of a HEF and the number of inpatient admissions per month on average at RHs (Table 10).

Across the period, utilization rates at government hospitals rose in line with growing population, improved economic conditions and improvements in service delivery. The increased utilization was most evident at those facilities covered by a HEF, both because of the service quality standards required by the HEFs and improved access to care.

The average monthly total number of IPD cases increased significantly at RHs with HEF coverage compared to those RHs that never have had coverage under the HEF (Figure 11). The average number of monthly admissions at RHs with HEF coverage doubled over the 96 months but rose by only half at those RHs without HEF.

Across the whole period, HEF-supported cases accounted for more than half of all admissions at those RHs with HEF coverage. The consistently high proportion of HEF-supported cases is a strong indication of increased access to and utilization of RHs by the poor at times of need.

Fluctuations in the monthly average number of IPD cases (periodic spikes in the data) resulted partly from seasonal outbreaks of dengue fever at the start of the annual rainy season. The increased utilization was especially clear at RHs with HEF coverage, which it appears were best placed to respond to the increased need for hospitalization.

The growth of IPD consultations is a strong indicator of improved RH performance over the period as well as a parallel increase in HEF penetration, with HEF-supported cases maintaining a high level despite a relatively stable HEF population coverage (of around 50,000 on average per RH catchment area) as the catchment population increased.

The presence of the HEF, contracting or voucher scheme had a statistically significant effect on RH utilization (Table 11). T-test results of the binary analysis indicate that only those RHs with a Subo scheme had a lower level of utilization with the scheme than without (a curious result that is not explained by the data) while the presence of the HEF in particular and other schemes raised utilization significantly. It is simply not possible to disaggregate the potential specific impact of the HEF, contracting and vouchers on utilization completely. In our sample, the strongest correlation with increased utilization was observed for the facilities covered by the HEF. Facilities with contracting arrangements also showed a large increase, though less than the presence of the HEF. In both cases, the new average monthly utilization rate varied around 450 cases, raising the possibility that the HEF (on the demand side) and contracting on the supply side) may work in unison to improve facility performance. The positive contribution of voucher schemes – limited to fewer facilities and issued only for maternal health care – was noticeable but plays a role that is supported equally by the HEFs.

**Figure 11: Average number of IPD cases per hospital per month, 2006-2013**
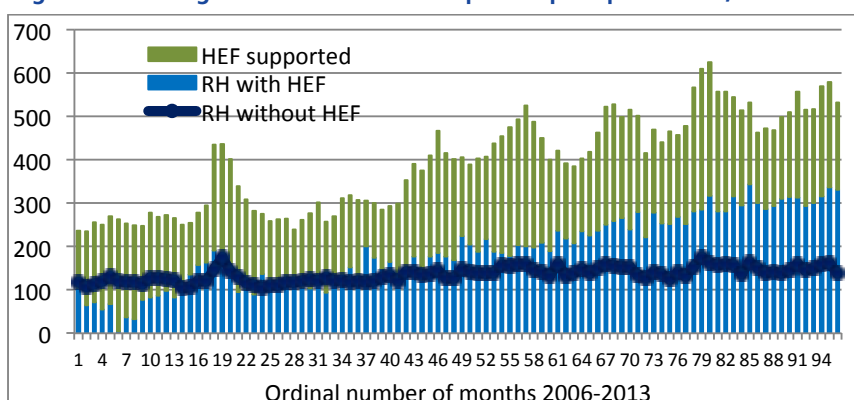
The multivariate regression analysis confirmed that the presence of the HEF as well as population change had a strong positive relationship with IPD utilization (Table 12). In Model 1, the presence of the HEF alone added on average 42 consultations per month to a constant of 229 (or 15% of average total IPD cases at those RHs with a HEF), though the result was not statistically significant. In Model 2, the effect was greater (70 additional cases), and statistically significant, at district RHs alone (excluding PHs). It appears that contracting was associated with reduced IPD utilization at these district RHs, but the result was not statistically significant. In Model 3, including all 62 hospitals, the HEF along with population numbers have a statistically significant relationship with raising IPD utilization (a rise on average of 48 cases per month per RH due to HEF and an increase by two cases when population is increased by 1000 persons).

**Newborn deliveries**
RH newborn deliveries were supported financially by user-fee payments, HEF reimbursements and maternal vouchers (as well as the midwife bonus at every RH). Data for newborn deliveries were available only for RH with HEF schemes (46 in total).
The presence of a HEF scheme had a positive and statistically significant relationship with the average monthly number of deliveries at RHs.

As Figure 12 shows, HEF-supported deliveries increased as a proportion of the total across the period, rising to 30% by 2013 (an average of 27% across the whole period). This indicates that poor women have access to hospital delivery services in proportion to their numbers in the total population.

The presence of a HEF or voucher scheme (designed to support maternal care) both had a statistically significant positive relationship with the level of deliveries at RHs (Table 14). T-test results of the binary analysis indicate that the presence of a HEF raised the average monthly number of deliveries from 24 to 73. The average number of deliveries at RHs with contracting was actually lower than RHs without contracting, and the difference was statistically significant. The reasons for this are not evident from the data and require further investigation.

However, the multivariate regression analysis indicated that the presence of a HEF had a statistically significant positive relationship with the average monthly number of deliveries at the HC only when combined with other schemes like contracting and vouchers (Model 2) (Table 15). The effect of a HEF on deliveries was greatest at district RHs and was dissipated when PHs were included (Model 3).

**Table 11. T-test comparing average number of IPD cases per hospital per month, with and without the stated intervention**

|  | Intervention | | Non-intervention | | |
|---|---|---|---|---|---|
|  | n | mean | N | mean | Sig |
| HEF | 2,933 | 468 | 2,075 | 139 | < .001 |
| Contracting | 1,540 | 445 | 3,468 | 281 | < .001 |
| Vouchers | 1,293 | 386 | 3,715 | 313 | <.001 |
| Subo | 346 | 189 | 4,662 | 343 | < .001 |

**Table 12: Inpatient cases: coefficients from the multivariate regression (fixed effects)**

|  | Model (1) (all hospitals) | Model (2) (excluding Provincial Hospitals) | Model (3) (all hospitals) | Model 3 [at 95% CI] | |
|---|---|---|---|---|---|
|  |  |  |  | Lower | Upper |
| Number of RHs | 62 | 48 | 62 |  |  |
| Data points | 5,008 | 3,959 | 4,858 |  |  |
| Constant | 229 | -84 | -47 | -274 | 180 |
| HEF | 42 | 70*** | 48* | 3 | 93 |
| Contracting | - | -46 | 14 | -106 | 135 |
| Vouchers | - | -0.5 | 18 | -29 | 65 |
| Subo | - | 1 | -22 | -59 | 1 |
| Population | - | 0.002 | 0.002* | 0.000 | 0.003 |
| Prob > F | . |  | . |  |  |
| F | . |  | . |  |  |
| R-sq (within) | .314 | .376 | .330 |  |  |
| Between | .317 | .100 | .045 |  |  |
| Overall | .163 | .139 | .126 |  |  |

*p<.05, **p<.001, ***p<.0001

**Figure 12: Total delivery cases and of deliveries paid by HEF, 2006-2013**
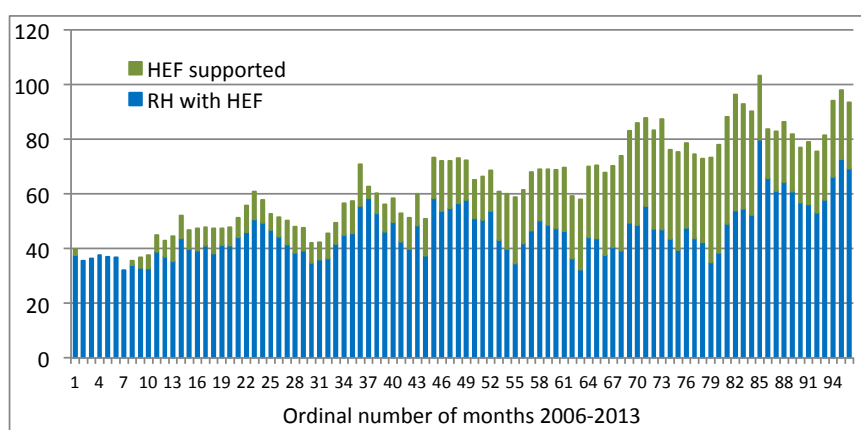


**Table 13: Mean number of delivery cases**

| Service provided | N | Mean | SD | Range |
|---|---|---|---|---|
| Total newborn deliveries | 3,471 | 67.75 | 67.62 | 1 – 2,096 |
| Total deliveries supported by HEF | 2,803 | 21.28 | 41.79 | 0 – 557 |
| Deliveries at Provincial Hospitals | 1,123 | 117.78 | 91.35 | 1 – 2,096 |
| Deliveries supported by HEF | 858 | 30.40 | 68.09 | 0 – 557 |
| Deliveries at district RHs | 2,348 | 43.83 | 31.63 | 1 – 223 |
| Deliveries supported by HEF | 1,945 | 17.26 | 20.51 | 0 - 123 |

**Table 14: T-test comparing delivery cases between hospital group with and without an intervention**

|  | Intervention | | Non-intervention | | |
| --- | --- | --- | --- | --- | --- |
|  | n | mean | n | mean | Sig |
| HEF | 3,077 | 73 | 394 | 24 | < .001 |
| Contracting | 1,495 | 55 | 1,976 | 77 | < .001 |
| Vouchers | 819 | 88 | 2,652 | 62 | <.001 |

**Table 15: Newborn deliveries: coefficients from the multivariate regression (fixed effects)**

|  | Model (1) (all hospitals) | Model (2) (excluding Provincial Hospitals) | Model (3) (all hospitals) | Model 3 [at 95% CI] | |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  | Lower | Upper |
| Number of RH | 45 | 31 | 45 |  |  |
| Data points | 3,471 | 2,301 | 3,395 |  |  |
| Constant | 34.8*** | 17.1 | 12.1 | -15.6 | 39.8 |
| HEF | 3.4 | 8.9* | 4.4 | -12.6 | 21.4 |
| Contracting |  | -12.1 | -0.5 | -30.9 | 29.8 |
| Vouchers |  | 2.7 | 14.9 | -11.3 | 41.1 |
| Population |  | 0.000 | 0.000 | 0.000 | 0.000 |
| Prob > F | . | . | . |  |  |
| F | . | . | . |  |  |
| R-sq (within) | .197 | 0.508 | 0.206 |  |  |
| Between | .006 | 0.094 | 0.054 |  |  |
| Overall | .067 | 0.262 | 0.110 |  |  |

*p<.05, **p<.001, ***p<.0001

## Outpatient department

Referral Hospitals are designed primarily to deliver IPD services and HCs are designed to provide primary, that is, ambulatory/outpatient care. Even so, the level of OPD care provided at RHs grew strongly across the period, from a monthly average of 300-600 to 1400-1600 (Figure 13, Table 16). HEF coverage for OPD care grew strongly during 2006-2013, rising from 2% of all cases to 22% or all cases (an average of 14% across the whole period). At those RHs that never had HEF coverage, OPD utilization grew much more modestly (from approximately 150 to 300 cases per month in total).

The reasons for these divergences could not be determined from the available utilization data but may be associated with a general improvement in the provision of government hospital services nationally, or the fact the better RHs – those that could meet quality of service criteria – were selected first for HEF coverage. Even so, by 2013, HEF-supported cases remained at a level which suggests that the HEF provided RH access for the very poor.

Among all 62 RHs, two-or-three outliers provided an extremely high level of OPD care. These were the very large hospitals in urban areas, particularly in Phnom Penh, Battambang and Banteay Meanchey.

The binary analysis suggests the presence of the HEF or contracting scheme at an RH had a statistically significant relationship with OPD utilization (Table 17). T-test results of the binary analysis indicate that those RH with HEF or contracting had on average a significantly higher number of OPD cases than those RH without these schemes, but most strongly for HEF, rising from 259 per RH per month to 1,114. It appears that the presence of a voucher or Subo scheme (which were available at only a small number of RHs) was associated with a lower level of OPD consultations. The reasons for this are not clear from the data but could possibly arise if the voucher and Subo schemes are available only at RHs with generally low levels of performance.

