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FINANCIAL PROTECTION OF PATIENTS THROUGH COMPENSATION OF PROVIDERS: THE IMPACT OF HEALTH EQUITY FUNDS IN CAMBODIA

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Abstract

Public providers have no financial incentive to respect their legal obligation to exempt the poor from user fees. Health Equity Funds (HEFs) aim to make exemptions effective by giving NGOs responsibility for assessing eligibility and compensating providers for lost revenue. We use the geographic spread of HEFs in Cambodia to identify their impact on out-of-pocket (OOP) payments. Among households with some OOP payment, HEFs reduce the amount by 29%, on average. The effect is larger for households that are poorer, mainly use public health care and live closer to a district hospital. HEFs are more effective in reducing OOP payments when they are operated by a NGO, rather than the government, and when they operate in conjunction with the contracting of public health services. HEFs reduce households' health-related debt by around 25%, on average. There is no significant impact on non-medical consumption and health care utilisation.

JEL Classification: H42, H51, I18

Keywords: Health Financing, User Fees, Financial Protection, Health Care, Cambodia

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1. INTRODUCTION

De jure, the poor are often exempt from user fees levied at public health facilities in low income countries. *De facto*, exemptions are seldom respected. The primary reason is that providers are charged with responsibility for establishing exemption eligibility but are not compensated for revenue lost from exemptions granted. The incentives to be vigilant in honouring legal rights to fee waivers are not strong. They are further weakened by the often vague criteria for eligibility status and the heavy reliance of health facilities on user fee revenue not only to finance supplies but also to provide incomes to staff whose low salaries may be paid intermittently (Creese, 1991; Gilson et al., 1995; Russell and Gilson, 1997). As a consequence, poor households are left exposed to out-of-pocket (OOP) health payments that threaten to drive them further into poverty. They may opt for unqualified, but ostensibly cheap, providers of health care and for self-medication, or even forgo treatment altogether.

Making exemptions effective would appear to require both separation of responsibility for assessment of exemption eligibility from that of provision of care and compensation of providers for lost fee revenue. Health Equity Funds (HEFs), which have been operating in Cambodia since 2000 and have a lesser presence in Lao and Vietnam, are based on this logic. They are mostly financed by international donors and operated by local Non-Governmental Organisations (NGOs), which have responsibility for selecting patients whose fees at selected public health facilities are paid from the fund. Besides having their fees paid, HEF beneficiaries may also be reimbursed for their transport and food costs.

This subsidy model has spread rapidly in Cambodia over the last decade. Three-quarters of the population is now resident in areas in which HEFs operate and the government is pursuing a target of nationwide coverage by 2013. HEFs are expanding not only geographically but also from coverage of district hospitals to include health centres. They are the most likely mechanism to implement a recently announced government policy of tax financed care for the poor at public facilities. For Cambodia, as well as other low income countries wrestling with the problem of financing public health services while shielding poor patients from prohibitive user fees, it is imperative to establish whether HEFs are succeeding in their primary objective of offering financial protection to poor households and their secondary one of improving access to qualified providers. The existing literature generally argues that HEFs fulfil their promise (Annear, 2010). This conclusion is largely based on small scale studies, which, while providing valuable detail on the operation of HEFs, make only descriptive comparisons between areas with and without a HEF, or of a single area before and after the introduction of a HEF. There has been no country-wide evaluation with a design sufficient to identify the impact of HEFs on health care payments and utilisation.

The effectiveness of HEFs in financially protecting the poor from health care costs cannot be taken as given. The model may fail to meet its objectives for a number of reasons. First, targeting of the poor could be weak. All methods that have been employed by HEFs to identify the poor give voice to the community and much latitude in the definition of poverty. While in many respects laudable, this could be exploited to direct subsidies toward acquaintances and cronies. Second, initially most HEFs established eligibility only when someone presented at the hospital for treatment – so-called 'post-identification'. Many poor may have been unaware that they would be granted exemption from fees. Third, most people in Cambodia do not immediately resort to public health care when sick. Distance to the district hospital and the often unreliable service on offer there, and not only the cost, discourage usage and encourage substitution with medicines purchased from usually unqualified, but convenient, local vendors. Waiving fees may not be sufficient to overcome the other deterrents to utilisation of public health care. Fourth, providers may attempt to charge illegally and still claim fees from the HEF. Finally, the NGO itself is usually paid in relation to inputs and estimated workload but compensates facilities on a fee per case

basis. To an extent, the disincentive to encourage utilisation by the exempted poor is shifted backward from the providers to the HEF operator.

This paper exploits the geographic spread of HEFs over the last decade to compare changes in outcomes in areas that acquire a HEF with changes in outcomes in areas that remain without a HEF. We implement this difference-in-differences (DID) identification strategy using household data from four nationally representative cross-sectional surveys conducted between 2004 and 2009. Effects on OOP payments for health care, health-related debt, non-medical consumption and health care utilisation are estimated.

We find that HEFs do not reduce the propensity to incur health care payments, which is anticipated since HEFs mainly cover inpatient care at the district hospital and will not eliminate all health care expenses, particularly those on self-medication and private sector care. But HEFs do reduce the amount spent on health care by a substantial 29% averaged over all households making some payment. The effect is larger for the poorer households (35%) that HEFs are intended to target. It is also larger for households that mainly rely on public health care (43%), which is what HEFs cover, and for those that live within 5km of a district hospital (46%), which is where HEFs are typically located. While NGO operated HEFs reduce OOP payments, we find that this is not the case in areas where fee exemptions are funded by the government and compensation of providers is paid through the public administration. This is important since consideration is currently being given to a policy of tax financed health care for the poor implemented through expansion of the government subsidy scheme. HEFs have a larger impact on OOP payments when they operate in conjunction with performance-based contracting of public health services. We also examine whether contracting itself impacts on OOP payments and find a negative effect only when accompanied by a HEF. But the impact of contracting is larger on the non-poor than it is on the poor.

The average payment for a hospitalisation in Cambodia has been estimated as equivalent to more than 40 times the daily earnings of a field labourer (Hardeman et al., 2004). Such costs can only be met through resorting to borrowing and other coping strategies. We find that HEFs reduce health-related debt by an average of 25% among households that incur such debt. There is no significant impact on non-medical consumption. This suggests that in the absence of the HEF subsidy, beneficiaries mainly finance health care through borrowing, and possibly other coping strategies. There is also no evidence of any impact on health care utilisation although this may be attributable to limitations of the health care data available.

In the next section we provide some background on health care financing and the operation of HEFs in Cambodia. In the third section we sketch our identification strategy and describe the data. The models and estimators are set out in section four. Results are presented in section five. The final section concludes with implications for the financing of health care in Cambodia and further afield.

2. HEALTH FINANCING AND HEFS IN CAMBODIA

2.1 HEALTH FINANCING

Cambodia, which has a population of a little less than 15 million, is one of the poorest countries in south-east Asia, with GDP per capita of only $1915 at purchasing power parity exchange rates (PPP) in 2009 (US$706), and 28% of the population living on less than $1.25 per day in 2007 (World Bank, 2011). Total expenditure on health per capita is low in absolute terms at only $122 (PPP) in 2009, but at 6% of GDP is the highest relative spending of any ASEAN country except Vietnam (World Health Organization, 2011b). Over 70% of health expenditure is financed from OOP payments (*ibid*), which are mainly for self-

medication and private sector care. Around two-thirds of the remainder is estimated to be financed by government, and the rest from external resources.

Utilisation of curative, but not preventive, public health services is low (World Health Organization, 2011a). This reflects perceived low quality of care and unreliability of service provision. Combined with often long distances to public health facilities and cultural preferences for care at home and traditional healers, there is a strong bias toward private sector, often unqualified, providers and self-medication (Annear et al., 2006). This bias is maintained and encouraged by low paid public sector staff moonlighting in the private sector.

Public health facilities are financed through a combination of government funding of salaries, drug supplies and recurrent costs, direct subsidies from international donors and user fees paid by patients and HEFs, as well as some payments through voucher schemes and community based health insurance. The right to charge user fees was established by the 1996 National Health Financing Charter. The objective was to provide revenue for the operation of hitherto poorly resourced facilities and to motivate staff paid very low salaries (Jacobs and Price, 2004). All but 1% of user fee revenue is retained by the facility; 60% can be used to provide staff incentives and 39% to supplement operational budgets (Ministry of Health, 2009a). Fees can only be charged after approval by both a local committee, including elected community representatives, and the Ministry of Health (MoH) (Jacobs and Price, 2004). MoH approval is conditional on establishing a system of exemptions of the poor, or rather the poorest.

