Performance-based financing with GAVI health system strengthening funding in rural Cambodia: a brief assessment of the impact

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Introduction Though Cambodia made impressive gains in immunization coverage between the years 2000 and 2005, it recognized several health system challenges to greater coverage of immunization and sustainability. The Global Alliance for Vaccines and Immunization (GAVI) opened a Health System Strengthening (HSS) funding window in 2006. To address the health system challenges, Cambodia has been receiving the GAVI HSS fund since October 2007. The major component of the support is performance-based financing (PBF) for maternal, neonatal and child health (MNCH) services.

Objective To examine the impact of the PBF scheme on MNCH services and administrative management in rural Cambodia.

Methods Quantitative and qualitative studies were conducted in Kroch Chhmar Operational District (OD), Cambodia. Quantitative analyses were conducted on the trends of the numbers of MNCH services. A brief analysis was conducted using qualitative data.

Results After the commencement of the PBF support, the volume of MNCH services was significantly boosted. In addition, strengthened financial and operational management was observed in the study area. However, the quality of the MNCH services was not ensured. Technical assistance, rather than the PBF scheme, was perceived by stakeholders to play a vital role in increasing the quality of the services.

Discussion To improve the quality of the health services provided, it is better to include indicators on the quality of care in the PBF scheme. Mutual co-operation between PBF models and technical assistance may ensure better service quality while boosting the quantity. A robust but feasible data validation mechanism should be in place, as a PBF could incentivize inaccurate reporting. The capacity for financial management should be strengthened in PBF recipient ODs. To address the broader aspects of MNCH, a balanced input of resources and strengthening of all six building blocks of a health system are necessary.

Keywords: Health system strengthening, performance-based financing, maternal and child health, Cambodia
Introduction

Like many low-income countries, Cambodia is committed to achieving the Millennium Development Goals (MDGs) including MDG 4 and MDG 5 (reduction of child and maternal mortality, respectively). Cambodia made impressive gains in immunization between the years 2000 and 2005, with rapid improvements in coverage (fully immunized child status from 39% in 2000 to 66% in 2005) and sharp declines in reportable vaccine preventable diseases (suspected measles cases from over 12 000 in 2000 to <400 in 2005) (Ministry of Health 2006a). However, the Cambodian Ministry of Health (MoH) recognized several challenges to greater coverage of immunization and its sustainability, which were related not only to immunization programme factors but also to the structure and function of the entire health system (Ministry of Health 2006a). Based on this recognition, and following the invitation by the Global Alliance for Vaccines and Immunization (GAVI) to develop proposals, the Cambodian MoH developed and submitted proposals to GAVI to gain GAVI Health System Strengthening (HSS) funding.

The GAVI was launched in January 2000, in response to deteriorating immunization coverage rates occurring in the late 1990s (Cutts 2000; Kane and Brooks 2002; Nossal 2003) due to donor fatigue (Nossal 2000). GAVI is one of the largest global public private partnerships, bringing together developing country governments, donor governments, the United Nations Children’s Fund, the World Health Organization (WHO), the World Bank, the Bill and Melinda Gates Foundation, civil society organizations, vaccine manufacturers and public health and research organizations (GAVI 2008a). GAVI aims to accelerate access to existing underused vaccines, introduce new vaccines including those against pneumococcus, rotavirus and Haemophilus influenzae type B (Hib) and raise immunization coverage in the poorest countries worldwide (GAVI 2008a). In 2006, GAVI opened a HSS funding window for 72 GAVI eligible countries (GAVI 2008b), acknowledging that health system constraints (Brugha et al. 2002; NORAD 2004; Travis et al. 2004) needed to be addressed to increase and sustain immunization coverage (GAVI 2007). The goal of the GAVI HSS is to improve and sustain immunization coverage and to reduce child mortality (MDG 4) and maternal mortality (MDG 5) (GAVI 2007).

The proposals submitted by the Cambodian MoH have since been approved by GAVI and Cambodia was granted funding from October 2007 until 2015. The goal of the proposed scheme is to improve immunization coverage and child survival through strengthening district health systems by increasing health centre (HC) utilization, improving the quality and coverage of services and increasing demand for health services (Ministry of Health 2006a). Ten operational districts (ODs) of the Cambodian MoH out of 76 ODs in the country were selected as recipients of the scheme based on a range of criteria (Ministry of Health 2006a). To achieve the goal of the proposed scheme, the grant has been supporting performance-based financing (PBF) for maternal, neonatal and child health (MNCH) services, operational costs for the services (e.g. training and supervision) and costs for promoting community participation. The scheme, as PBF, disburses US$1 per antenatal care (ANC) visit and immunization dose, and US$0.5 per outpatient consultation visit to each HC. Among the immunization doses, only hepatitis B (birth dose) given within 24 h after delivery, diphtheria, pertussis and tetanus (DPT) hepatitis B (three times) and measles are subject to disbursement of the PBF.

The Cambodian MoH was using quantity and coverage not only of these services but also of the entire health services in Cambodia for the monitoring and evaluation of the sector programme. However, statistical analysis was rarely undertaken for the same purposes. In addition, impacts of the PBF scheme on the quality of the health services, and financial and operational management were not analysed. Furthermore, impacts of the GAVI HSS funding had not yet been analysed in earlier studies as of late 2007.