The results of the multivariate regression analysis were less clear, suggesting that the impact of none of the schemes (HEF, contracting, vouchers) on RH OPD cases was statistically significant (Table 18). The results indicate the presence of the HEF introduced at some time during the period increased the average number of OPD cases per RH by 24 per month, but the association was not statistically significant. The addition of contracting appears to make the effect of HEF stronger. The effect of HEF and contracting appears to be stronger at RHs (excluding PHs).

**Figure 13. Average OPD consultations per RH per month, 2006-2013**
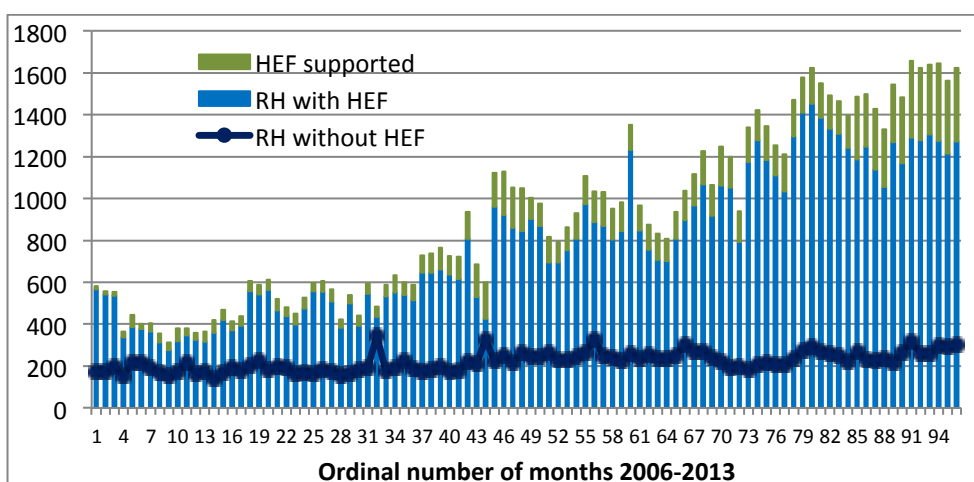
**Table 16. Hospital outpatient (OPD) services and OPD by HEF**

| Services provided | N | Mean | SD | Range |
|---|---|---|---|---|
| Total OPD consultations | 4,909 | 756 | 1,759 | 1-26,139 |
| Total OPD supported by HEF | 2,470 | 166 | 259 | 0-1,844 |
| OPD consultations at Provincial Hospitals | 913 | 2,266 | 36 | 16-26,139 |
| OPD consultations supported by HEF | 883 | 234 | 347 | 0-1,844 |
| OPD consultations at district RHs | 3,996 | 411 | 433 | 1-3,744 |
| OPD consultations supported by HEF | 1,587 | 127 | 183 | 0-1,370 |

**Table 17: T-test comparing OPD cases between hospital group with and without an intervention**

| | Intervention | | Non-intervention | | |
|---|---|---|---|---|---|
| | n | mean | n | mean | Sig |
| HEF | 2,854 | 1,114 | 2,055 | 259 | < .001 |
| Contracting | 1,481 | 877 | 3,428 | 704 | < .01 |
| Vouchers | 1,224 | 695 | 3,685 | 777 | > .05 |
| Subo | 360 | 174 | 4,549 | 802 | < .001 |

# C. UTILIZATION OF HEALTH CENTRE SERVICES

On average, the number of new-case consultations at HCs with HEF (641 per month) was greater than at HCs without HEF (581) (Table 19). This was true also when adjusted for changes in population in the catchment area (ratio of 0.051 and 0.047 respectively). Similarly, the average number of deliveries per month was 11.2 and 9.7 respectively, with delivery-to-expected-birth ratios of 0.030 and 0.027. In both cases the differences between the intervention group (with HEF) and the control group (without HEF) were statistically significant (independent-sample T-Test at p<0.01); this remained true when adjusted for population numbers and expected number of deliveries in the catchment area.

**New-case consultations and deliveries**
The presence of the HEF had a significant impact on increasing the level of HC utilization for new-case consultations and for deliveries, and seemed to provide coverage for the poor who would otherwise have been unable to attend health facilities.

The trend in new-case consultations is illustrated in Figure 14. In 2006, the number of HCs covered by the HEF was still very small and the impact was difficult to detect. By 2008,

the impact of the HEF on raising the level of new-case consultations became apparent. Experience in implementing the HEF has indicated a lag in impact of one or two years from commencement as communities learn the benefits of the new system. By 2013 almost half of all HCs were covered by the HEF, and the effect was more visible.

The contribution of the HEF to consultations and deliveries grew over time as a cumulative effect both within HCs and across all HCs. By 2013, about 20% of new-case consultations were supported by HEF, which was consistent with HEF coverage in the general population. It is clear too that HC visits rose and fell with the general trend in consultations at non-HEF HCs, which suggests that the HEF provided coverage for poor people at a time of need.

The pattern is much the same for deliveries (Figure 15), though the HEF providing support for deliveries at HCs with the HEF from 2006. That support grew in proportion over time. Again, the HEF supported approximately 15-20% of deliveries, which is in line with the level of poverty in the wider community. Once again, deliveries at HCs with a HEF once rose and fell in line with the non-HEF HCs, which demonstrates that the HEF added to the overall utilization of facilities in a way that would not have occurred otherwise.

**Table 18. Outpatient cases: coefficients from the multivariate regression (fixed effects)**

|  | Model (1) (all hospitals) | Model (2) (excluding Provincial Hospitals) | Model (3) (all hospitals) | Model 3 [at 95% CI] | |
|---|---|---|---|---|---|
|  |  |  |  | Lower | Upper |
| Number of RHs[a] | 61 | 47 | 61 |  |  |
| Data points | 4,909 | 3,870 | 4,754 |  |  |
| Constant | 708*** | -387 | 128 | -1585 | 1835 |
| HEF | 24 | 86 | 59 | -73 | 191 |
| Contracting |  | 96 | -240 | -757 | 277 |
| Vouchers |  | -40 | -109 | -303 | 86 |
| Subo |  | -19 | -87 | -220 | 46 |
| Population |  | .004 | .004 | -.006 | .015 |
| Prob > F | . |  | . |  |  |
| F | . |  | . |  |  |
| R-sq (within) | .043 | .156 | .047 |  |  |
| Between | .059 | .265 | .011 |  |  |
| Overall | .027 | .202 | .023 |  |  |

*p<.05, **p<.001, ***p<.0001
Notes: a. Determined by data availability

**Table 19. Average number and ratio of new cases and deliveries per month (HEF intervention and control groups), 2006-2013**

| Variable | | Intervention group (with HEF) | Control group (without HEF) |
|---|---|---|---|
| Number of new-case consultations | N = | 42458 | 49757 |
| | Mean | 641 | 581 |
| | Standard deviation | 382 | 388 |
| Ratio of new-case consultations to population in the catchment area | N = | 40824 | 46850 |
| | Mean | .05139 | .04696 |
| | Standard deviation | .03152 | .03489 |
| Number of deliveries | N = | 42451 | 49755 |
| | Mean | 11.19 | 9.66 |
| | Standard deviation | 10.494 | 11.576 |
| Ratio of deliveries to expected deliveries in the catchment area | N = | 41488 | 48096 |
| | Mean | .02960 | .02706 |
| | Standard deviation | .02565 | .02890 |

**Figure 14. Average number of new-case consultations per month at HCs, 2006-2013**
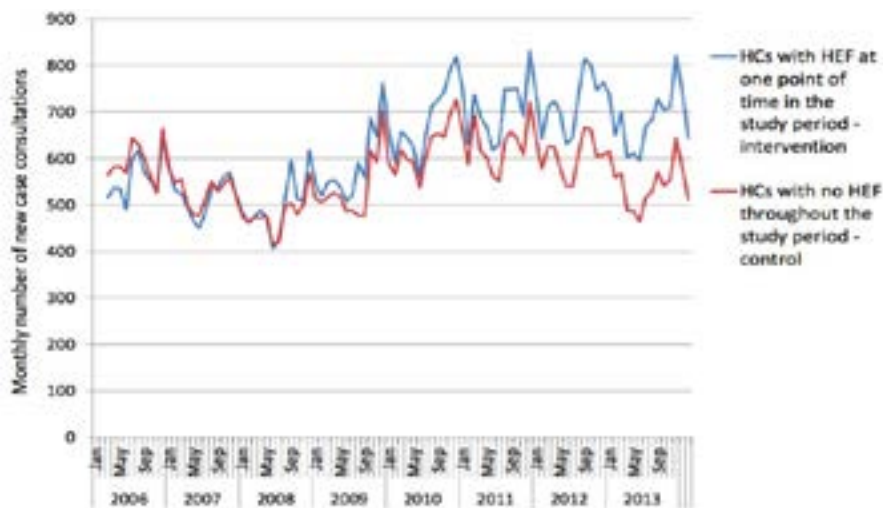


**Figure 15. Average number of deliveries per month at HCs by intervention and control status**

## Significant difference due to the HEF

Bivariate relationships – calculated for new-case consultations (number and ratio to population) and deliveries (number and ratio to expected births) – indicate that the presence of the HEF had a statistically significant positive relationship with the number of consultations and deliveries (Pearson correlation; at the 0.01 level; two-tailed Sig.). However, the relationship was relatively weak (Pearson correlation 0.111), though slightly stronger with the presence of contracting (0.216). The relationship was negative but weak for voucher schemes (Pearson correlation -0.011). The positive correlation for HEF and contracting remains when the population ratio is considered. The results confirm that the HEF is associated with higher levels of new-case consultation.

The positive relationship between the presence of a HEF and the number of newborn deliveries was evident for all schemes (HEF, vouchers and contracting) and strongest for the presence of HEF alone (Pearson correlation 0.178), and remained when the population ratio was considered.

The multivariate analysis confirmed that HEF status had a positive relationship with the number of new-case consultations (Table 20, column 1). The numbers suggest that, at HCs with HEF, if there were normally 566 new consultations per HC per month (p-value<0.01), it could be expected that an additional 90 additional cases would be provided through the HEF (or 13% of total new cases; p-value<0.01). When confounding factors were controlled for (model 1-5) the relationship of new-cases to HEF status remained and was statistically significant (at least 82 new cases attributable to the HEF at below the 0.01 confidence level). The

**Table 20. Impact of HEF on new-case consultations at health centres**

| Variable | (1) New-case consultations per HC | (2) New-case consultations per HC | (3) New-case consultations per HC | (4) New-case consultations per HC | (5) New-case consultations per HC |
|---|---|---|---|---|---|
| Number of HCs | 1,081 | 1,072 | 1,072 | 1,072 | 1,072 |
| Observations: N = | 92,215 | 87,674 | 87,674 | 87,674 | 87,674 |
| R-squared | 0.135 | 0.143 | 0.144 | 0.145 | 0.146 |
| Constant | 566.3*** | 510.7*** | 511.5*** | 495.6*** | 496.6*** |
| | [69.27] | [11.51] | [11.56] | [11.22] | [11.26] |
| HEF | 89.7*** | 84.2*** | 84.5*** | 81.5*** | 81.9*** |
| | [7.06] | [6.68] | [6.71] | [6.49] | [6.53] |
| Population ('000) | | 3.895 | 3.854 | 3.818 | 3.782 |
| | | [1.186] | [1.177] | [1.171] | [1.164] |
| Voucher | | 16.2 | | 14.6 | |
| | | [1.4] | | [1.3] | |
| Contracting | | | | 56.9*** | 56.1*** |
| | | | | [3.3] | [3.2] |

*** p<0.01
Note: Coefficients for time dummy variables not shown. Intervention variable is included in the fixed effects. Robust t-stats in brackets. Standard errors were clustered at the HC level.