The opportunity to charge fees is taken up by almost all public health facilities. Fees are estimated to generate around 30% of public health facility revenue (Annear et al., 2006). Case studies claim that user fees substituted for informal payments, reduced price uncertainty by replacing opaque under-the-table payments with a published price schedule, possibly even reduced costs to patients, raised hospital revenue and, consequently, service quality and utilisation (Akashi et al., 2004; Annear et al., 2006; Barber et al., 2004; Jacobs and Price, 2004). But there is also a widespread belief that exemption schemes were ineffective, in large part because providers were not compensated for the lost revenue. Around 10% of revenue is estimated to be lost due to the fee exemptions that are actually granted (Annear et al., 2006). In the years immediately following the introduction of user fees, the average proportion exempted was around half the official poverty rate (Annear et al., 2006). Official exemption schemes are designed at the Operational District (OD) level within the health system, resulting in a great deal of geographic variation in exemption rates, as well as means testing rules.

Case studies suggest that, prior to the introduction of HEFs, fees deterred utilisation by the poor (Jacobs and Price, 2004) and that OOP payments were a major cause of impoverishment and indebtedness (Van Damme et al., 2004).

2.2 Health Equity Funds

The HEF model recognises the importance of user fees in providing resources and incentives to public health facilities, but also in leaving poor households exposed to health care costs. By funding fee waivers HEFs not only support demand for public health care, they also provide incentives for suppliers to respect exemption entitlements. Providers are usually paid a fixed amount per case, which is very broadly defined. Autonomous at the OD level, HEFs have spread rapidly from operating in only 2 of 77 ODs in 2000 to 61 by 2010. Financed mostly by international donors, HEFs basically act as purchasers of public health care on behalf of the poor. This role is typically carried out by local NGOs, who also screen households, or patients, to identify those entitled to subsidies.

Twelve ODs and six national hospitals are supported by a government subsidy scheme (known as SUBO) that operates through the Ministry of Health and compensates facilities for user fee revenue lost through granting of exemptions. For brevity, we will sometimes refer to this as a government funded, or operated, HEF although this is rather imprecise. It is quite a different model from that of a HEF operating as an independent third-party purchaser.

OD level autonomy and mostly external funding creates a great deal of heterogeneity in the design and operation of HEFs. With this in mind, a typical HEF benefit package covers district referral hospital medical services, transport costs from health centre to referral hospital, food for patients and carers, and sometimes funeral costs. The government subsidy scheme does not cover transport and food costs. In 2008, 38% of all hospitalised patients and 25% of deliveries at covered referral hospitals were funded by HEFs (Ministry of Health, 2009b).[1] Where case study sample sizes permit disaggregation, which is seldom, it is evident that women are the largest group of HEF beneficiaries, followed by children. On average, around one-quarter of user fee revenue is estimated to flow from HEFs (Annear et al., 2006), although there is a great deal of variation (Annear et al., 2007; Ir, 2008; Ir and Hardeman, 2003).

If public hospitals were operating at full capacity, then HEF subsidization of the poor would be expected to crowd out non-subsidized patients. But utilisation of public sector care is low and hospitals typically have spare capacity. HEF funding that increases facility revenue and, consequently, staff attendance can then generate benefits that extend beyond the direct recipients of the subsidy. It is not the public sector user fee that causes non-poor patients to seek private sector alternatives since the latter are typically more expensive. It appears to be the perceived difference in quality that is decisive. A better stocked and more reliable public sector may therefore increase utilisation and reduce OOP payments of households that are not identified as HEF beneficiaries.

Assessment of subsidy eligibility is carried out before (pre-identification) and/or after (post-identification) presentation for treatment. In the early years, most HEFs only operated post-identification. This involved a means test, based on asset ownership, applied at the NGO office on the hospital site. Pre-identification of households eligible for fee exemptions has increased over time and is implemented usually with a combination of means test screening of a population and consultation with community representatives on which households are considered poor. There is usually still an opportunity for patients to apply for HEF coverage at the hospital. While reducing exclusion errors, this may increase inclusion errors if there is gaming of the means test to qualify for exemption when treatment is needed. In fact, inclusion errors have been estimated at only around 10% (Annear, 2010; Jordanwood et al., 2009), and most HEF beneficiaries are amongst the poorest households (Hardeman et al., 2004). Exclusion errors are estimated to be much higher at 25% or so (Annear, 2010; Jordanwood et al., 2009).

In the early years of operation, the means test and community consultation procedures used to identify the poor varied a great deal with the funder and operator of the HEF. From 2007, the Ministry of Planning began implementing standardised procedures (known as IDPoor) to identify poor households and establish entitlement to a variety of government and non-government assistance programmes, including HEFs. Households are screened by a common means test, the score from which is taken into account by a Village Representative Group, whose recommendation on households to be classified as poor is considered and revised after consultation at the village level, and finally approved following review by the Commune Council (Ministry of Planning, 2007). IDPoor has spread geographically, with HEFs playing an important role in its implementation, but by 2009 it did not yet cover the whole country.

[1] Cited by (Annear, 2010)p.5. Ministry of Health data for 2010 indicate that 6.3% of outpatient cases, 27% of inpatient cases and 15.6% of deliveries at all public health facilities (not only referral hospitals) were funded by HEFs

Expansion of IDPoor is contributing to realisation of the policy goals of greater uniformity in the operation of HEFs and nationwide coverage. Expansion of the government subsidy scheme is the most likely means of realising the recent commitment made by the Prime Minister to tax finance health care for the poor at public facilities. Besides the source of finance, the 'government HEF' differs from the externally funded ones in two important respects that may weaken effectiveness. First, there is no third-party NGO acting as a purchaser of care and so providers must seek compensation through the often slow and inefficient public administration. Second, transport and food costs are not subsidised.

3. Empirical Strategy and Data

3.1 Identifying information and sample selection

We use data from the 2004, 2007, 2008 and 2009 Cambodian Socio-Economic Surveys (CSES). In 2004, HEFs were operating in 16 ODs (out of a total of 77) in which one-quarter of the population was resident (Table 1). By 2007, the number of ODs with HEFs had almost doubled and by 2009 it had more than trebled, such that the fraction of the population living in HEF areas had reached three-quarters. We use this variation in HEF coverage both between districts and across time in a difference-in-differences (DID) strategy comparing changes in outcomes occurring in areas in which a HEF comes into operation with changes in outcomes in areas that remain without a HEF.

Each CSES is nationally representative and all follow the same stratified sampling design. Primary sampling is at the 'village' level, which defines neighbourhoods of towns and cities as well as rural villages. The 2004 and 2009 surveys sampled around 720 villages and 12,000 households, while in 2007 and 2008 half the number of villages, and just less than one-third of the number of households, were sampled. In each of 2007 and 2008 the villages sampled were a subset of those sampled in 2004. The 2009 survey sampled (potentially) different villages. In order to eliminate the risk of compositional bias, we would like to keep the sample of villages constant between 2004 and 2009. This is not quite possible since the village codes are not consistent across surveys. There are consistent identifiers at the commune level, which represents a slightly wider geographic area.[2] In our estimation sample we include only those communes sampled in 2009 that were also sampled in 2004.

While HEFs are implemented at the OD level, within a survey year there is variation in HEF coverage across communes within an OD due to differences in the interview date, which can differ by up to 12 months. Of the 42 ODs that acquired a HEF between 2004 and 2009,[3] in 11 the HEF was functioning in only some of the communes at the time they were surveyed in the initial year of operation. For example, in one OD a commune was surveyed one month before a HEF came into operation, while another commune had been exposed to the HEF for seven months by the time it was surveyed later in the year. We identify a commune as being covered if the HEF has been operating for at least one month at the time of the survey.

There are very few communes for which we could not establish HEF coverage (Table 1). These are dropped from the sample. Selecting only communes sampled in 2004 and in at least one other year, we lose around 30% of communes from the 2004 CSES and 45% of those from the 2009 sample (Table 1). There is no loss in 2007 and 2008 since all those sampled in those years were also sampled in 2004. We arrive at the estimation sample by dropping the 30% of communes that already had HEF coverage in

[2] In the 2004-2009 CSES samples used in estimation there are, on average, 1.4 villages within each commune and 72% of communes consist of only one village.
[3] This appears inconsistent with the numbers in Table 1 only because the table records ODs that acquired a HEF during 2004 as having a HEF in 2004.

2004. The DID estimates are thus derived from comparisons between communes that acquire a HEF after 2004 with those that remain without a HEF in subsequent survey waves. The estimation sample corresponds to one half of the full CSES cross-section sample of households in 2004, two-thirds in 2007 and 2008 and a little less than two-fifths in 2009 (Table 1). An important exclusion is the capital city, Phnom Penh. Operation of HEFs in the capital is confined to the slum areas and these were already covered by 2004 and so households in Phnom Penh are excluded from the estimation sample.

Around a quarter of the estimation sample of communes (and households) that did not have HEF coverage in 2004 was covered by 2007. Over half was covered by 2008 and two-thirds by 2009 (Table 1).

TABLE 1

3.2 HEF COVERAGE AT THE HOUSEHOLD LEVEL

Not the whole population of an area in which a HEF operates directly benefits from it. At least in principle, HEF subsidies are targeted on the poor. Since the CSES did not ask about receipt or entitlement to subsidized health care until 2009, it is not possible to identify treatment status, in the form of HEF funded exemptions, at the household level. The 2009 data can be used to examine the extent to which HEFs make the poor's legal entitlement to user fee exemptions effective. In areas in which a HEF was operating, over 6% of households reported receipt of free or subsidized health care in the last 12 months, and a further 2% reported entitlement without receiving treatment (Table 2). In areas with no HEF, the corresponding figures are 1% and 0.5%. Clearly, there is a strong correlation between HEF operation and reported subsidization.

To assess the targeting of subsidies on the poor in 2009 we construct an indicator of household living standards from a principal components analysis (PCA) of household characteristics, including housing materials, ownership of durables, land and livestock (see Appendix, Table A1), that are also weighted in the IDPoor programme. We use PCA because the CSES does not have the complete information necessary to apply the IDPoor means test. From the second panel of Table 2 it is clear that health care subsidies are disproportionately directed to the poor. The poorest quintile of households account for 43% of all those in receipt or entitled to subsidies. Moving up the wealth distribution, the proportion of subsidized households falls monotonically. However, 17% of those receiving or entitled to subsidies are in the top two quintiles of the wealth index distribution. Since the PCA score is only an imperfect indicator of poverty, and not that used to establish HEF subsidy entitlement, we cannot interpret these numbers as unbiased measures of the target inefficiency of the subsidies. They do suggest, however, that there is substantial leakage to non-poor households.

In the DID analysis, we examine whether the HEF impact varies between households below and above the 40th percentile of the year specific wealth index distribution. This threshold is chosen because data from IDPoor reveal that, on average, around 30% of households are identified as poor and entitled to subsidisation. However, the proportion does vary substantially across districts. Further, our wealth index does not correspond to the IDPoor score or to the assessment employed by HEFs for much of the period of analysis. Allowing for these discrepancies, the 40th percentile seems a reasonable threshold around which to consider variation in the HEF effect. Of course, we certainly cannot rule out that there are HEF beneficiaries in the top 60% of the wealth index distribution and there may be an indirect impact on better-off households through improvements in service quality due to subsidy revenue.

TABLE 2

3.3 OUTCOMES

We examine four types of outcomes: payments for health care, health-related debt, non-medical consumption and health care utilisation. Health payments are recorded as the total amount spent on health care for each household member in the last four weeks. We aggregate across individuals to get total household spending on health care. In 2008, spending on health care was not asked in the health module of the survey resulting in an inconsistency that forces us to drop this wave from the analysis of payments. In 2009, payments for health services and medicines were recorded separately from health care-related transport costs. Comparison of descriptive statistics suggests that respondents in previous waves included transport costs in the amounts reported. We therefore aggregate payments and transport costs in 2009 and rely on a year dummy variable in the models to control for any discrepancy. Payments are deflated to constant 2000 prices using the non-food consumer price index.[4]

In Table 3 we split households into those living in communes that acquired a HEF between 2004 and 2009 and those in communes that remained without a HEF. We present means of the outcomes by these 'treatment' and 'control' groups in 2004 and 2009. This is done to give a general impression of any baseline and trend differences between households that get exposed to a HEF and those that do not. In the DID estimation a household is used as a control in any survey year in which it has not yet been exposed to a HEF.

At the beginning of the period, three per cent more of the control than the treatment group incurred any payments for health care in the last month. The percentage making health payments increased for both groups over time, but more so in both absolute and relative terms for those that remained without a HEF. Conditional on making any payment, the mean payment was slightly lower for this control group in 2004 at 7980 Riel ($2.08) per month. Over time, the inflation-adjusted amount of payment increased substantially for both groups but, again, to a greater extent in both absolute and relative terms for those that did not acquire a HEF, for whom it reached 21164 Riel ($5.51) by 2009. Unconditional differences-in-differences, which can be computed by comparing group-specific changes in means, are suggestive of HEFs being effective in constraining the increase in health care payments.

The CSES asks whether the household has any loans that were taken out principally because of illness or injury. No distinction is made between borrowing to pay for health care and to replace earnings lost due to work incapacity. Nonetheless, this provides the opportunity to test for an impact of HEFs on health-related debt. We sum the amount borrowed through all outstanding loans taken out primarily because of illness or injury to get the total health-related debt incurred.

In both treatment and control communes, just over 5% of households had health-related debt in 2004 (Table 3). The prevalence of debt fell for both groups over time but more so in areas in which a HEF started to operate. Among households with health-related debt, the mean amount increased by more than 100% between 2004 and 2009 in the treatment areas but by almost 200% in the control areas. So, the probability of incurring health-related debt fell by more in areas where a HEF was introduced and the positive amount of debt increased by less in these areas.

We measure household living standards by per capita household consumption net of payments for health care. This is the aggregate of expenditures on food and non-food items, plus the value of food produced for household consumption. Between 2004 and 2009, real non-medical consumption increased by more than 100% in both treatment and control areas but both the absolute and relative increase was greater in areas that obtained HEF coverage (Table 3).

[4] Unfortunately, the only available price index for the 2004-09 period is specific to Phnom Penh. There was very rapid inflation in food prices in 2008. Non-food inflation was much less marked.

The household head or spouse is asked whether each household member experienced any illness, injury or health problem in the last four weeks. He or she is also asked whether each individual sought health care over the same period. In the 2004 survey, the question on utilisation (and payments) was posed only if sickness was reported for an individual. We examine the probability of seeking health care among individuals for whom sickness is reported. When health care use is recorded, the respondent is asked from which provider care is usually sought, with options including different types of hospital, health centre, drug store, traditional healer, etc. We distinguish between respondents reporting their main provider to be in the public sector (national, provincial and district hospitals and health centres), the private sector (private hospitals and clinics), and those mainly using pharmacies and drug vendors.

In 2004, around 18% of individuals in both the treatment and control groups reported illness, injury or a health problem in the last four weeks (Table 3). The percentage fell by 2.5 points in areas that had acquired a HEF by 2009 but increased slightly in areas that remained without a HEF. At the beginning of the period, around two-thirds of individuals reporting illness sought care. Fortunately, the propensity to use health care when sick increased dramatically over time and by roughly the same degree in both treatment and control areas. Of the individuals that sought care, the proportion that did so in the public sector increased over time in areas that acquired a HEF, while it fell slightly in the control areas. The bias in favour of utilisation of private sector care increased over time in the control areas but not in the treatment areas. These trends are consistent with HEFs shifting patterns of utilisation toward the public sector. Only the trends in the utilisation of pharmacies are in the opposite direction. The propensity to use pharmacies increased over time in the treatment areas but fell in control areas.

TABLE 3

4. ESTIMATION AND SPECIFICATION

4.1 ESTIMATION

We estimate modified two-part models (Mullahy, 1998) of OOP payments with fixed effects. Let I_{ict} be an indicator of whether household *i*, in commune *c* at time period *t* incurs any OOP payments and assume this is determined as follows,

$$I_{ict} = 1\left(\beta_1 HEF_{ct} + \mathbf{Z}_{ct}\boldsymbol{\gamma}_1 + \mathbf{X}_{ict}\boldsymbol{\theta}_1 + \tau_{1t} + \lambda_{1c} + \varepsilon_{ict} > 0\right) \quad (1)$$

where 1(.) is the indicator function and the error (ε_{ict}) is assumed to follow a logistic distribution. The time varying dummy variable HEF_{ct} is equal to one in periods in which a HEF operates in a commune. We control, through dummy variables, for year effects (τ_{1t}) that are common across all communes and commune specific effects (λ_{1c}) that are fixed across all periods. The bias due to the latter incidental parameters is likely to be very small by virtue of the large number of households (38 on average) per commune (Coupè, 2005; Greene, 2004; Heckman, 1981; Katz, 2001). Time varying commune level covariates $(\mathbf{Z}_{ct})$ (see next sub-section) are included to increase plausibility of the DID identifying assumption by controlling for changes in determinants of health care expenditure and utilisation that are correlated with, but not caused by, the introduction of a HEF. Time varying household level determinants $(\mathbf{X}_{ict})$ are included both to gain precision and to avoid bias in the instance that their year specific commune level averages are correlated with the introduction of HEFs. The vector includes, among other characteristics (see next sub-section), a set of dummies indicating the wealth index quintile of the household. Since the wealth indices are year specific and because the trends in outcomes might differ by

wealth, we allow the wealth effects to be time varying. Although it is not made explicit in (1), we also control for month effects to allow for seasonal variation in the demand for health care.

The average effect of a HEF on the probability of incurring OOP payments across the population in HEF covered areas during periods of operation is estimated by

$$\widehat{ATT_1} = \frac{1}{N_{HEF}} \sum_{i \in S_{HEF}} \Lambda\left(\hat{\beta}_1 + \mathbf{Z}_{dt}\hat{\boldsymbol{\gamma}}_1 + \mathbf{X}_{ict}\hat{\boldsymbol{\theta}}_1 + \hat{\tau}_{1t} + \hat{\lambda}_{1c}\right) - \Lambda\left(\mathbf{Z}_{dt}\hat{\boldsymbol{\gamma}}_1 + \mathbf{X}_{ict}\hat{\boldsymbol{\theta}}_1 + \hat{\tau}_{1t} + \hat{\lambda}_{1c}\right), \tag{2}$$

where $\Lambda(.)$ is the logistic distribution function, S_{HEF} is the set of observations for which $HEF_{ct} = 1$ and N_{HEF} is the number of such observations.