**Table 21. Impact of HEF on deliveries at health centres**

| Variable | (1) Deliveries per HC | (2) Deliveries per HC | (3) Deliveries per HC | (4) Deliveries per HC | (5) Deliveries per HC |
|---|---|---|---|---|---|
| Number of HCs | 1,081 | 1,072 | 1,072 | 1,072 | 1,072 |
| Observations: N = | 92,206 | 87,665 | 87,665 | 87,665 | 87,665 |
| R-squared | 0.346 | 0.340 | 0.341 | 0.340 | 0.341 |
| Constant | 2.978*** | 0.670 | 0.719 | 0.672 | 0.736 |
| | [14.86] | [0.723] | [0.783] | [0.725] | [0.800] |
| HEF | 0.770** | 0.700* | 0.718** | 0.700* | 0.721** |
| | [2.083] | [1.900] | [1.965] | [1.898] | [1.970] |
| Voucher | | | 0.954*** | | 0.956*** |
| | | | [2.872] | | [2.874] |
| Population ('000) | | 0.151** | 0.149** | 0.151** | 0.149** |
| | | [2.275] | [2.257] | [2.274] | [2.257] |
| Contracting | | | | -0.009 | -0.063 |
| | | | | [-0.018] | [-0.125] |

*** p<0.01, ** p<0.05, * p<0.1
Note: Coefficients for time dummy variables not shown. Intervention variable is included in the fixed effects. Robust t-stats in brackets. Standard errors were clustered at the HC level.

presence of the HEF therefore had a positive and robust relationship with the number of new-case consultations.

The multivariate analysis also confirmed that HEF status had a positive relationship with the number of births per HC (Table 21, column 1). The presence of the HEF increased by approximately 1 (p-value<0.05) the average number of deliveries otherwise carried out at HCs (constant of almost 3; p-value <0.01). Controlling for confounders (columns 2-5) did not affect the positive result for the HEF at a confidence level of < 0.01. The presence of the HEF had a positive and robust relationship with the number of deliveries; understandably, the presence of a voucher scheme had a positive relationship with the number of deliveries (p-value<0.01), though contracting did not.

# DISCUSSION AND CONCLUSIONS

The HEF system is the largest and most significant social security scheme in Cambodia in terms of population coverage. During the last 15 years it has been scaled up from an initial two ODs and two RHs to national coverage of government health facilities in every Operational District in the country, including every HC, by 2015. The HEF is currently funded approximately 40% by government taxation revenues through the health budget and 60% by donor funding with an expectation that the government contribution will rise. The HEF is financially sustainable and effective in providing access to government health services for the poorest one-fifth of the population who would most commonly not have access to care otherwise.

From the beginning, the design function and the primary purpose of the HEF was to provide access to health care for the poor by directly reimbursing government health facilities. The HEF does not fund the full cost of government health service delivery, the main part of which is subsidized through the health budget; the HEF funds the cost of service fees for the poor. An indirect benefit of the HEF is to provide a source of additional financing, on the demand side, to health facilities, though this was not their intended purpose. Nonetheless, the HEF was designed originally to reimburse only RH (where user-fees were greater) and not HC (where user fees were negligible). Our analysis took full advantage of a period in HEF development during 2006-2013 when the HEF had been established and were operating for some time in a large number of, but not all, Operational Districts.

This provided the opportunity for a rigorous analysis of national quantitative data in two ways, using the DID approach: first, an analysis of those facilities with HEF coverage and those without; secondly, the analysis of these differences and how they changed over time. This is the most complete analysis yet carried out of the primary purpose of the HEF – providing access for the poor – and the only analysis of comprehensive national data on HEF beneficiaries and health facility utilization.

It is clear that proximity to a health facility is an important factor in the utilization of RH and HC services for HEF members (particularly at the HC level): most travelled less than 10 kilometers and one-third less than one kilometer to reach a health facility. While HEFs have reduced the financial barrier to access to health services, it is the ongoing process of extending the number of HC and RH nationally that seems to have reduced the physical barrier to access. This perhaps indicates a virtuous relationship between demand-side and supply-side improvements. Wide variations in travel distance, however, indicate that the process of providing physical access is not yet complete.

The distinct pattern in the age distribution of HEF-patient visits to facilities – heavily concentrated in the 0-5 and the 25-35 age groups – suggests the possibility that HEF membership is of particular value to mothers and their children. While the diagnostic category was poorly recorded for HC and RH visits in the membership database, a significant but minor proportion of visits at RH level were for newborn deliveries as well as antenatal and reproductive health care. However, the sex distribution of HEF patients was not recorded in the membership database and this conclusion therefore awaits further investigation. The possibility also arises that maternal and child health care remains the most commonly felt need among HEF members (while national statistics indicate both major reductions in the infant, child and maternal mortality and a rise in the prevalence of non-communicable disease as a major cause of morbidity).

The longer RH inpatient ALOS for HEF beneficiaries may suggest that HEF benefits encourage a longer stay in hospital in order to increase hospital revenues. Supplier-induced demand of this sort needs to be further investigated and closely monitored, particularly in circumstances where HEF coverage and utilization is rising and there is a prospect of broadening the population base of the HEFs.

Otherwise, escalating HEF costs in the longer term could threaten the financial viability of the system.

Both the increased access to facilities by HEF members and rapid increase in the number of HCs covered by HEFs led to a steep rise in total facility visits by HEF beneficiaries during 2006-2013. Of the total number of facility visits during 2006-2013, 63% occurred at HCs and the remainder was evenly split between RH IPD and OPD departments. These numbers indicate a growing role for HCs as HEF coverage expands and reinforces the expectation that HEF coverage of the HCs may well strengthen the referral system. Further investigation would be beneficial.

The share of HEF beneficiaries in total RH and HC contact numbers is consistent with the proportion of poverty among the general population (roughly 20%) and indicates the HEFs are serving their primary purpose. While no data on out-of-pocket expenditures were available, a measure of average HEF reimbursements for an IPD admission or OPD visit was in line with standard facility fees and indicated a degree of financial protection provided by the HEF. Further information on potentially catastrophic health care payments by HEF members is needed.

A significant increase in utilization levels at government facilities has often accompanied the process of removing user fees at government facilities internationally, particularly in low-income countries in Sub-Saharan Africa.[24] Similarly, the HEF model in Cambodia (which protects the poor financially and provides the basis for extension of social protection measures further across the population) shows that the funded exemption of user-fees for the poor is an effective and sustainable alternative that has the additional advantage of protecting health facility revenues. In this respect, the HEFs remain an interim measure of particular value on the path towards strengthening social health protection and the fuller funding of health care through

the government budget. Where raising government expenditure is not a viable means for replacing user-fee revenues at facilities, the HEFs are a proven means for filling the gap while protecting the poor.

Generally, HEF beneficiaries are represented in utilization numbers (for HCs, OPD, IPD and deliveries) in proportion to their composition within the general population (approximately 20%) suggesting that the HEF is effective in meeting their primary and fundamental design purpose, that is, to provide access to government health services for poor people who previously in general were unable to attend health facilities principally due to financial barriers.

This analysis fills a gap in the evidence and satisfies a need within the Cambodian health system for conclusive evidence on the effectiveness of the HEF. The study provides the foundation for further work on the structure and implementation of the HEF now that it has achieved national coverage. This additional work could include issues such as beneficiary identification method, national HEF organization and management, definition of benefit package, reliable funding sources, and monitoring and evaluation.

There is an unavoidable difficulty in isolating the effect of one scheme in conditions where many exist side-by-side at the same facility. In our analysis, we controlled for the impact of contracting of service delivery at Operational District level, of vouchers for maternal health care and of the government's Subo scheme. Even so, the co-existence of these schemes affects the outcomes of the quantitative analysis and may mask the impact of the HEF alone.

Only one tertiary national hospital has HEF coverage, though HEF coverage is provided through the Phnom Penh municipal RH. National Hospitals have increasingly become more autonomous in their financing and service delivery operations within the context

[24]Barbara McPake, Nouria Brikci, Giorgio Cometto, Alice Schmidt and Edson Araujo. (2011). Removing user fees: learning from international experience to support the process. Health Policy Plan.26 (suppl 2): ii104-ii117.

of the MOH and are increasingly expected to raise additional revenues through user fees. The challenge of providing financial protection for the poor at these facilities needs further investigation.

The limitations of our study are the product of using routine health information data for which the quality is dependent on the accuracy of the reporting process (which cannot be regarded as completely reliable). Though we controlled for known changes in population numbers, it was not possible to identify a clear and consistent population denominator over time, nor account for the social and economic attributes of women who gave birth. No data were available on the attributes of HC users, including their poverty status. Many of these limitations derive from the inability to make fuller use of the HEF Operational Database due to its technical design.

The use of national aggregate data, averaging outcomes per month and per facility, meant there was no opportunity to look more closely at particular Operational Districts or facilities. For technical reasons, we did not have access to census data or to valid household data. Conditions do vary between Operational Districts and between facilities. Based on our findings, further work that looks at particular cases, and especially outliers, would be of great value in the further administration of the HEF and the health system more broadly.

Other limitations include incidences of missing data due to failures in the HMIS reporting practice. Some items of the data appeared inaccurate but there was no opportunity to identify an explanation. There may also have been an interaction between explanatory variables for which it was not possible to take account. For example, contracting may act to improve service provision, which would result in attracting more fee-paying clients; it was not possible to capture this effect. We are also conscious that the facilities selected for HEF coverage were likely to be, in any case, the better performing facilities.

For these reasons, it is not possible to establish causality between the presence of a HEF and increased utilization of health services. While in our analysis we controlled for some alternative explanations of the rise in utilization at those health facilities covered by a HEF, we were unable to reject the hypothesis that there may have been other, unidentified, potential causes. Even so, the increased utilization over time of HEF-supported cases suggests a strong correlation between the role of the HEF and increased access to care for the poor.

Despite the limitations, the study strongly suggests that further support for the HEF policy-making process is justified and provides additional empirical evidence supporting the further consolidation of the HEFs. The HEF now cover all RHs and HCs in the country; the consolidation of the HEFs as a national social health protection mechanism therefore raises challenges associated not with geographic expansion but with population coverage (extending beyond the poor) and with making demand-side health financing mechanisms more efficient. The results of the study suggest that the best results may be achieved when the various schemes work in combination. There is clearly common ground between HEFs and the contracting of service provision (both of which provide incentives for improved facility and staff performance); voucher schemes (which provide benefits already available through the HEFs) may in practice be thought of as a mechanism used specifically to target weaker areas of service delivery more effectively and with greater precision.

The positive impact of the utilization of HEF on HC services and access to HCs by the poor is surprising given the original design of the HEF as hospital based mechanisms but indicates too that financial barriers to primary care services are real for the poor and the HEF has an important role to play in removing those barriers. One reason for this may be the strengthening of HC service delivery during the study period. The extension of the HEF to HC coverage can only add to efforts to improve the health care referral system.

The rise in utilization of HC services by the poor may also underlie the failure to find an association between RH OPD utilization and the presence of the HEF. In fact, the provision of hospital OPD service to HEF patients began

in practice on an ad hoc basis and at different times. Hospitals were officially approved to offer OPD services to HEF beneficiaries only in 2013.

The effect of the HEF on uptake of IPD services was even greater among district-level RHs (commonly known as CPA1 and CPA2) than PHs (CPA3).[25] As many of the PH were covered by the HEF earlier than 2006, it is possible that increased in utilization due to the presence of the HEF had been fully achieved prior to 2006 with little additional rise in utilization numbers in following years. This would occur if coverage of the poor population by HEFs was effectively saturated in the early years (meaning little further population coverage occurred) while the numbers covered by HEF remained stable also due to a reduction in average poverty rates.

For similar reasons, the presence of the HEF had a positive relationship with hospital newborn delivery at district RHs though not at PHs. District RHs (CPA2-3) function as the primary facilities for newborn deliveries while PH activities (CPA 1) focus on higher levels of care. Furthermore, as most of the PHs had HEF coverage prior to 2006, the relationship with deliveries was again more difficult to detect.

The results also indicate that the effect of the HEF on the utilization of health services went beyond the HEF beneficiaries. The HEF had an indirect relationship with service provision by helping to raise the quality of service delivery and therefore attracting fee-paying users to the hospitals.