The expectation of OOP payments (y_{ict}) over their positive range is specified as an exponential function,

$$E\left[y_{ict} \middle| y_{ict} > 0\right] = \exp\left(\beta_2 HEF_{ct} + \mathbf{Z}_{dt}\boldsymbol{\gamma}_2 + \mathbf{X}_{ict}\boldsymbol{\theta}_2 + \tau_{2t} + \lambda_{2c}\right). \tag{3}$$

The error of this Generalised Linear Model (GLM) is assumed to follow a gamma distribution. The average effect of a HEF on mean positive payments among those with such payments in the treated population is estimated by

$$\widehat{ATT}_2 = \frac{1}{N_{HEF_+}} \sum_{i \in S_{HEF_+}} \exp\left(\mathbf{Z}_{dt}\hat{\boldsymbol{\gamma}}_2 + \mathbf{X}_{ict}\hat{\boldsymbol{\theta}}_2 + \hat{\tau}_{2t} + \hat{\lambda}_{2c}\right)\left[\exp\left(\hat{\beta}_2\right) - 1\right], \tag{4}$$

where S_{HEF_+} is the subset of S_{HEF} with positive OOP payments and N_{HEF_+} is the number of such households. We also estimate the ATT relative to the counterfactual, which is simply $\widehat{RATT}_2 = \exp\left(\hat{\beta}_2\right) - 1$.

Standard errors for the average treatment effects are calculated by a delta method that takes account of sample clusters (Korn and Graubard, 1999). Despite allowance for commune fixed effects, the cluster adjustment is intentionally not applied at the commune-year level but one level up at the commune level in order to allow for possibly serially correlated commune-level shocks that would result in overstatement of the precision of the DID estimate, which is identified from variation in HEF exposure at the commune, rather than the household, level (Angrist and Pischke, 2009; Bertrand et al., 2004).

Putting the two parts of the model together, the average effect of a HEF on mean OOP payments among the exposed population is estimated by

$$\begin{aligned}\widehat{ATT} = \frac{1}{N_{HEF}} \sum_{i \in S_{HEF}} &\left[\Lambda\left(\hat{\beta}_1 + \mathbf{Z}_{dt}\hat{\boldsymbol{\gamma}}_1 + \mathbf{X}_{ict}\hat{\boldsymbol{\theta}}_1 + \hat{\tau}_{1t} + \hat{\lambda}_{1c}\right)\exp\left(\hat{\beta}_2\right) - \Lambda\left(\mathbf{Z}_{dt}\hat{\boldsymbol{\gamma}}_1 + \mathbf{X}_{ict}\hat{\boldsymbol{\theta}}_1 + \hat{\tau}_{1t} + \hat{\lambda}_{1c}\right)\right] \\ &\times \exp\left(\mathbf{Z}_{dt}\hat{\boldsymbol{\gamma}}_2 + \mathbf{X}_{ict}\hat{\boldsymbol{\theta}}_2 + \hat{\tau}_{2t} + \hat{\lambda}_{2c}\right)\end{aligned} \tag{5}$$

In proportionate terms, it is

$$\widehat{RATT} = \frac{1}{N_{HEF}} \sum_{i \in S_{HEF}} \frac{\Lambda\left(\hat{\beta}_1 + \mathbf{Z}_{dt}\hat{\boldsymbol{\gamma}}_1 + \mathbf{X}_{ict}\hat{\boldsymbol{\theta}}_1 + \hat{\tau}_{1t} + \hat{\lambda}_{1c}\right)}{\Lambda\left(\mathbf{Z}_{dt}\hat{\boldsymbol{\gamma}}_1 + \mathbf{X}_{ict}\hat{\boldsymbol{\theta}}_1 + \hat{\tau}_{1t} + \hat{\lambda}_{1c}\right)} \exp\left(\hat{\beta}_2\right) - 1. \tag{6}$$

HEFs are intended to target the poor and are therefore expected to have a greater impact on the poor population. To allow for this explicitly, beyond that arising from non-linearity of the estimators, we

extend the specifications to include interaction terms between HEF and poverty status, such that equation (3) becomes

$$E\left[y_{ict}\left|y_{ict}>0\right.\right]=\exp\left(\beta_2 HEF_{ct}+\delta_2 HEF_{ct}\times POOR_{ict}+\mathbf{Z}\boldsymbol{\gamma}_{dt\ 2}+\mathbf{X}_{ict}\boldsymbol{\theta}_{2}+\tau_{2t}+\lambda_{2c}\right) \quad (7)$$

and equation (1) is extended analogously. $POOR_{ict}$ is an indicator of poverty status defined, as explained in the previous section, by location below the 40th percentile of the (year specific) wealth index. Keep in mind that **X** includes indicators of wealth index quintiles interacted with the year effects. So, we are allowing outcomes and their trends to differ by wealth level in both treatment and control areas. Given our imprecise notation that uses β_2 to represent different parameters in (3) and (7), the treatment effects for the non-poor are as above except for summation over the non-poor subset of the defined populations. For the poor, the treatment effects, which are the incremental effects of HEF_{ct}, are also functions of the interaction terms.

Since the HEF benefit package is usually restricted to, or dominated by, treatment at a district hospital, we expect households living closer to such facilities to benefit most from the subsidy. To test this, we extend the two-part model of health payments to include a three-way interaction between the HEF indicator, poverty status and whether the household's village is located within 5 kilometres of a district hospital.

The treatment effect may vary not only with the characteristics of the household but also those of the HEF. For example, the effectiveness may vary with vintage. It has been claimed that HEF membership peaks after about 18 months of operation. In using intra OD variation in HEF coverage created by differences in the interview date of the survey of up to 12 months, we assume any HEF effect is evident within this period. We distinguish between HEFs that have been operating for no more than one year $\left(HEF_{ct}^{a}=1\right)$ and those that have operated for longer than a year $\left(HEF_{ct}^{b}=1\right)$ and estimate two-part models that include these indicators and their interactions with poverty status. For example, the expectation of positive expenditures is specified as,

$$E\left[y_{ict}\left|y_{ict}>0\right.\right]=\exp\left(\xi_1 HEF_{ct}^{a}+\xi_2 HEF_{ct}^{b}+\eta_1 HEF_{ct}^{a}\times POOR_{ict}+\eta_2 HEF_{ct}^{b}\times POOR_{ict}+\mathbf{Z}\boldsymbol{\gamma}_{dt\ 2}+\mathbf{X}_{ict}\boldsymbol{\theta}_{2}+\tau_{2t}+\lambda_{2c}\right) \quad (8)$$

Treatment effects for short and long vintage HEFs, each potentially varying with poverty status of the household, are derived from this specification following the general procedures described above.

Heterogeneity of effect by whether or not the HEF is independently operated is of particular interest given the proposed nationwide rollout of HEFs following the model of the government subsidy scheme with no third-party NGO operator and subsidisation of user fees only (not transport and food costs). Around 10% of the sample in treatment areas is covered by the government subsidy scheme. We test for heterogeneity by estimating models specified as in (8) in which the treatment indicators identify independently operated HEFs and 'government HEFs'.

Since 1999 there has been performance-based contracting of the management of public health services to NGOs in some districts. Contractors assume responsibility for delivering the mandatory health service package of a district. They have greater freedom in setting terms and conditions of staff and their funding can be partly contingent on the realisation of performance targets. An evaluation of contracting in five districts found that it improved targeted maternal and child health outcomes, and reduced household OOP health expenditures (Bhushan et al., 2007). There is some evidence indicative of contracting raising public hospital occupancy rates (Annear et al., 2006) and it has been claimed that it works best when operating in conjunction with HEF subsidisation of user fees (Annear et al., 2007). Around 17% of the

treatment sample of households is in areas with contracting in addition to HEF coverage. We control for the presence of contracting and allow the effect of HEFs to differ depending upon whether they operate in conjunction with contracting by again implementing models based on a specification like (8).

There is little evidence on the impact of contracting itself on household health expenditures in Cambodia and elsewhere. The Bhushan et al. (2007) study was intended to be a randomised experiment but nonconformity with assigned treatments meant that randomisation was eventually used as an instrument for contracting. Further, coverage of only five treatment districts means that statistical power is limited. Given this paucity of evidence, we exploit the geographic variation in whether and when contracting is introduced to identify the impact of performance-based contracting on OOP payments using the same DID approach used to identify the impact of HEFs.

Treatment effects on the other outcomes are estimated using the same general specifications but with different estimators. Because relatively few households incur health-related debt (Table 3) there is insufficient within commune variation to make inclusion of a full set of commune dummies in the second part of the model feasible. Instead, we control for time invariant differences between treatment and control communes through a dummy to indicate residence in a commune that eventually gets a HEF, in addition to the dummy indicating HEF coverage at the time of the survey. All the health care utilisation outcomes are binary and are modelled by logit with dummies to control for the commune effects. For these outcomes, the analysis is at the individual, rather than the household, level.

4.2 CONTROL VARIABLES

Controls at the village level are particularly useful to avoid bias that could arise if there are epidemics, changes in health care supply or other programmes implemented at the same time as a HEF. Descriptions, means and changes in means of these control variables are given in Table 4 separately for communes that acquired a HEF by 2009 ('treatment group') and those that did not ('control group'). Few covariates display group differences in baseline means. There are some differences in the changes in means, which confirms the value of being able to control for these time varying characteristics. For example, the prevalence of malaria and dengue increase in treatment relative to control areas, which would have biased the analysis toward finding increased health care payments and utilisation in areas that remained without a HEF if it were not possible to control for these differential trends. On the other hand, the operation of public health programmes, which by providing preventive care should reduce health expenditures, increased by more in control areas and the availability of private clinics and drug vendors fell significantly only in these areas. The latter may explain the reduced use of pharmacies in control areas observed in Table 3.

At the household level, we control for household demographics, housing, urban/rural location, economic activity, wealth index quintiles, and head of household demographics, education, occupation, disability status and ethnicity (Table 4). There are few differences between control and treatment households in 2004, besides those that acquire a HEF being less likely to reside in rural areas, but more significant changes in means across time for both groups, which could have biased the estimates if it were not possible to control for these covariates.

The models for utilisation include the village and household level covariates listed in Table 4 except that for adults the individual's own education, economic activity and occupation is used rather than that of the head of household. In addition, we control for possible changes in demographic composition through age-sex specific dummies.

5. RESULTS

Health payments

The estimated effects of HEFs on payments for health care are presented in Table 5. There is no indication of an effect on the probability that a household makes any payment for health care. This is to be expected. HEFs mainly pay for care at district hospitals and subsidize related transport and food costs. It is unlikely that they will eliminate all expenditures related to an episode of illness. There may be self-medication and private care may be sought prior to seeking care at the public hospital (Annear, 2010).

Among households that make some payment for health care, on average, HEFs reduce the monthly per capita amount by around 7000 Riel, equivalent to $1.80. While this does not seem much, it represents a 29% reduction from a baseline average of around 24000 Riel ($6.20). The reduction in absolute terms does not reach statistical significance, but the relative decrease is significant at the 5% level. This is because the ATT is a function of all the parameters and covariates included in the model, while the RATT is computed only from the coefficient on the HEF indicator. Combining the estimated effects on the probability of any payment and the conditional amount of payment, we estimate that, on average over all households, a HEF reduces the amount paid by 3084 Riel ($0.80), or 27%.[5]

The estimated average effect of a HEF on health payments (conditional on there being any payment) is larger in both absolute and relative terms for the poor, defined as households in the bottom 40% ranked by the wealth index. For these households, the positive amount of health payments is estimated to fall by a substantial and highly significant 35%. For households above the 40th percentile of wealth, payments are estimated to fall by 25% and this is significant only at the 10% level. Subject to the caveat that our ranking of households based on possession of assets, housing conditions and economic activity is only indicative of relative poverty status, it appears that HEFs are indeed successful in targeting financial protection on the most poor. Stratifying by an indicator that more closely corresponds to the poverty assessment conducted by HEFs would presumably reveal even greater bias toward the 'poor' but would beg the question of which assessment is more accurate in identifying households experiencing the greatest deprivation.

TABLE 5

Since HEFs subsidize care received at public health facilities, principally district hospitals, one expects their impact on payments to be greater for those obtaining care mainly from the public sector. But, to the extent that HEFs encourage substitution of public for private care and for self-medication, payments to these other providers may also be reduced. Lack of data on payments made specifically to each type of provider makes it difficult to reach firm conclusions about the extent to which subsidisation of public care leads to its substitution for other sources of treatment. Nonetheless, comparing the impact of HEFs on total OOP payments across households that differ in the provider from which they report usually seeking care is informative. The relevant estimates from the second part of two-part models are presented in Table 6.[6]

Among households in which a public provider is reported as the main source of care for at least one person, the introduction of a HEF is estimated to reduce total OOP payments for health care by a significant 18,617 Riel ($4.84), or 43%. The effect is even larger (56%) for poor households and is a

[5] We do not compute a standard error for the overall effect. Although it could be obtained from a bootstrap, it would be a function of all coefficients and covariates from both parts of the model.

[6] Conditional on seeking care and so reporting a usual provider, almost all observations make some payment and so the first part of the model is not interesting. In any case, for all the models permitting heterogeneous effects estimated, we never found any significant impact on the probability of incurring OOP payments for any group and so report only the conditional mean estimates in Table 6.

marginally significant 30% for non-poor households mainly using public care. These suggest very substantial direct gains from the subsidy to public care. The estimated effects are consistently negative and, as expected, smaller in magnitude for those principally using private clinics, hospitals and traditional healers, but they are never close to significance.

Among households that report usually seeking treatment from a pharmacy or drug vendor, there is a significant reduction of around 5,500 Riel ($1.44) in total OOP payments. While this is less than a third of the average decrease in payments among households that mainly rely on public providers, it still represents a 40% reduction relative to a lower average. The effect is significant for both poor and non-poor households, and in relative terms is larger (45%) among the former. These reductions could derive from reduced payments for public care among those that rely mainly, but not exclusively, on the purchase of medicines from drug vendors. They could also result from reduced reliance on self-medication or even a reduction in prices charged by drug vendors in response to the subsidized public care. Unfortunately, with the data at hand it is not possible to cast light on the relative importance of these potential explanations.

For households within 5 kilometres of a district hospital, HEFs reduce (positive) health payments by around 13,500 Riel ($3.50) on average, or 45% (Table 6).[7] The effect is larger in both absolute and relative terms among the poor but it is significant even for the non-poor living close to a district hospital. For households located further away, the estimated effects are much smaller and are never close to significance. Despite the fact that HEFs often subsidize transport costs, this does not seem to be sufficient to overcome the barriers created by remoteness from the subsidized facilities. Contrary to the idea that HEFs require time to accumulate effectiveness, those that have been operating for a year or less reduce health payments by as much as older ones (Table 6). However, the impact on the poor relative to the non-poor appears to be larger in the more mature HEFs, which suggests some improvements in targeting over time. Since pre-identification of HEF beneficiaries is usually implemented after post-identification, this result could reflect the more effective targeting of the poor achieved by the former, as well as increased awareness of HEF availability among potential beneficiaries.

The estimated effect of HEFs implemented as part of the government subsidy scheme is negative but not significant (Table 6).[8] When implementation is through NGOs, the absolute effect is significant at 10% and approximately double the point estimate for government implemented HEFs. Independent NGO-operated HEFs are estimated to reduce (positive) OOP payments by 32% on average, by 37% for the poor and by a marginally significant 27% for the non-poor. The muted impact of the government HEFs is consistent with failings of the government subsidy scheme identified by a recent qualitative evaluation (Men et al., 2011). Burdensome and inefficient Ministry of Health bureaucracy raises the administrative costs of applying for compensation and the delay before receiving it. This reduces the incentive for facilities to grant exemptions. Incentives are further eroded by flat rate reimbursements that are often insufficient to cover costs and are lower than those paid by independent HEFs. Despite the bureaucracy, there is no effective monitoring of claims leaving the scheme vulnerable to leakage of funds and spending on fictitious patients. On the demand side, the lack of coverage of transport and food costs is perceived to be an important limitation on the financial protection offered to patients.

The impact on OOP payments is much larger when HEFs operate in conjunction with the contracting of public health services (Table 6). In areas without contracting, the HEF effect is less than half of the

[7] We found no significant impact on the probability of incurring any health payments for any of the groups identified in the right-hand panel of Table 6 and so present only estimates from the second part of the respective two-part models.

[8] Because only 6% of the sample are in areas with a government operated HEF, we do not estimate heterogeneous effects by poverty status for these HEFs.

absolute effect in areas with contracting. When operating alongside contracting, HEFs reduce mean (positive) OOP payments by a significant 39%. In the absence of contracting the relative effect is an insignificant 16%. It is larger (27%) and marginally significant for the poor but in areas where a HEF operates together with contracting the relative impact on the poor is a much larger 42%.

TABLE 6

In Table 7 we present the estimated effects on OOP payments of performance-based contracting itself. Across all households, contracting significantly reduces OOP payments by the equivalent of $2.27 per month, or 38%. This is consistent with the large negative effect estimated by (Bhushan et al., 2007), who attribute it to contracting encouraging substitution of public for private providers in response to the improved quality of service available from the former. Their study found that contracting reduced staff absence at public facilities, decreased the propensity to use unqualified providers and increased the probability of using qualified public sector providers.