This adds to the evidence that the presence of a HEF was a useful and effective mechanism for improving utilization of hospital services, particularly IPD care, by the poor and for enhancing hospital performance and productivity. At the same time, the better functioning of HCs over time may have acted (appropriately) to divert some patients from hospital OPD services. While it appears the presence of a HEF and/or contracting at a RH is associated with improved utilization, the results

of the regression analysis are statistically less certain.

Based on this comprehensive research, it is concluded that the presence of a HEF:
- Is associated in most cases with proximity to health facilities, serves best mothers and their children, reimburses user fees at standard rates and works increasingly in support of the referral system;
- Had a positive relationship with increased access to and utilization of hospital IPD services by the poor;
- Had a positive relationship with increased overall uptake of inpatient care at hospitals; the impact was stronger among district RHs than among PHs;
- Had a positive relationship with increased the uptake of OPD services at hospitals by the poor;
- Had a significant positive relationship with increased utilization of hospital newborn delivery service by the poor, and was particularly strong at district RHs.
- Had a positive relationship with an increased level of HC utilization for routine consultations and deliveries by the poor.

We conclude that the HEFs have therefore been effective in fulfilling their design function of removing financial barriers to access, providing access to health services and raising the level of utilization of government health facilities by the poor. While causality between the presence of a HEF and increased utilization of RH and HC services could not be demonstrated in this research, we are confident that the findings fully suggest the government should continue funding the HEFs, further expand population coverage and consolidate the HEFs as a national social health protection mechanism and recommend that the results of this study be used to refine and strengthen the HEF program.

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[25] CPA designates the Complementary Package of Activities, which is the official package of services offered by government hospitals. Levels 1, 2 and 3 indicate different levels of care (different packages), with level 3 offering the most complete package, including surgery, and available only at Provincial level.

Hospitals were officially approved to offer OPD services to HEF beneficiaries only in 2013... we are confident that the findings fully suggest the government should continue funding the HEFs

# APPENDIX 1: ANALYSIS OF THE HEF MEMBERSHIP DATABASE

By Ellen Moscoe, Harvard T.H. Chan School of Public Health

## Research aims

This project aimed to perform the first comprehensive national assessment of household-level benefits attributable to Cambodia's Health Equity Funds (HEFs) and the associated costs of implementation.

Intending to combine HEF administrative data from the membership database with other data sources, such as the Cambodia Socio-Economic Survey (CSES), our original goal was to estimate the cost effectiveness of the HEF program in terms of health care activities and financial risk protection. From the beginning of the project, however, we faced several unanticipated problems with the data, which caused us to shift away from the type of analysis we had anticipated.

In effect, as the pre-existing membership database provided an incomplete record of individuals and families, we could not construct information about the HEF "eligible" population, despite extensive efforts and the integration of earlier databases. The available data were, therefore, incomplete in terms of the admissions/visits themselves and provided no usable information about the individuals/ families.

The database did, though, provide for the first time useful information in the form of descriptive statistics, though still limited, on the visit characteristics while not revealing information about the population who used the facilities, or the population eligible to use them.

## Description of the HEF membership database

The HEF membership database was developed as an administrative tool to track health service utilization by identified HEF beneficiaries for the purposes of making payments and auditing facilities.

The database was developed as an administrative tool to track health service utilization of HEF beneficiaries for the purposes of making payments and auditing facilities. The HEF membership databased was constructed as a record of HEF beneficiary utilization of health facilities; it provides a record of beneficiary visits to facilities and performs this task well. We obtained the database as a series of backup files from the Ministry of Health (MOH) and the administrators of the database, the University Research Company (URC). We merged different data sets to make a complete and consistent database that included 2.6 million admissions between January 2004 and June 2013.

The database was not designed as a complete record of HEF membership, nor as a research database. The database comprises beneficiary records obtained from the IDPoor national identification of poor households. As each round of the IDPoor identification process is independently carried out, each round of the identification process assigns to families a different record number from previous rounds.

## Suitability for various types of analysis

For research purposes, it is necessary to have a consistent identifier of individual HEF beneficiaries, both for comparison of trends over time and for comparison with companion databases. The database, however, includes no variable that can be used as a consistent family identifier.

Our goal was to use the database to analyze HEF beneficiaries who were health facility users and those who were non-users and to develop an estimate of household-level benefits attributable to HEFs. After extensive work with the data, the team encountered issues that precluded using it for such analysis.

We made extensive efforts to prepare the database for in-depth statistical analysis of HEF beneficiaries, utilization rates, non-use by beneficiaries, health service characteristics and household behaviours. Through a number of

meetings and discussion working collectively with colleagues at URC, both remotely and face-to-face, we carried out a detailed assessment of the database. We implemented several measures to identify key features of the data set and to ensure that the structure was suitable for analysis.

In order to perform any analysis at the level of individuals or households, the data structure needed to allow us to identify unique individuals in the database without counting any individual multiple times, and then to follow these individuals over time.

Due to the actual procedure for assigning identification numbers to each HEF member, which creates new identifiers for each wave of ID Poor pre-identification, this was not possible. The team attempted many alternative strategies to identify unique individuals, but none were possible with the database's structure.

Our quantitative analysts at the Harvard T.H. Chan School of Public Health searched for alternative strategies to organize the data for analysis. Eventually, we concluded that without a data structure that allows for uniquely identifying individuals with no duplication,

we were not able to perform any analysis pertaining to HEF coverage or household benefit.

**Descriptive data**
In contrast, the admission-level information was complete and each admission record can be uniquely identified with no duplication. This meant that we could access information on every instance that a HEF beneficiary utilized services, and we could therefore perform admission-level analyses. This was useful for generating indicators about the visits to health facilities covered by the HEF schemes and their characteristics.

As a record of 2.6 million facility visits, the database revealed a small number of descriptive statistics that were useful. These statistics, fully described in the main research report, provide the first national profile of HEF beneficiaries and their use of public health services. These indicators include  type of facility visit (in-patient, out-patient, health centre), benefits paid (visit cost, transport, food, etc.) and basic categories of diagnosis and services received.

# APPENDIX 2: HEF LITERATURE REVIEW

By Ir Por, National Institute of Public Health and Peter Leslie Annear, Nossal Institute for Global Health

## Context and background

A long period of civil war and genocide in Cambodia that began in the 1970s devastated Cambodia's infrastructure and health system. In a period of relative peace and development from 1990, the Ministry of Health (MOH) and development partners have made considerable efforts to reconstruct and strengthen the health system [1] and have achieved some outstanding results, reflected in a significant increase in life expectancy, a steady reduction of maternal and child mortality [2], and decreased incidence and prevalence of infectious diseases, such as malaria, tuberculosis and HIV, and polio-eradication. However, many health indicators remain below international standards and are among the lowest in the region.

Despite consistent economic growth in the past decade, Cambodia remains one of the poorest countries in South-East Asia. With a population of 15 million, GDP per capita was US$1,008 in 2013. While the national poverty rate dropped from 52% in 2004 to 20% in 2011, most households only marginally escaped poverty and remain highly vulnerable; even small shocks can quickly push them again below the poverty line [3,4].

The health sector remains fragmented, and the relatively low level of utilisation of public health care providers raises specific concerns [5]. The share of out-of-pocket expenditure (OOPE) in total health expenditures in Cambodia is high by global standards, accounting for over 60% of the total health expenditure, and paid mainly to private providers [6,7]. A growing body of evidence shows illness to be one of the main causes of impoverishment and indebtedness in Cambodia [8-11]. Putting in place a mechanism to relieve people from the need to shop for health care in the private sector and to provide access to public health

facilities where treatments are typically less expensive though still of an acceptable quality is one way to help prevent such consequences.

However, access to public health services has been a constraint for much of the Cambodian population, especially the poor. Official user fees at public facilities have provided an important source of revenues for health facilities and health staff and are crucial for public health facility performance. However, health-care expenses have been a major financial barrier to accessing public health services for the poor, especially when added to other costs, such as transportation [12-13].

## Health financing

The Cambodian health system is characterized by a pluralistic mix of public and various types of private providers, including non-medical providers. The public sector dominates preventative services while the growing and loosely regulated private sector provides curative services, mainly out-patient care to the majority of the population. Today, public health services are provided through a network of more than 1,000 health centres for primary care and nearly 100 referral hospitals providing higher levels of care. These facilities are financed through a combination of government budget funding of salaries, drug supplies and recurrent costs, user fees paid by patients, and payments through various demand-side social health protection schemes.

While an increasingly high proportion of citizens, especially women and children, appear to enjoy access to public-provided and subsidized preventive care services (e.g. vaccinations, family planning services, antenatal and postnatal care, and facility-based deliveries), the majority of Cambodians seek curative care services, mainly outpatient care, in the private sector. Approximately 62% and 72% of the first treatments of illnesses or injuries respectively took place at private providers, including non-qualified practitioners [14,15].

User fees, with exemptions for the poor, were introduced at government health facilities in

1997 and gradually expanded to all public health facilities. The schedule of user fees is set nationally at a relatively low price (estimated to be about 30% of the full cost of service delivery). Ninety-nine percent of the user fee revenue is retained at the health facility and is used to provide staff incentives and to supplement operational budgets. The available evidence suggests that the implementation of user fees improved the performance of public health facilities but became a barrier for the poor to accessing public health services, especially hospital services, where the exemption system failed.

From the beginning, the user-fee policy included exemptions for the poor, but the evidence showed quickly that exemptions but did not work well, especially due to a perceived conflicts of interest [16-18]. Because user fees provided significant revenue to facilities, the exemptions were a cost that these poorly funded providers could not afford. Therefore, from early 2000, NGOs active in Cambodia and the MOH pioneered a new strategy, called the Health Equity Fund, to enable the poor to access public health services based on maintaining user fees and reimbursing the facilities for the user-fee exemptions provided [19,20].

**Health Equity Funds**
The Health Equity Fund (HEF) is a social health protection measure designed to reimburse the cost of user-fee exemptions for the poor at public health facilities. The HEFs therefore act as a demand-side health financing mechanism initiated in Cambodia as a strategy to improve access to public health services for the poor and to protect them from catastrophic effects of health care costs.

The Cambodian health system is a three tier structure with tertiary national hospitals in the capital, secondary-level provincial and district-level referral hospitals, and sub-district health centres providing primary care. Health Operational Districts have been created to cover the national population, each with a referral hospital and 10-20 health centres.

Initiated in two districts in 2000, the district-based HEFs act as a third-party purchaser of health services from public health facilities. Their management at district level is entrusted to a third party, usually a national NGO (known as HEF Implementer) sub-contracted by the central HEF authority (the HEF Operator) and the MOH. he HEFs identify the eligible poor at district level and fund the providers monthly for user-fees exemptions provided to identified poor patients. Other more limited health financing schemes have been implemented alongside the HEFs (such as maternal health vouchers and other staff incentive payments).

HEF beneficiaries are identified according to objective eligibility criteria, either at the household level before accessing health services (household pre-identification survey) or on presentation at the health facility through an interview process (post-identification), or a combination of the two. Initially, pre-identification was carried out by the HEF Implementer; now, the pre-identification of the poor is a national system carried out through the IDPoor household survey through the Ministry of Planning. At health facilities, eligible poor patients receive full or partial support from the HEF for the cost of user fees, transport costs and other related costs during hospitalization such as food allowance and cost of funeral in case of death.

Since 2000, HEFs have been progressively scaled up nationwide to address financial barriers to accessing public health services for the poor and to protect them from catastrophic effects of health care costs. By 2013, HEFs were implemented in 51 (or 58% of) referral hospitals and 421 (or 40% of) health centres in 48 (or 60% of) health districts in the country. The HEF is now a national system comprising district-based funds, which were initially established at district referral hospitals and later expanded to health centres within each district. By December 2015, HEF coverage extended to every referral hospital and every health centre in the country.

**Previous studies**

An interesting feature of the HEF experience in Cambodia has been the role of evidence in policy development [21]. Policy makers and donor partners have sought out evidence on the operation of the HEFs as a basis for developing national health financing policy, even where the available evidence has been limited in its quality. Much of the early evidence was based on case studies of HEF implementation at district level. Other evidence has been based on a mixture of methods, including key informant interviews, small household surveys, and time series analysis using routine data. This evidence did, though, consistently suggest that the introduction of the HEF coincided with a strong increase in utilisation of hospital services by the poor and a decrease in paying patients was not evident [22,23]. Other case studies suggested an HEF impact on reducing the incidence of health related debt [24,25].