We find no significant effect of contracting on OOP payments among poor households but a larger and strongly significant effect (47%) for non-poor households. The reason for this differential impact is not immediately obvious. One possibility is that only the better-off households have the economic means to take advantage of the improved quality of public health services. But this is not supported by the fact that the differential impact is just as evident when contracting operates together with a HEF, which should weaken the price barrier for the poorer. The negative impact of contracting on OOP payments is increased in the presence of a HEF. The point estimate is much smaller and significance is lost when there is no HEF compensating for lost user fee revenue. This, together with the finding that the impact of HEFs is stronger when operating together with contracting, suggests that the combination of supply and demand side interventions helps realise a reduction in household health expenditures.

TABLE 7

Health-related debt and non-medical consumption

HEFs succeed in reducing payments for health care, particularly for poorer households, those mainly using public health care and those living close to a district hospital. Does this result in less borrowing to pay for health care and/or increased spending on other goods and services? There is no evidence whatsoever that HEFs reduce the probability of incurring health-related debt (Table 8). Conditional on the existence of health-related debt, HEFs have a negative effect on its level. On average, it is estimated that the amount of debt is reduced by 52,179 Riel ($13.58). Although this absolute effect is not significant, the relative effect of 25% is. Both effects are significant for the poor and they are larger than those estimated for the non-poor, which are not significant.

Since these estimates are based on only 665 households with health-related debt, one may worry about their sensitivity to outliers. For this reason, estimates from a robust GLM estimator (Cantoni and Ronchetti, 2006) are also presented. The robust estimates for all households and for poor households are reasonably close to those obtained from standard GLM. Both relative effects are strongly significant, although inference should be conducted with some caution since the standard errors of the robust estimates have not been adjusted for clustering. For the non-poor, the robust estimator delivers a much larger estimate of the treatment effect, with the result that the relative effect (28%) is the same as that for the poor and is significant at the 10% level. We conclude that there is evidence that HEFs reduce the amount of health-related debt among households with such debt by 25-28%. The estimated impact on health-related debt across all households (Table 8, final columns) is very small in absolute (although not relative) terms because the vast majority of households do not incur such debt.

Despite the reduction in payments for health care, there is no evidence that the household resources released are used to raise consumption of other goods and services. The point estimates of the impact of HEFs on non-medical expenditure presented in the second panel of Table 8 are consistently positive, but none is close to significance.[9] This suggests that households mainly use borrowing, saving, asset depletion, etc. to pay for health care rather than cutting back on consumption.

TABLE 8

Health care utilisation

In Table 9 we present estimates of the estimated impact of HEFs on the probability of reporting illness and utilisation of health care. Besides poverty status, we disaggregate by gender and age since mothers and children are likely to benefit most from the services that HEFs subsidise.

Estimated effects of HEFs on the propensity to report illness in the last four weeks are negative for all population groups (Table 9, panel 1). However, in no case is the estimated effect close to reaching statistical significance. Conditional on reporting illness, the introduction of a HEF has no significant impact on the probability of seeking care for all groups. This is perhaps not surprising since HEFs are more likely to influence the pattern of health care seeking behaviour than the aggregate rate of utilisation. We test for this by conditioning on reporting illness and seeking care and modelling the propensity to seek care mainly from a public provider, a private provider or a pharmacy/drug vendor. There is no significant effect on the probability of seeking public care for all groups. The effects on the probability of seeking care from a private provider are consistently negative. Significance is reached for the effect averaged across the whole treated sample and across the non-poor. The larger and more significant effect on the non-poor than the poor may be due to the fact that the former are more likely to be using private providers in the first instance. There are also significant negative reductions in the propensity of women and children to use private care. These results suggests that HEFs may discourage utilisation of private providers but the lack of a positive and significant impact on public care is not consistent with this being achieved through substitution of public for private care. The effects on the probability of visiting a pharmacy or drug vendor are consistently positive, which is the opposite of the desired effect of HEFs reducing self-medication, but are never close to significant. The significant reduction in total OOP payments among those mainly relying on drug vendors observed in Table 6 does not therefore appear to be due to any impact of HEFs on the composition of this group.

TABLE 9

6. CONCLUSION

Poorly resourced health systems struggle to achieve an appropriate balance between raising revenue essential for service provision and financial protection of the poorest households from health care costs. Because user fees are such an important source of revenue, providers have no incentive to grant exemptions from them even when they are statutorily obliged to do so. Compensation of providers for the revenue lost through exemptions and separation of responsibilities for service provision and adjudication of exemption eligibility are essential ingredients of an effective fee waiver system. Health Equity Funds possess these characteristics.

[9] Estimating the log of non-medical consumption by OLS with commune fixed effects rather than GLM also gives positive point estimates but not remotely significant effects. Restricting to the sub-sample of households with positive OOP payments, there is still no significant the impact on non-medical consumption.

We evaluate the impact of HEFs on households' payments for health care, their debts, non-medical consumption and health care utilisation in Cambodia. We find that HEFs have a significant and substantial negative impact on health care payments. On average over households making payments for health care in covered areas, HEFs reduce the amount paid by 29%. The effect is even larger for poor households, those mainly making use of public care and those living close to a district hospital, the main provider supported by HEFs. It is also larger when providers are compensated for lost user fee revenue through externally funded independent NGOs, rather than through the government subsidy scheme administered by the Ministry of Health. Contracting the management of public health services has a direct negative impact on household health expenditures and reduces them further through a synergy with HEFs.

The latter findings suggest that the arm's length relationship of HEFs with public providers is an important ingredient of their success. But this also poses a dilemma for their sustainability. In Cambodia, HEFs have been mainly funded by external donors. This leads to much heterogeneity in their operation and also means that the continued subsidisation of poor households is uncertain. In the long run, government funding is probably the only sustainable source of finance. The government of Cambodia has recently committed to tax financed care for the poor at public facilities with an expansion of the government subsidy scheme the most likely means of implementation. Our analysis suggests that this would weaken financial protection from health care costs. One reason is that the government scheme does not cover transport and food costs. A second is that it blurs the distinction between the finance and the provision of care and requires that facilities seek compensation for user fee exemptions through a bureaucratic and slow public administration.

Rather than bring HEFs within the public system, it may be preferable to more clearly define their role as purchasers of health care for the poor within a system that also demarcates responsibility for the public funding of health care, including the subsidisation of the poor, and the provision of services, management of which could be contracted out. HEFs would continue to operate independently receiving a public subsidy to pay the user fees of the poor and relying on external funding to reimburse transport and food costs (Men et al., 2011). The evidence presented here is not sufficient to conclude decisively in favour of this tripartite model but our findings that independent HEFs and those operating alongside the contracting of public health services are more effective in reducing household payments for health care suggest that autonomy and division of responsibilities are important ingredients of success.

Our estimate of a 29% reduction in mean (positive) OOP payments may seem surprisingly large given only around 8% of households in HEF covered areas report receipt of, or entitlement to, subsidised care and HEFs cover only public health services, while households make heavy use of private care and self-medication. One explanation is that many households may be ignorant of their HEF entitlement. It is estimated that around two-fifths of hospitalisations and one-quarter of deliveries at covered hospitals are financed through HEFs. Benefits from this substantial inflow of revenue are likely to extend beyond the households receiving the subsidy. Fee paying patients may be induced by increased stocks of supplies and better staff attendance to seek less expensive treatment from public providers rather than the more convenient but less medically effective private clinics and drug vendors.

The estimated magnitude of the effect would be overestimated if HEFs were purposively located in areas in which health expenditures were expected to decline. HEF operators have little incentive to engage in such strategic location and their ability to forecast changes in health care utilisation and expenditures is likely to be limited in any case. More probable is that locations are selected on the basis of initial conditions. But this does not jeopardise the consistency of our difference-in-differences estimator. The strength of the parallel trends assumption required for identification of the effect is weakened not only by our ability to follow the same communes over time but also by control for changes in their observable

characteristics that could be correlated with health care utilisation and expenditures. These include public health programmes and development projects, which may be established in the same locations as HEFs in order to exploit economies of agglomeration arising from administrative infrastructures. Nonetheless, we cannot completely rule out the possibility that there are other projects attracted to the HEF sites that are not documented in the data. If this is the case and if these interventions reduce health expenditures, then the estimated impact of HEFs on OOP payments will be overestimated.

We find no significant effects of HEFs on health care utilisation, which seems inconsistent with our estimates of large reductions in payments for health care. Subsidies that are effective in reducing the cost of care would be expected to raise utilisation as a consequence. We suspect that the data are not sufficiently rich to detect an effect on utilisation. With a four week reference period, binary indicators of utilisation, distinction between types of care only through a question about the 'usual provider' and an intervention targeted at care provided by district hospitals, the data may not contain the detail or have the power necessary to detect any effect on the level and pattern of utilisation. The impact of HEFs on utilisation therefore remains open.

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TABLES

Table 1: Health Equity Fund coverage and sample selection

	2004	2007	2008	2009
Operational Districts (77 in total)				
With a Health Equity Fund (HEF)	16	30	47	53
% of population in ODs with HEF	25.1	47.5	72.5	73.5
Communes				
Total number in Cambodia Socioeconomic Survey	692	293	291	621
With information on HEF coverage	684	290	288	617
Included in 2004 CSES and at least once 2007-2009	472	290	288	340
Without HEF coverage in 2004 (estimation sample)	332	205	203	230
Estimation sample with HEF	0	49 (24%)	110 (54%)	152 (66%)
Mean number of years with HEF coverage	0	0.53	1.08	2.01
Households				
In estimation sample	7473	2346	2311	4474
As % of total cross-section CSES sample	49.9%	65.3%	65.1%	37.4%
In commune with HEF coverage at time of survey	0	560 (24%)	1254 (54%)	2955 (66%)

Source: Authors' calculations from Cambodian Socioeconomic Surveys (CSES).

Table 2: Reported health care subsidization by HEF coverage and wealth quintile, 2009

	HEF operating	No HEF operating
% reporting received free or subsidized treatment in last 12 months	6.2	1.1
% reporting entitlement to, but not received, free or subsidized treatment	1.9	0.5
Number of households	8857	3034
% of those reporting receipt or entitlement to subsidy by wealth quintile		
poorest 20%	43.3	
2nd poorest	24.1	
Middle	15.7	
2nd richest	11.6	
richest 20%	5.4	

Source: Authors' calculations from Cambodia Socioeconomic Survey 2009

Notes: Sample weights applied. Top panel is split by communes that are and are not covered by a HEF. Bottom panel is for both HEF and non-HEF areas. Quintiles of wealth index derived from principal components analysis of asset ownership, economic activity and housing conditions (see Appendix 1).

Table 3: Means of outcomes by treatment status

	2004	2009	Change	% change
Households				
Percentage with any health payments				
HEF introduced b/w 2004 & 2009	44.7	45.6	0.9	2.0
No HEF b/w 2004 & 2009	47.6	53.4	5.8	12.2
Mean monthly health payment (if positive) (Riel)[a]				
HEF introduced b/w 2004 & 2009	9415	18026	8611	91.5
No HEF b/w 2004 & 2009	7980	21164	13184	165.2
Percentage with any health-related debt				
HEF introduced b/w 2004 & 2009	5.2	3.58	-1.62	-31.2
No HEF b/w 2004 & 2009	5.3	4.85	-0.45	-8.5
Mean health-related debt (if>0) (Riel)				
HEF introduced b/w 2004 & 2009	90642	195594	104952	115.8
No HEF b/w 2004 & 2009	80924	236881	155957	192.7
Mean monthly non-medical consumption per capita (Riel)				
HEF introduced b/w 2004 & 2009	53622	126011	72389	135.0
No HEF b/w 2004 & 2009	48934	104145	55211	112.8
Individuals				
Percentage reporting illness, injury or health problem ("ill") in last 4 weeks				
HEF introduced b/w 2004 & 2009	18.2	15.6	-2.6	-16.3
No HEF b/w 2004 & 2009	18.1	18.7	0.6	3.1
Percentage seeking health care if ill				
HEF introduced b/w 2004 & 2009	65.2	92.6	27.4	29.6
No HEF b/w 2004 & 2009	67.2	93.6	26.4	28.2
Percentage usually seeking public health care if ill and seek care				
HEF introduced b/w 2004 & 2009	13.7	18.3	4.6	25.2
No HEF b/w 2004 & 2009	15.1	13.7	-1.4	-10.2
Percentage usually seeking private health care if ill and seek care				
HEF introduced b/w 2004 & 2009	16.2	16.6	0.4	2.4
No HEF b/w 2004 & 2009	30.5	37.5	7.1	18.8
Percentage usually going to pharmacists / drug vendor if ill and seek care				
HEF introduced b/w 2004 & 2009	30.3	36.6	6.3	17.3
No HEF b/w 2004 & 2009	18.7	12.9	-5.9	-45.5

Source: Authors' calculations from Cambodia Socioeconomic Survey

Notes: [a] Amounts deflated to December 2000 prices using non-food price index specific to Phnom Penh. In 2000, the official exchange rate was 3841 Riel to the US$.

Table 4: Baseline means and changes in means of control variables by treatment status

	Baseline 2004		Change: 2009 – 2004	
	HEF after 2004	No HEF	HEF after 2004	No HEF
Village level variables				
Distance to nearest district hospital < 5 km (%)	33.55	32.06	1.55	6.44
Distance to nearest health center < = 2 km (%)	41.21	41.05	8.30^{+}	6.48
Distance to nearest health centre]2,5km] (%)	31.76*	42.97	-0.30	-3.81
Village has bank or loan credit union (%)	31.30	30.92	9.58^{++}	12.51^{+}
Any non-health govt. development project (%)	34.05	31.91	-2.28	8.76
Any non-health NGO development project (%)	27.58	24.78	1.39	0.16
Malaria is one of the most important health problems in village (%)	35.67***	19.52	-12.18^{+++}	-6.21
Dengue is one of the most important health problems in village (%)	58.43	52.36	4.98	20.95^{+++}
Any public health programme† (%)	72.95**	59.98	7.06^{+}	27.63^{+++}
Village has a private clinic, drug shop or other shop selling drugs (%)	31.78*	41.15	3.94	-16.13^{++}
Household level variables				
log of household size	1.510	1.490	-0.038^{+++}	0.000
number of children below 6y	0.509***	0.449	0.069^{+++}	0.139^{+++}
number of children 6y to 11y	0.605	0.585	0.021	0.064^{+}
number of adults 45y and older	0.374**	0.417	0.041^{+++}	0.048^{+}
House is rented (%)	0.64	0.34	2.54^{+++}	0.24
Rural (%)	77.15***	96.17	-2.58	-6.21^{+}
Anyone in hhold. runs a company/business (%)	38.11	34.27	-3.29	1.55
Anyone in hhold. engages fishing or aquatic farming (%)	50.88	52.61	3.76	4.05
Head of household				
Male (%)	77.36	77.58	0.98	3.84^{++}
Elementary occupation (%)	7.55	7.23	1.39	1.73
Moderately or severely disabled (%)	7.98	8.85	-1.29	0.10
Unpaid family worker (%)	3.32	2.41	-3.01^{+++}	-2.16^{+++}
Civil servant (%)	12.13	14.16	-5.65^{+++}	-9.64^{+++}
Unemployed (%)	11.82	13.91	-5.24^{++}	-5.55^{+++}
No schooling (%)	31.23	28.61	-5.21^{++}	-6.27^{++}
School grades one to five (%)	36.41	37.36	1.46	2.30
School grades six to twelve (%)	30.83	31.76	2.82	5.23^{++}
log of age (in years)	3.75*	3.77	0.016	0.007
Not Khmer (%)	4.89	3.29	-1.22	-0.70

Notes:
*, **, *** indicate significant difference between HEF and no HEF areas in baseline means at 10%, 5% and 1% levels.
$^{+}$, $^{++}$, $^{+++}$ indicate significant difference between 2004 and 2009 means at 10%, 5% and 1% levels.
† Programme for immunisation, mother and child health, family planning, HIV/AIDS testing, iodine deficiency/Goiter.

Table 5: Effects of HEF on payments for health care (OOP) by poverty status

	Pr(OOP>0) - Logit			E[OOP|OOP>0] - GLM					E[OOP]	
				Riel (3841 = $1)			Relative effect		Riel	Rel. Eff.
	ATT_1	SE	Baseline	ATT_2	SE	Baseline	$RATT_2$	SE	ATT	RATT
All	0.008	0.041	0.452	-6923	4234	23814	-0.291**	0.121	-3084	-0.274
Poor	0.011	0.046	0.443	-7561*	4583	21890	-0.345***	0.131	-3205	-0.326
Non-poor	0.007	0.042	0.459	-6055	4703	24766	-0.245*	0.143	-2780	-0.231
N	12212			5606					12212	

Notes: Estimated from 2004, 2007 and 2009 CSES. Observations are households. GLM specified with Gamma distribution and log-link. Effects are average treatment effects on the treated (ATT) estimated as in equations (2), (4)-(6). Effects by poverty status obtained from (7) with partial effects averaged over appropriate sub-samples. All models control for covariates listed in Table 4 plus commune fixed effects, month effects, year effects and wealth quintile effects with the latter two interacted. Standard errors (SE) are computed by delta method and corrected for clustering at the commune level. Standard errors are not computed for the effects on E[OOP]. Baseline corresponds to the counterfactual (no treatment) probability / conditional mean. * p<0.1, ** p<0.05, *** p<0.01.