Many studies of HEF implementation and outcomes have been carried out during the past 15 years. In 2010, Annear [26] reviewed 92 published articles and other grey literature on the operation and effectiveness of HEFs and related demand-side interventions, such as performance-based contracting, vouchers, community-based health insurance, and user fee exemptions between 2001 and 2010.

*The key findings of this extensive review can be summarized as follows:*

- Hospital-based HEFs were found to be effective in lowering financial barriers to access to public hospital services for the poor, thus increasing the utilisation of public health services and reducing (but not eliminating) debt for health care.
- HEFs are a significant source of additional revenue for public health facilities and staff incentives, and therefore help to improve staff attitudes toward providing care to poor patients.
- The targeting of the poor in HEFs was accurate and cost-effective at the time of pre-identification.
- There was evidence on the impact of HEFs on improved quality of care, though it was not conclusive.
- There was limited evidence on the impact of HEFs on reduced household health expenditures as well as reduced impoverishment due to health care costs and on improved health outcomes.
- One study found hospital-based HEFs to be effective in complementing health centre-based vouchers and other midwifery incentives to increase institutional delivery for poor women in rural areas.

The review also highlighted the common design features of HEFs and implementation issues, including pre-requisites for HEFs and their potential in linking with and complementing to other health financing interventions.

**The main body of evidence**

Among the most informative papers published on HEF-related issues five in particular provide detailed information:

1. In 2004, Hardeman and colleagues [27] conducted the first in-depth evaluation of a hospital-based HEF pilot in Sotnikum two years after commencement of operation. The evaluation was based on routine data, key informant interviews and in-depth interviews of 68 randomly selected hospitalised and non-hospitalised patients. The findings suggested that HEF effectively improved financial access to hospital care for the poor and had the potential to protect poor households from the negative effects of health care costs through direct cost subsidies at the hospital and preventing unnecessary expenditure in the private sector. The authors highlighted three conditions that made the HEF effective: (i) a relatively well-functioning health service, in which health staff are present, drugs available and informal charges absent; (ii) the socio-economic context in rural Cambodia which allows charging (low) user fees to the majority of the population, while targeting support to those unable to pay; and (iii) management of the HEF by a local NGO which has solid knowledge of the local socio-economic context, good skills to target and a strong motivation to serve the genuinely poor.

2. A 2006 study by Jacobs and Price of a pagoda-managed HEF in Kirivong [28], comparing data from two cross-sectional household surveys, suggested an impact of HEF on improving access to public health services and reducing health care expenditure for the poor. The pagoda is the community centre for Buddhist worship and was used in this district to implement the HEF. The study highlighted the importance of community participation in the management and financing of the HEF, which in turn can enhance its sustainability.

3. A comparative analysis by Noirhomme and colleagues in 2007 [29] of four hospital-based HEF schemes, including those in Sotnikum and Kirivong and based mainly on routine data and key informant interviews, provided more evidence on the impact of HEF on increased utilisation of public hospital services by the poor. The analysis identified several key design aspects associated with the effectiveness of the HEF scheme, including the existence of subsidies, the presence of a leading agent, a clear separation of roles, appropriate identification techniques and a holistic consideration of different barriers to health service utilization.

5. Ir and colleagues [30] assessed the effectiveness of HEFs and vouchers in improving access to skilled birth attendants for poor women in three rural districts in Kampong Cham province. By analysing the trends of facility deliveries between 2006 and 2008, and comparing the data in the three intervention districts with that in other districts in the province, they found a sharp increase in facility deliveries in the intervention districts and that increase was more substantial than in the comparison districts, especially after the introduction of vouchers. They concluded that HEFs combined with vouchers, if carefully designed and implemented, can effectively complement other interventions to improve access for poor women to skilled birth attendants.

6. In 2010 qualitative review by Ir and colleagues [31], key stakeholders provided a positive view on hospital-based HEFs, reporting that "HEF is a pragmatic concept that allows reaching the dual objective of ensuring access for poor patients to government health facilities, while at the same time helping these facilities to generate income–a solution to the failure of user fees waivers and exemptions".

7. In 2011, Flores and colleagues [32] analyzed data from the Cambodian Socio-Economic Survey (CSES) to assess the impact of HEFs on financial protection for the poor. The authors used the Difference-in-Difference (DiD) method to analyze the CSES data from surveys in 2004, 2007, 2008 and 2009. They compared health districts with a HEF (intervention districts) and districts with no HEF (comparison districts) based on the geographic spread of HEFs over the period between 2000 and 2010. Applying controls for confounding factors, such as the existence of performance-based contracting, they found that among households with some out-of-pocket (OOP) payment, HEFs reduced the OOP amount by 35% on average, but has no impact on households' health related. The effect on reducing OOP was larger for households that were poorer, that mainly used public health care and lived closer to a district hospital. HEFs were more effective in reducing OOP payments when they were operated by an NGO, rather than the government, and when they operate in conjunction with the contracting of public health services. They did not find any significant impact of HEF on health care utilization.

**Further investigation**
This body of evidence covers many important aspects of HEF design, access to care, financial cost to households, and health-related debt and indicates the effectiveness of HEFs in these areas, limited mainly to hospital-based services.  There has been no previous evidence on the national coverage of the HEFs, the profile of HEF beneficiaries, national patterns of utilization and access to services, or the coverage of health centres. Our current study was designed to address such gaps. Issues related to the cost and cost-effectiveness of the HEFs waits on further investigation.

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# APPENDIX 3: IMPACT OF HEALTH EQUITY FUNDS ON UTILIZATIONOF REFERRAL HOSPITAL SERVICES

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## Abbreviations

CBHI: Community-Based Health Insurance
CDHS: Cambodia Demographic and Health Survey
CSES: Cambodian Socio-Economic Survey
GMIS: Government Midwifery Incentive Scheme
HC: Health Centre
HEF: Health Equity Fund
HMIS: Health Management Information System
MOH: Ministry of Health
NGO: Non-governmental Organisation
OD: Operational Health District
OPD: Outpatient Consultations (new case)
RH: Referral Hospital
RGC: Royal Government of Cambodia
URC: University Research Company

## Research questions

The framework for this study is based on the principal aim of the Health Equity Funds (HEFs), which is to increase access to health services by the poor. This study is designed to investigate whether or not and to what extent HEFs have an impact on access to referral hospital (RH) services. We use RH utilization of key services (outpatient consultation/OPD, inpatient care/ IPD and newborn delivery services) as the principle indicators of RH service delivery and a close proxy for access to care. The study is significant for contributing to empirical evidence and for policy making. It will look also at the relationship of HEFs to other health financing and management schemes such as contracting or maternal health vouchers. If the HEF serves its purpose, RHs with HEF will display the delivery of a greater volume of these three services in comparison to RHs without HEF. This analysis does not take into account if the increase comes from fee-paying or HEF clients. To isolate the effect of HEF on different services, other concurrent interventions were included in the quantitative analysis as controls.

## Methods and data

The study employs a difference-in-difference (DID) approach in the assessment of impact of HEF at different time points during 2006-2013. The approach first defines a difference between two groups at baseline, and the two groups are compared again after a period over which one group had received an intervention. The differences at baseline and follow-up are then compared producing one final difference. The approach allows control for factors confounding the effect of intervention.

### *Data collection*

The study used retrospective data extracted from the Ministry of Health (MOH) Health Management Information System (HMIS) national database and supplied by the University Research Company (URC), which administers the HEF system nationally. The data are RH utilization numbers for the three indicators collected at monthly time points over a period of eight years (96 months) from January 2006 to December 2013. This period

was chosen because data for these years are more complete, following the application of a web-based data management system supported by URC. Much of the data were entered into the web-based database in 2009 from pre-existing hard copy records from 2006 (but not earlier). The database became operational online in 2010.

The number of RHs increased over time. By the end of 2013, there were a total of 94 RHs in Cambodia. Sixty two RHs for which more complete and consistent data were available were included in the study; data for these RHs were extracted both from the regular HMIS database and from the web-based Social Health Protection platform (which records data only from RHs implementing HEF).

Data on outcome variables (measured as number of cases aggregated by month) were collected for inpatient visits, outpatient admissions and newborn delivery cases, both as a total number of RH cases (fee-paying and HEF beneficiaries) and as those cases funded through the HEF. Newborn delivery cases that required a hospital stay (i.e. delivery by C-section) were counted as inpatient care. Data were also available for population in the RH coverage area, the number of health centers and the number of HEF members. The data also included variables related to whether or not a HEF or other scheme was implemented at the RH at any time during the study period and the month a HEF commenced. Table 1 includes a list of variables in the data set, their descriptions and type of data. Data were extracted also for a number of concurrent financing and management interventions, including contracting, maternal health vouchers, Subo (the Government subsidy scheme), GAVI HSS and the national Midwife Incentive. Table 2 provides a list of concurrent interventions by year of commencement.

## Data analysis

The study employed a combination of descriptive statistics along with bivariate and multivariate analysis. For each outcome indicator, descriptive statistics (codebook, summary statistics) were generated by RH and

by year to examine the trend in service delivery over eight years. In the bivariate analysis, t-test was used to compare each outcome between RHs with and without an intervention in an aggregate (the whole eight years) and by year. Correlation was run to check the relationship between variables. The analysis used only available data and excluded all cases with missing data. Data were analyzed using Stata version 11.02.

In testing the hypotheses that HEF has an effect on the three outcomes, multivariate analyses were employed. The multivariate regression without control is represented in the model below.

Outcome = HEF + hospital fixed effect + time Fixed Effect + error (cluster option)

Time fixed effect was used because the outcomes were also influenced by time itself, in this case the month when each HEF scheme was introduced at the hospital. Hospital fixed effect was used because this study is interested in knowing the impact of HEF within respective RHs which varies over time. Each RH has its own unique characteristics, for example, number of doctors or staff, advanced utility available or the unique leadership or management at the RH, which may or may not influence the outcomes, by using fixed effect we remove this time-invariant characteristics and produce net effect of the predictor, HEF in this case, on the outcome.

Because changes in population numbers may affect utilization of public health facilities, the population in the RH coverage area was included as a control. Previous studies indicate that vouchers influence utilization of maternal health services [1,2]. As the concurrent interventions influence change in outcomes they were included as controls. GAVI HSS and contracting were merged as one covariate as they are both performance-based financing mechanisms. MWI was not included in the model because the intervention implemented at one time was nationwide both at RHs with and at those without HEF, in which case we assumed its effect would be uniform.

Multivariate regression models were run using fixed effect for hospital and time (month) variations and correcting for heteroskedasticity and serial correlation in data. Colinearity occurs when two or more variables have a high correlation, or they are very similar, leading to estimation errors. In such case, Stata automatically drops one or more of the variables in the analysis.

The model with control is represented by the equation below:

Outcome = HEF + hospital fixed effect + time Fixed Effect + control + error (cluster option)

Analyses were performed on two separate data sets, the first with all 62 RHs and the second with district-level RHs (48 of them) excluding provincial hospitals. This is because many provincial hospitals provide a higher-level service package (CP3) which enables them to attract clients and whose performance may skew the analysis.