Table 6: Heterogeneous effects of HEF on payments for health care (OOP) (conditional on OOP>0)

		E[OOP|OOP>0] – GLM			
		ATT_2	SE	$RATT_2$	SE
By whether household usually seeks care from,	N=5589				
public provider	All	-18617**	8486	-0.428***	0.123
	Poor	-25295**	11345	-0.563***	0.121
	Non-Poor	-13588	9138	-0.304*	0.180
private provider	All	-10805	10052	-0.204	0.179
	Poor	-11394	17989	-0.172	0.302
	Non-Poor	-10540	9385	-0.205	0.185
pharmacy/drug vendor	All	-5514**	2388	-0.398***	0.105
	Poor	-5245**	2347	-0.445***	0.112
	Non-Poor	-5687**	2860	-0.355***	0.131
By distance to district hospital,	N=5606				
≤ 5km	All	-13820**	6854	-0.464***	0.110
	Poor	-14616**	7358	-0.579***	0.111
	Non-Poor	-11828*	7159	-0.395***	0.138
> 5km	All	-2700	3746	-0.136	0.165
	Poor	-3155	4116	-0.169	0.185
	Non-Poor	-2129	4323	-0.101	0.189
By years HEF has been in operation,	N=5606				
≤ 1 year	All	-6397	4281	-0.266**	0.126
	Poor	-6391	4544	-0.293**	0.145
	Non-Poor	-5880	4821	-0.235	0.147
>1 year	All	-7956	4910	-0.331**	0.156
	Poor	-9132*	5218	-0.418**	0.171
	Non-Poor	-6679	5447	-0.267	0.178
By implementer of HEF,	N=5606				
Government	All	-3533	4025	-0.195	0.207
NGO	All	-7096*	3960	-0.316**	0.123
	Poor	-7505*	4340	-0.368***	0.135
	Non-Poor	-6408	4419	-0.271*	0.145
By whether HEF operates,	N=5606				
with contracting of public	All	-7049	6357	-0.389**	0.178
health services	Poor	-8795	7143	-0.419**	0.193
	Non-Poor	-5530	8068	-0.264	0.280
without contracting out	All	-3263	4153	-0.161	0.156
	Poor	-6143	5153	-0.277*	0.165
	Non-Poor	-1557	4331	-0.071	0.183

Notes: As Table 5. Effects by type of provider estimated from samples selected on whether that provider reported as usual source of care for any household member. Effects by distance to district hospital (DH) computed from model with three-way interaction between HEF indicator, poverty status and distance to DH. Effects by HEF vintage and government/NGO implementer computed from model like equation (8). Effects by co-existence with contracting estimated from a model including indicators for both HEF and contracting each fully interacted with each other and with the poverty indicator. In all cases, estimated effects on the probability of payments being positive are never significant.

Table 7: Effects of contracting of public health services on payments for health care (OOP) by poverty status and HEF coverage (conditional on OOP>0)

	E[OOP|OOP>0] – GLM			
	Riel (3841 = $1)		Relative effect	
	ATT_2	SE	$RATT_2$	SE
All	-8710**	3933	-0.381***	0.127
Poor	-3920	2933	-0.264	0.170
Non-poor	-14463***	5575	-0.475***	0.112
By whether contracting operates				
alongside HEF				
All	-9405**	4569	-0.373***	0.143
Poor	-2963	3388	-0.220	0.222
Non-poor	-14252**	6198	-0.468***	0.124
without HEF				
All	-2938	3822	-0.139	0.265
Poor	-340	3559	-0.029	0.307
Non-poor	-6022	5357	-0.328	0.252
N	5606			

Notes: As Table 5. Effects by co-existence with HEF estimated from same model used for last panel of Table 6. Estimated effects of contracting on the probability of payments being positive are never significant.

Table 8: Effects of HEF on health-related debt and non-medical consumption by poverty status

Health-related debt

	Pr(debt>0)			E[debt|debt>0]								E[debt]	
	Logit			GLM					Robust GLM				
	ATT_1	SE	Baseline	ATT_2	SE	Baseline	$RATT_2$	SE	ATT_2	$RATT_2$	SE	ATT	RATT
All	-0.005	0.010	0.053	-52179	36218	207059	-0.252**	0.120	-56356	-0.276***	0.113	-3938	-0.329
Poor	-0.017	0.017	0.082	-52778*	28155	186162	-0.284**	0.119	-46200	-0.277***	0.098	-6404	-0.444
Non-poor	0.006	0.008	0.027	-51012	68304	309034	-0.165	0.203	-75799	-0.275*	0.157	175	0.025
N	11027			665					665			11027	

Non-medical consumption

	E[non-medical consumption]			
	GLM			
	ATT	SE	RATT	SE
All	2142	3657	0.019	0.033
Poor	2501	2550	0.032	0.033
Non-poor	1144	5749	0.008	0.042
N	14359			

Notes: As for Table 5. Estimated from 2004, 2007, 2008 and 2009 CSES. Standard errors for the ATT_2 derived from the robust GLM estimator have not been computed and those for the $RATT_2$ from this estimator are not adjusted for clustering at the commune level.

Table 9: Effects of HEFs on sickness and health care utilisation by poverty status, gender and age

	ATT_1	SE	Baseline
Probability of having illness, injury or other health problem in last 4 weeks			
All treated	-0.020	0.017	0.177
Poor	-0.017	0.019	0.185
Non poor	-0.022	0.018	0.172
Female	-0.026	0.020	0.215
Children	-0.009	0.017	0.154
N			69604
Probability of seeking health care if ill in last 4 weeks			
All treated	0.003	0.032	0.860
Poor	-0.007	0.040	0.842
Non poor	0.010	0.030	0.874
Female	0.004	0.033	0.860
Children	0.013	0.030	0.873
N			10741
Probability of usually seeking care at public provider if ill and seek care			
All treated	0.006	0.032	0.192
Poor	-0.006	0.037	0.223
Non poor	0.015	0.032	0.168
Female	-0.005	0.034	0.199
Children	0.016	0.036	0.203
N			8680
Probability of usually seeking care at private clinic/ hospital if ill and seek care			
All treated	-0.078*	0.042	0.229
Poor	-0.051	0.037	0.167
Non poor	-0.096*	0.049	0.273
Female	-0.092**	0.045	0.253
Children	-0.067*	0.040	0.187
N			7959
Probability of usually seeking care at private pharmacy / drug vendor if ill and seek care			
All treated	0.046	0.050	0.361
Poor	0.054	0.054	0.369
Non Poor	0.040	0.052	0.356
Female	0.067	0.050	0.338
Children	0.026	0.054	0.390
N			8388

Notes: Estimated from CSES 2004, 2007, 2008 and 2009. Observations are individuals. ATT_1 estimated from dummy variable logit models as in equation (2). All models control for covariates listed in Table 4 plus commune fixed effects, month effects, year effects and wealth quintile effects with the latter two interacted. For adults, the individual's own education, economic activity and occupation is used rather than that of the head of household. In addition, demographics are controlled for through indicators for 18 age-sex categories. Standard errors (SE) are corrected for clustering at the commune level. Baseline is the counterfactual probability. Sample sizes differ due to dropping communes for which there is no within variation in the outcome.

APPENDIX

Table A1: Household characteristics used in principal components analysis construction of wealth index with means and factor weightings in 2004

	Mean	Factor weighting
Primary construction material of the roof of the housing/dwelling unit occupied by the household is		
Thatch	0.208	-0.185
Tiles	0.268	0.047
Fibrous cement	0.051	0.061
Galvanized iron	0.352	0.032
Salvaged materials	0.002	0.003
Mixed but mainly made of galvanized iron/aluminum, tiles or fibrous cement	0.011	0.003
Mixed but mainly made of thatch/leave /grass or salvaged materials	0.005	-0.025
Concrete	0.042	0.237
Other	0.062	-0.085
Primary construction material of the wall of the housing/dwelling unit occupied by the household is		
Bamboo, thatch	0.271	-0.179
Wood or logs	0.252	0.041
Plywood	0.197	0.032
Concrete, brick, stone	0.093	0.314
Galvanized iron	0.022	-0.001
Fibrous cement	0.002	-0.002
Makeshift, salvaged	0.014	-0.021
Other	0.150	-0.110
Floor area of the housing (m^2)	43.013	0.265
Area of the plot used for vegetable gardening, agricultural or farming (m^2)	21.60	-0.004
Percentage of household members economically inactive (%)	0.416	0.039
Durable goods per household, number of		
radio	0.379	0.092
television	0.496	0.295
cell phones	0.201	0.372
videos	0.069	0.260
stereo	0.238	0.225
camera (picture/video)	0.030	0.213
bicycle	0.847	0.057
motorcycle	0.350	0.322
cart	0.251	-0.075
car	0.033	0.267
jeep	0.007	0.095
rowing boat	0.085	-0.034
motor boat	0.024	0.007
tractor	0.003	0.008
hand tractor	0.042	-0.007
Purchase value of all means of transportation/vehicle (current Riel prices)	1410381	0.285
Livestock per household, number of		
Cattle	1.140	-0.068
Buffaloes	1.041	-0.004
Horses, Ponies	0.009	-0.011
Pigs	0.913	-0.005
Goats	0.019	-0.003

Notes: PCA is conducted separately for each year. Means and factors weightings shown for 2004 only.