**Table 22: Number of hospitals with an intervention and the time of commencement at the study hospitals**

| Year | HEF | Contracting | Gavi HSS | Subo | Vouchers | MWI |
|------|-----|-------------|----------|------|----------|-----|
| 2006 | 25 | 18 | 3 | 0 | 0 | 0 |
| 2007 | 27 | 18 | 9 | 1 | 4 | |
| 2008 | 42 | 18 | 9 | 5 | 12 | |
| 2009 | 42 | 18 | 11 | 5 | 15 | |
| 2010 | 43 | 21 | 11 | 5 | 15 | All |
| 2011 | 43 | 21 | 11 | 5 | 23 | |
| 2012 | 45 | 21 | 11 | 5 | 23 | |
| 2013[a] | 45 | 21 | 11 | 5 | 23 | |

Note: a. There were 62 hospitals in the study sample, of which 45 had a HEF by 2013

**Table 1: Variable in the data set**

| Variable | Description | Data |
|---|---|---|
| opd_his | Total number of new cases of outpatient consultation | count, numeric |
| ipd_his | Total number of cases of inpatient care | count, numeric |
| del_his | Total number of newborn delivery | count, numeric |
| day_his | Total number of inpatient days spent in hospital | count, numeric |
| death_his | Total number of deaths reported by the hospital | count, numeric |
| opd_hef | number of outpatient consultations paid by HEF | count, numeric |
| ipd_hef | number of inpatient care paid by HEF | count, numeric |
| del_hef | number of newborn deliveries paid by HEF | count, numeric |
| hef_hc | number of health centers which implemented HEF | count, numeric |
| hef_mem | number of HEF members in the coverage area of the RH implementing HEF | count, numeric |
| contracting | dummy variable denoting existence of contracting at the hospital | binary (0/1) |
| voucher | dummy variable denoting existence of voucher scheme at the hospital | binary (0/1) |
| hef | dummy variable denoting existence of HEF at the hospital | binary (0/1) |
| subo | dummy variable denoting government subsidy for the poor at the hospital | binary (0/1) |
| gavi | dummy variable for GAVI support in Health system strengthening | binary (0/1) |
| mwi | dummy variable for midwifery incentive scheme | binary (0/1) |
| id | code for hospital | numeric 1 to 59 |
| hosp_name | name of hospital | string |
| month | code for month from 1 to 96 for each hospital | numeric 1 to 96 |
| pop | number of population in the coverage area of hospital | continuous |

# FINDINGS

## Effect of HEF on hospital inpatient care

Inpatient care is measured as the count of patients admitted for a hospital stay for any reason; the total comprises all fee-paying patients and all to those paid for through the HEF. The descriptive analysis, bivariate and multivariate analysis all indicated that the HEF is associated with increased inpatient care.

The average monthly number of total IPD cases increased significantly over the period (Figure 1). It appears that the increase in HEF-supported cases played a part in this rise. The graph shows clearly that RH that had a HEF at some time performed well above those without. Fluctuations in the total number of IPD and HEF-supported case were mainly due seasonal outbreaks of dengue fever which typically occurred at the start of the annual rainy season (for example, in July 2007 and in subsequent years).

The consistent increase in HEF-supported cases is a good indication of increased utilization by the poor, especially considering that the total number of HEF beneficiaries remained at approximately 50,000 across the whole period (due to a falling poverty proportion in the total population). HEF-supported cases accounted for approximately 40% of total IPD cases across the period. The analysis indicated that the proportion of HEF-supported IPD cases to total IPD cases was higher among district level RHs than among provincial hospitals.

There were statistically significant differences in average number of IPD cases between the hospital group with an intervention (HEF, contracting, voucher, and midwifery incentive and Subo) and the group without them. Table 4 shows the T-test comparisons. In each case the mean number of monthly cases is higher in the group with the intervention than in those without at $p<.001$. The results suggest that the impact of the HEF intervention on utilization was stronger than the impact of contracting. The results from the binary analysis do not, however, indicate clearly which of the interventions had the strongest influence on IPD service provision.

The average total monthly number of IPD cases across the 62 RHs varied widely (Figure 2). This was anticipated as different RHs commenced HEF at different times and displayed different service delivery capacity. It appeared that RHs with a HEF had a high monthly average (coded 1-45 in Figure 2A) than those without HEF (coded 46 onward). The outlier (#28) is the

RH in the capital, Phnom Penh. The monthly average number of IPD cases for all 62 RHs increased over time and the variation among RHs grew larger in the last two years (Figure 2B).

The multivariate analysis suggested strongly that the HEF and population change both had a significant influence on IPD service delivery. Three regression models were run, controlling for confounding effects of concurrent interventions (Table 5). Model (1) included HEF alone in the list of explanatory variable; in model (2), analysis was performed only among district level RHs (excluding provincial hospitals) with control variables for population, contracting, voucher and Subo added simultaneously. In this model, HEF had a statistically significant association with IPD (coef. 70.2, p < .001), indicating a strong impact of HEF on utilization at district level hospitals. That is, among district level RHs (n = 48), introducing HEF was associated with an increase in the total IPD by 70 cases per month after controlling for the effect of other concurrent interventions. In model (3), which calculated the control variables at all 62 hospitals, two explanatory variables had a statistically significant association with IPD: HEF and population. Holding other factors constant, model (3) indicates introducing HEF increased the monthly number of IPD cases by 48 (coef. 48.3, CI [3.6 – 93], p <.05); the monthly number of IPD increased by one case when population increased by 1000 persons (coef. .001, CI [.000 - .003], p < .05). The voucher and contracting schemes seemed to
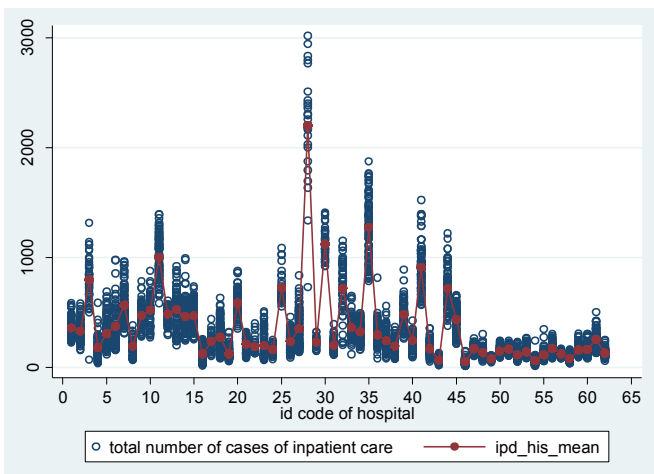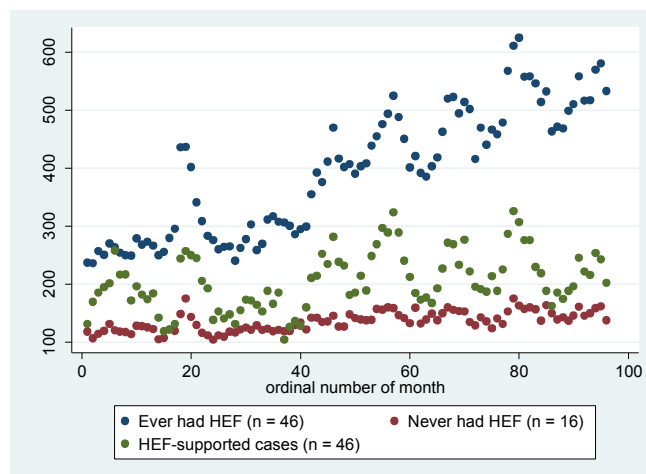
**Figure 1: proportion of overall IPD cases to population**



have a positive effect (coef. 17.8 and 13.7 respectively), but the association was not statistically significant (p > .05). While Subo had a negative association with IPD (-23.0) it was not statistically significant (p > .05).

**Effect of HEF on hospital OPD service**
Hospital outpatient care was measured as the count of all OPD cases at the hospital, including both all fee-paying patients and all HEF-supported cases. The presence of a HEF appeared to have a positive effect on increased hospital outpatient care, though this could not be demonstrated statistically (Figure 3).

The average monthly number of OPD consultations increased significantly at RHs across the 96 months. The largest absolute and the fastest rate of increase occurred at RHs with a HEF at some time. The monthly average number of OPD consultations supported by HEF rose steadily during the period; one reason for the relatively low level of HEF-supported cases over all may be the commencement of HEFs at HCs in the district.
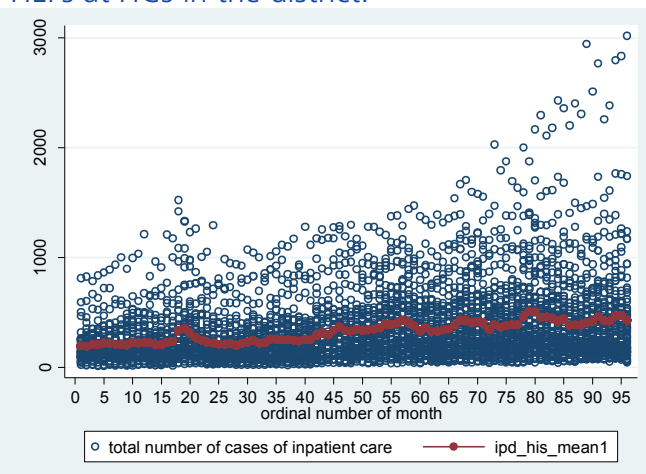
**Figure2: Variations in monthly number of IPD cases across hospitals (2A left) and across months (2B right)**

**Table 4: T-test comparing IPD cases between hospital group with and without an intervention**

|  | Intervention | | Non-intervention | | Sig |
|---|---|---|---|---|---|
|  | n | mean | n | mean |  |
| HEF | 2933 | 467.827 | 2075 | 138.852 | < .001 |
| Contracting | 1540 | 444.824 | 3468 | 281.207 | < .001 |
| Voucher | 1293 | 385.530 | 3715 | 312.723 | <.001 |
| Subo | 346 | 189.176 | 4662 | 342.085 | < .001 |

**Table 5: Coefficients of multivariate regression for IPD (fixed effects)**

|  | Coef.(1) n=62 | Coef. (2) n=48 | Coef. (3) n=62 | [95% CI] (3) | |
|---|---|---|---|---|---|
|  |  |  |  | Lower | Upper |
| hef | 41.734 | 70.211*** | 47.841* | 3.048 | 92.633 |
| contracting | - | -46.268 | 14.235 | -106.218 | 134.688 |
| voucher | - | -0.446 | 17.862 | -28.882 | 64.607 |
| subo | - | 1.137 | -22.147 | -58.790 | 14.496 |
| pop | - | 0.002 | 0.002* | 0.000 | 0.003 |
| constant | 228.878 | -83.899 | -47.403 | -274.292 | 180.121 |
| Obs | 5008 | 3959 | 4858 |  |  |
| Group | 62 | 48 | 62 |  |  |
| Prob > F | . |  | . |  |  |
| F | . |  | . |  |  |
| R-sq (within) | .314 | .376 | .330 |  |  |
| between | .317 | .100 | .045 |  |  |
| Overall | .163 | .139 | .126 |  |  |

*p<.05, **p<.001;
Notes: (1) all 62 hospitals; (2) excluding provincial hospitals; (3) all 62 hospitals

Average monthly number of OPD cases varied across the 62 RHs (Figure 4A); peaks in the number of cases per hospital were associated with big hospitals, such as those in Phnom Penh, Battambang and Banteay Meanchey, which all cater for a high level of service delivery. The monthly average number of OPD consultations rose steadily across the 96 months (Figure 4B) and was particularly strong at the larger hospitals.

T-test results indicate that HEF, contracting and Subo may influence OPD outputs (Table 6). The hospital group with HEF had a statistically significant higher monthly number of OPD cases than the group without (mean 1114 vs. 259, p < .001), as well as the group with contracting (mean 877 vs. 703, p < .01). There was no explanation for the lower number of OPD cases among hospitals with voucher or Subo schemes.
Results from the multivariate regressions indicated that none of the interventions contributed in a statistically significant way

to increased OPD service delivery. Model (1) included all 62 hospitals and model (2) only 48 RH with a HEF. Result from model (1) indicated that introducing HEF would increase the number of OPD cases by 24 per month, but the association was not statistically significant (24, CI [-70.4 – 192.0], p > .05). In models (2) and (3), none of the explanatory variables had a statistically significant association with OPD. Difference in the coefficient for HEF in model (1) (24 cases), model (2) (85 cases) and model (3) (59 cases) suggest that the HEF effect may be stronger among district-level RHs and that the effect of HEF may be altered by the presence of other interventions and population change, although all this cannot be confirmed statistically.

Effect of HEF on hospital newborn deliveries
Newborn deliveries were measured as the number of deliveries performed at the RH each month. The number included all deliveries, including all paying patients, all HEF-supported cases and all patients supported by the maternal voucher scheme.

Data for newborn deliveries were available only for RHs with a HEF, that is 46 of the 62 RHs. The monthly average number of HEF-supported deliveries accounted for more than 30% of total delivery cases; excluding provincial hospitals, the proportion increased to almost 40% among district-level RHs (Table 8). Figure 8 shows that both the average total number of delivery and average number of delivery by HEF increased over the eight-year period.

T-test analysis revealed a significant difference in the average monthly number of delivery cases between the hospital group with and the group without each of these interventions (Table 9). Comparisons were not possible for the Subo scheme due to the small number of cases with data. Hospitals with HEF or vouchers had a higher average monthly number of deliveries than the group without (the difference was statistically significant). It was not possible to explain the apparently lower number of monthly delivery cases at hospitals with contracting compared to those without.

Results from multivariate analysis indicated that the presence of a HEF has a greater impact on the monthly number of newborn deliveries at district level RHs alone (8.940 p<.05) than at all hospitals taken together, including provincial hospitals (not significant statistically). Subo was omitted due to colinearity. The association between contracting and delivery was negative though not statistically significant, whereas vouchers were positively associated with delivery service.

**Figure3: Growth of total OPD cases and HEF-supported OPD cases**
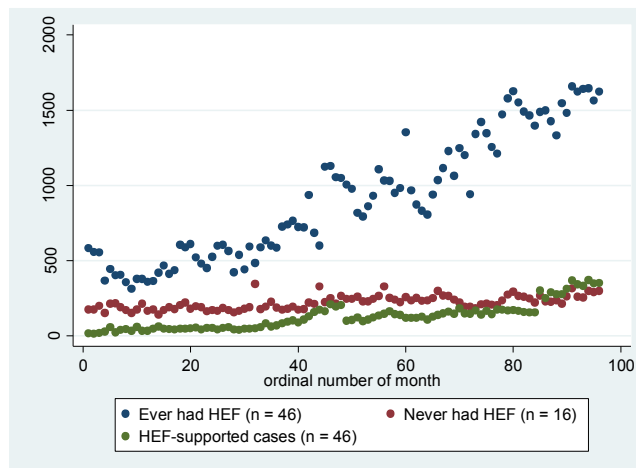


## Limitations

There are a number of limitations in this study. First, there were issues with the data, including missing data. Some of the data did not seem to be correct, for example, the drop in delivery services between 2010 and 2012, but without a plausible explanation. It was not possible to explain some of the missing data. The option of imputation was considered, but was not adopted because the results from imputed data would not necessarily be generalizable.

Secondly, there may be interactions between explanatory variables which were not included for reasons related to ease of interpretation of coefficients. For example, contracting may also improve service provision which would result in better services and attract more fee-paying clients. But this was no way to capture this effect.

**Figure 4: Variations in average of OPD cases across hospitals (4A left) and months (4B right)**
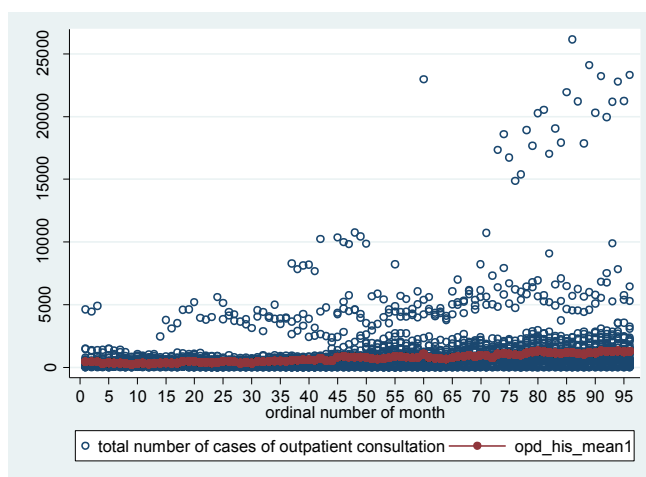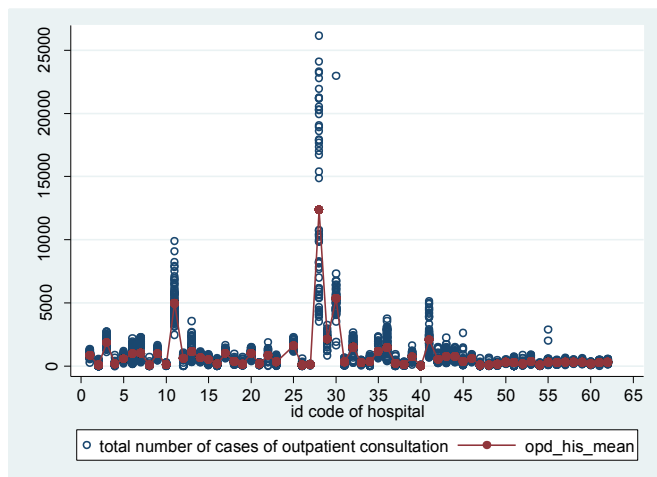
Thirdly, it is not possible to establish total causality of a particular intervention on the outcomes because of the presence of multiple interventions and the limited number of control variables. The most that can be said is that one or more of these interventions may exert the most effect on one of these outcomes while it is apparent that many if not all the interventions contribute in some way to these outcome.

Fourthly, due to constraint in data availability, only 16 RHs without HEF were included in the analysis, compared to 46 RHs with HEF. Selection of hospitals in this analysis was based on data availability. An implication of this is these RHs may have good reporting compared to the rest of hospitals.

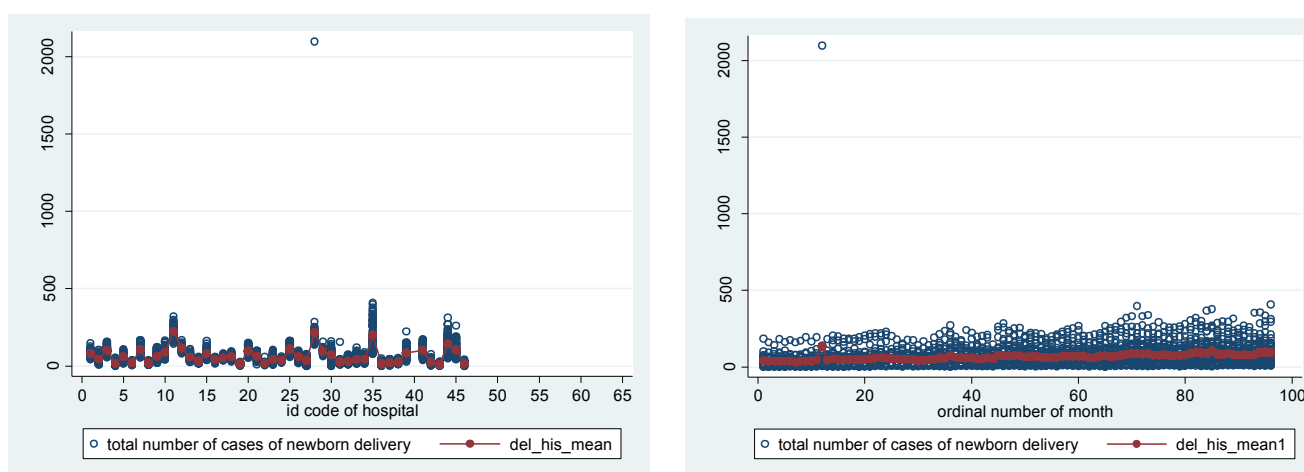**Figure 5: Variations in averages of delivery cases across hospitals (5A left) and months (5B right)**



**Table 6: T-test comparing OPD cases between hospital group with and without an intervention**

|  | Intervention | | Non-intervention | | Sig |
|---|---|---|---|---|---|
|  | n | mean | n | mean |  |
| HEF | 2854 | 1114.034 | 2055 | 259.008 | < .001 |
| Contracting | 1481 | 877.208 | 3428 | 703.783 | < .01 |
| Voucher | 1224 | 694.535 | 3685 | 776.554 | > .05 |
| Subo | 360 | 174.361 | 4549 | 802.142 | < .001 |

Note: n = number of monthly data points

**Table7: Coefficients of multivariate regression for OPD (fixed effect)**

|  | Coef.(1) n=62 | Coef. (2) n=48 | Coef. (3) n=62 | [95% CI] (3) | |
|---|---|---|---|---|---|
|  |  |  |  | Lower | Upper |
| HEF | 24.316 | 85.615 | 58.795 | -73.213 | 190.803 |
| contracting | -- | 95.602 | -240.262 | -757.293 | 276.768 |
| voucher | -- | -40.179 | -108.592 | -303.112 | 85.926 |
| subo | -- | -19.177 | -87.084 | -220.282 | 46.114 |
| pop | -- | .004 | .004 | -.006 | .015 |
| constant | 708.235*** | -386.811 | 127.974 | -1585.084 | 1835.033 |
| Obs | 4909 | 3870 | 4754 |  |  |
| Group | 61 | 47 | 61 |  |  |
| Prob > F | . |  | . |  |  |
| F | . |  | . |  |  |
| R-sq (within) | .043 | .156 | .047 |  |  |
| between | .059 | .265 | .011 |  |  |
| Overall | .027 | .202 | .023 |  |  |

*p<.05, **p<.001; (2) excluding provincial hospitals, (1 & 3) including provincial hospitals

## Table 8: Mean monthly number of delivery cases

|  | N | Mean | SD | Range |
|---|---|---|---|---|
| Total deliveries | 3471 | 67.75 | 67.62 | 1 - 2096 |
| Deliveries by HEF | 2803 | 21.28 | 41.79 | 0 – 557 |
| Deliveries* | 1123 | 117.78 | 91.35 | 1 – 2096 |
| Deliveries by HEF* | 858 | 30.40 | 68.09 | 0 – 557 |
| Deliveries** | 2348 | 43.83 | 31.63 | 1 – 223 |
| Deliveries by HEF** | 1945 | 17.26 | 20.51 | 0 - 123 |

*among provincial hospitals
**among regular referral hospitals

## Table 9: T-test comparing delivery cases between hospital group with and without an intervention

|  | Intervention | | Non-intervention | | Sig |
|---|---|---|---|---|---|
|  | n | mean | n | mean |  |
| HEF | 3077 | 73.307 | 394 | 24.418 | < .001 |
| Contracting | 1495 | 55.352 | 1976 | 77.143 | < .001 |
| Voucher | 819 | 87.649 | 2652 | 61.614 | <.001 |

## Table 11: Coefficients of multivariate regression on Newborn Delivery (fixed effects) (among hospitals with HEF only)

|  | Coef.(1) n=62 | Coef. (2) n=48 | Coef. (3) n=62 | [95% CI] (3) Lower | Upper |
|---|---|---|---|---|---|
| hef | 3.376 | 8.940* | 4.398 | -12.628 | 21.423 |
| contracting |  | -12.106 | -0.523 | -30.872 | 29.825 |
| voucher |  | 2.704 | 14.905 | -11.291 | 41.102 |
| subo |  | (omitted) | (omitted) |  |  |
| population |  | 0.000 | 0.000 | 0.000 | 0.000 |
| constant | 34.760*** | 17.146 | 12.100 | -15.606 | 39.806 |
| Obs | 3471 | 2301 | 3395 |  |  |
| Group | 45 | 31 | 45 |  |  |
| Prob > F | . | . | . |  |  |
| F | . | . | . |  |  |
| R-sq (within) | .197 | 0.508 | 0.206 |  |  |
| between | .006 | 0.094 | 0.054 |  |  |
| Overall | .067 | 0.262 | 0.110 |  |  |

*p<.05, **p<.001; (2) excluding provincial hospitals, (1 & 3) including provincial hospitals

*HEF had a positive impact on increasing overall uptake of inpatient care at the hospital*

# DISCUSSION AND CONCLUSIONS

While the national population increased over the years, the total number of HEF beneficiaries remained relatively stable or decreased slightly. The reason for this is consistent growth in the economy, which brought about a reduction in poverty levels from 40% in late 1990s to just above 20% in 2013.

The contribution of HEF-supported cases to the rising level of IPD admissions is a finding consistent with previous studies [3-5]. Our finding confirms that the original, intended purpose of the HEFs to provide access for the poor to expensive hospital services has apparently been achieved.
The effect of HEF on uptake of IPD services was even greater among district level RHs than provincial hospitals. Many of the provincial hospitals started implementing HEF earlier than 2006 with possible early rises in IPD cases as a result, with the effect tapering off at the higher level in subsequent years.

The result indicates that the impact of the HEF goes beyond HEF members. It appears that the HEF had an indirect effect on IPD service delivery by attracting fee-paying users to the hospitals, perhaps as a result of improved service quality. Reimbursing providers for user fee exemptions produces a higher level of revenue for hospitals that can be used for staff incentives and operating costs.

It appears that the presence of a HEF has no statistically significant effect on hospital OPD services. At each RH there is a HC in close proximity that provides OPD services, and at times this may be counted as part of hospital services. In general, OPD services are provided at health centers and the HEF was not initially established to reimburse primary care (which was added later to the benefit package). In principle, HEF members must receive a referral slip from a HC in order to access hospital inpatient services, implying that OPD or primary care is received at the HC. But in reality this gate-keeping role has not been consistently implemented.

Consequently, the provision of OPD services at hospitals began on an ad hoc basis and at different times. Reimbursement of fees for OPD services at referral hospitals was implemented officially only in 2013 although many hospitals had done so long before that. Over the years, HEF coverage has been extended to more and more HCs and it appears that patients generally are accessing OPD services mostly at the HC level for reasons related to convenience, distance and cost of transportation.

The results indicate that the presence of a HEF has a positive effect on hospital newborn deliveries among district level RHs, though not among provincial hospitals. At hospital level, newborn delivery services are counted as inpatient (IPD) care. Nationally, facility based deliveries are a targeted activity for hospitals; again, elevated levels of newborn deliveries may have been achieved early at provincial hospitals that had implemented HEF before 2006 while many district level referral hospitals implemented HEF later with a consequent short-term impact on increased delivery care.

Contracting and vouchers showed different effects on service delivery depending on the type of hospital service and the type of hospital. These schemes may well have had the effect of improving HC level services and therefore attracting more patients away from hospitals for primary care services. As well, it appears that the voucher schemes promote hospital IPD and delivery services. Most voucher programs targeted maternal and child health and were mostly used for deliveries. The MOH policy requires that normal deliveries be performed at HCs while high risk cases and those with complications be referred to hospital level, usually provincial hospitals.

**Based on the results, we can conclude that:**
HEF had a positive impact on increasing overall uptake of inpatient care at the hospital. The impact was stronger among district level RH than among provincial ones.
HEF contributed in some way to the

overall uptake of OPD services at RHs. The inconclusive results may be due to the fact that offering of OPD service at hospitals to HEF members had been delayed and that many HCs implemented HEF and attracted clients away from hospitals.

As newborn deliveries are treated as inpatient care, the HEF contributed significantly to hospital delivery services, and the impact was significant among district level RHs.

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# APPENDIX 4: IMPACT OF HEALTH EQUITY FUNDS ON UTILIZATION OF HEALTH CENTRE SERVICES

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Acknowledgements

## Abbreviations

CBHI:  Community-Based Health Insurance
CDHS: Cambodia Demographic and Health Survey
CSES:  Cambodian Socio-Economic Survey
GMIS: Government Midwifery Incentive Scheme
HC:    Health Centre
HEF:   Health Equity Fund
HMIS: Health Management Information System
MOH: Ministry of Health
NGO:  Non-governmental Organisation
OD:    Operational Health District
OPD:   Outpatient Consultations (new case)
RH:    Referral Hospital
RGC:   Royal Government of Cambodia
URC:   University Research Company

## Aims and methods

This study of the impact of HEFs on health centre (HC) utilization was conducted as an impact evaluation in 2014. We employed the difference-in-difference (DID) method – a rigorous method of impact evaluation [1] – to estimate the impact of HEFs on HC service delivery.

The DID method has been widely used in retrospective impact evaluations of interventions in a context where other robust methods, such as randomized controlled trials or before-after control designs, are not feasible. The DID method first defines a difference between two groups at baseline; then the two groups are compared again after a period during which one group had received an intervention. The differences at baseline and at follow-up are then compared.

In Cambodia, the DID method has been used to estimate the impact of HEFs and reproductive health care vouchers using panel data from the Cambodian Socio-Economic Surveys (CSES) and Cambodia Demographic and Health Survey (CDHS) respectively [2,3].

## Data and sample selection

Data for this study were collected with the assistance of the University Research Company (URC), the national HEF administrator, from the Ministry of Health's (MOH) national Health Management Information System (HMIS) database. These data are routinely collected by individual health facilities and collated at the district level in a specific software package on a monthly basis and sent to the provincial health office, which in turn forwards them to the central MOH. The number of new case consultations and newborn deliveries per month at HCs for all months from January 2006 to December 2013 were extracted for the study.

The period 2006-2013 was selected because data for the years were and more reliable and more complete [4]. The MOH, with support from URC, had established a web-based data system in 2009-2010. Retrospective data on service provision dating back only to 2006

were re-entered into the system from earlier records. New case consultations (designated here as OPD) are the most commonly used service at HCs, while newborn deliveries are the most important and most expensive HC service. These two indicators provide a significant view of the significance and effect of HEFs on HC utilization.

According to the HMIS database, the number of HCs in Cambodia progressively increased from 960 in 2006 to 1,088 in 2013. A few of these HCs were not fully functioning, and thus, no data on health service utilization was reported. In this study, we included 1,081 HCs became operational in any time between January 2006 and December 2013 and had at least one month of data available by December 2013.

The presence of a HEF at a HC was defined by recording the date of commencement at the HC as provided by URC. Over the study period, the number of HCs with a HEF increased gradually from 16 (1.5% of all functioning HCs) in December 2006 to 476 (40% of all functioning HCs) in December 2013. Table 1 presents the number of HCs in Cambodia by their functioning and intervention status by year between 2006 and 2013.

There was previous evidence that the implementation of contracting procedures at health facility level (under a scheme designed to provide incentives and strengthen the delivery of services) [5-8]as well as the use of vouchers for reproductive health services had been associated with an increase in service provision and facility-based newborn deliveries. To account for this, we included a variable for HC status (with or without these interventions) in the study for control purpose. Although there is evidence that a government schemes paying a Midwife Incentive for live births at facilities was associated with increased newborn deliveries at HCs and referral hospitals (RH) [9,10], this was not included in our study as it was launched nationwide at one point in time and thus affected all HCs in the country. This intervention could not therefore be considered as a confounder.

**Table 1: Number of HCs by their functioning and intervention status, 2006-2013**

|  | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|
| Total no. of HCs | 960 | 963 | 967 | 984 | 997 | 1,004 | 1,024 | 1,088 |
| No. of functioning HCs | 956 | 959 | 960 | 962 | 970 | 995 | 1,019 | 1,081 |
| No. of HCs with HEF | 16 | 17 | 81 | 168 | 246 | 277 | 301 | 476 |
| % (of functioning HCs) | 1.5 | 1.6 | 7.5 | 15.5 | 22.8 | 25.6 | 27.8 | 40.0 |
| No. of HCs with vouchers | 0 | 44 | 200 | 272 | 272 | 405 | 405 | 405 |
| % (of functioning HCs) | 0 | 4.1 | 18.5 | 25.2 | 25.2 | 37.5 | 37.5 | 37.5 |
| No. of HCs with contracting | 328 | 437 | 437 | 467 | 509 | 509 | 509 | 509 |
| % (of functioning HCs) | 30.3 | 40.4 | 40.4 | 43.2 | 47.1 | 47.1 | 47.1 | 47.1 |

*Note: No. = Number; HC = Health Centre; HEF = Health Equity Fund*

## Data analysis

We used the DID method to identify the impact of the HEF scheme on HC utilization by comparing changes in the delivery of HC services where HEF schemes were introduced during 2006-2013 (treatment group) to changes at HCs that remained without HEFs (control group). This strategy was implemented by estimating regression models including fixed effects at the HCs and OPD/newborn delivery period effects. The assumption behind this identification strategy is that the use of services at treatment and control HCs would have evolved in the same way in the absence of HEFs.

The two outcome variables of interest were: (1) the number of monthly OPD visits at HCs (absolute number or as % of the population in the catchment area) and number of newborn deliveries at HCs (absolute or as % of expected births in the catchment area). Independent variables include: the existence of HEF scheme being implemented at the HC (treatment) and the existence of contracting (including GAVI) or a voucher scheme at the HC (as control). The econometric models make use of the HEF starting date variability:

### *(Model 1a)*

$$OPD_{it} = a_0 + a_1.HEF_{it} + a_5.u_i + \sum_{t=1}^{t=96} a_{6t}.d_t + e_{it}$$

Where:

$OPD_{it}$   is the number of new consultations in HC i during period t.

$HEF_{it}$   is a dummy variable equalling 1 when the HC i has HEF during period t, and 0 otherwise, it's our variable of interest: a_1 is its estimated coefficient, and represents the effect of HEF on the number of consultations.

$u_i$   controls for the HC fixed effects.

$d_t$   is a dummy time variable; the set of dummy time variables controls for time effects.

$e_{it}$   represents the error term.

The model is first performed this way. Then in order to control for confounding factors, explaining variables are added to the model, such as:

- The population in the catchment area (this variable varies every year for each health facility);
- Whether the health facility i benefits from a voucher program or not during period t;
- Whether the health facility i benefits from a contracting program or not during period t.

**(Model 1b)**

$$OPD_{it} = a_0 + a_1.HEF_{it} + a_2.pop_{it} + a_3.voucher_{it} + a_4.contracting_{it} + a_5.u_i + \sum_{t=1}^{t=96} a_{6t}.d_t + e_{it}$$

In the case of new consultations, we expect the contracting program to have a positive effect as well.

The model explaining the health center newborn deliveries follow the same shape:

**(Model 2)**

$$deliv_{it} = b_0 + b_1.HEF_{it} + b_5.u_i + \sum_{t=1}^{t=96} b_{6t}.d_t + e_{it}$$

Where:

$deliv_{it}$ represents the number of newborn deliveries in HC I at time t. Here as well, population, voucher and contracting variables are added in order to control for them. In particular, the voucher program is expected to have a positive effect.

## Overview of the dataset

Table 2 summarizes key variables and their characteristics in the dataset. The two outcome variables of interest are the number of OPD visits and newborn deliveries at the 1,081 HCs included in the study. For each HC, data covered the full 12 months for eight years (from January 2006 to December 2013), or 96 time points where the data was complete.

Because a number of HCs commenced and became operational only during the period of study, data for the period prior to commencement were of course missing. There are also unexplained missing data for those HCs that were operational at different points in time. Table 3 summarizes the valid data for key outcome variables, new case consultations or OPD visits (absolute number and to population ratio) and newborn deliveries (absolute number and to expected births ratio)s. In general, nearly 90% of the data were complete or valid for the absolute number and around 85% for the population ratios; in some cases the population data were also missing.

Table 4 shows the distribution of complete data for key

**Table 1: Number of HCs by their functioning and intervention status, 2006-2013**

| Variables | Description | Data type |
|---|---|---|
| HC_name | Health center name – not unique to each HC | String |
| HC_code | Health center code - unique to each HC | Numeric |
| Month | Code for month when the services was used | Numeric, 1-12 |
| Year | Code for year when the service was used | Numeric, 1-8 |
| Month_year | Code for month and year when the service was used | Numeric, 1-96 |
| OPD_HC | No. of new case consultations at HC | Count, numeric |
| OPD_pop | Ratio of new case consultations to population covered | Continuous |
| Del_HC | No. of newborn deliveries at HC | Count, numeric |
| Del_birth | Ratio of newborn deliveries to expected births | Continuous |
| Intervention | If the HC has a HEF over the study period - intervention - or not | Dummy, 1/0 |
| HEF | If the service was used at the time the HC had HEF or not | Dummy, 1/0 |
| Voucher | If the service was used at the time the HC had voucher or not | Dummy, 1/0 |
| Contracting | If the service was used at the time the HC had contracting or not | Dummy, 1/0 |
| POP | Estimated no. of population in the coverage area of HC | Continuous |
| Exp_births | Number of expected births in the coverage area of HC | Continuous |