We, therefore, aimed to examine the achievement of the goal of the PBF scheme. The specific objectives for this study were: (1) to statistically analyse changes in quantity of MNCH services provided under the PBF scheme (i.e. ANC visits, immunizations and outpatient consultation visits) in a recipient OD; (2) to analyse how the PBF scheme affected the quality of the MNCH services in the OD; (3) to analyse how the PBF scheme affected the financial and operational management in the OD; (4) to elaborate advantages and disadvantages of the PBF scheme based on the analyses and (5) to provide the GAVI HSS with feedback based on the analyses and discussion for its improvement.

Methods

Study area

This study was conducted in Kroch Chhmar OD, Kampong Cham Province. This OD was under the control of Kampong Cham Provincial Health Department (PHD), and served its total population of 100,527 as of 2008. The OD had 1 referral hospital and 10 HCs, 6 being compliant with the Minimum Package of Activities (MPAs) and entitled to collect user fees, and the other 4 being non-MPA compliant. Kroch Chhmar OD was selected as 1 of the 10 PBF recipient ODs, and has been receiving the fund since October 2007, which will continue until 2015. Since July 2008, the United Nations Populations Fund with contributions from the Australian Government’s...
overseas aid program (UNFPA/AusAID) has been providing additional support to complement the support from GAVI HSS and ensure more comprehensive MNCH care, namely PBF provisions intended for post-natal care (US$1 per care) and birth spacing (US$1 per visit). Furthermore, the Cambodian government has been disbursing PBF for childbirth services (US$15 per service). Thus, in the Kroch Chhmar OD, three PBF schemes, each supported by GAVI HSS, UNFPA/AusAID, and the Cambodian government, have sought to facilitate the continuum of MNCH care, comprising ANC, delivery, post-natal care, immunization for children and birth spacing. These PBF related MNCH services were mainly provided by the 10 HCs.

Data collection
This study was conducted from January 2008 to July 2009. Official records on ANC visits and immunizations (hepatitis B birth dose; DPT hepatitis B 1, 2 and 3; and measles) from January 2007 to June 2009 were obtained from the Kroch Chhmar OD (health administration) office. Similarly, data on outpatient consultation visits from January 2006 to June 2009 were also collected from the OD office. To examine the quality of the MNCH services, two sessions of focus group discussions (FGDs) with 12 midwives, two sessions of FGDs with two OD staff and one session of semistructured interviews (SSIs) with a trainer of midwifery training of the National Maternal and Child Health Centre were conducted. In addition, four rounds of HC visits were conducted to observe the MNCH services provided by the 10 HCs. To explore the financial and operational impacts of the scheme, three sessions of FGD with three OD staff and two sessions of SSI with 10 HC staff were conducted. The interview guides for FGDs and SSIs were first developed in English and were translated into Khmer.

Data analysis
The quantitative data obtained through the study period were checked in the field, and analysed using Microsoft Excel 2008. Transitions of the number of the MNCH services were analysed. Estimated coverage of ANC (first: ANC 1 to fifth: ANC 5) and immunizations before and after the introduction of the PBF scheme were compared using the chi-square test. Considering the seasonality, the comparison was performed between the coverage from January to September 2007 (before) and the one from January to September 2008 (after). To estimate the ANC coverage, the numbers of pregnancies in the OD in the pre- and post-PBF support periods were calculated. Annual total number of pregnancies in the OD in 2008 (2513) was estimated by multiplying total population in the OD in 2008 (100,527) by 0.025 (National Institute of Statistics et al. 2011). Thus, the number of pregnancies in the post-GAVI HSS support period (January–September 2008) was estimated at 1885. The annual total number of pregnancies in the OD in 2007 (2473) was estimated by multiplying the total population in the OD in 2008 (100,527) by 0.984 (population growth rate of 1.6% between 2005 and 2010) (UNFPA 2009) and the CBR (0.025) (National Institute of Statistics et al. 2011). Therefore, the number of pregnancies in the pre-PBF support period (January–September 2007) was estimated at 1855. The numbers of infants in the OD in the pre- and post-PBF support periods were also calculated to estimate the immunizations coverage. The number of infants in the pre-PBF support period (1813) was estimated by subtracting the estimated number of midyear infant deaths from the estimated number of pregnancies or births in the pre-PBF support period (1855). The number of midyear infant deaths was estimated by multiplying the estimated number of births in the pre-PBF support period (1855) by the infant mortality rate (0.045) (National Institute of Statistics et al. 2011), and dividing by 2. The number of infants in the post-PBF support period (1842) was also estimated in the same manner. Regarding the data on outpatient consultation visits, descriptive analysis was undertaken since the coverage estimation and statistical analysis were inappropriate. The contents of the FGDs and SSIs were transcribed and checked to ensure accuracy of the contents. Finally, key phrases were categorized. The observation records taken during the HC visits were reviewed.

Results
Service coverage and quantity
ANC services at HCs in the Kroch Chhmar OD included measurement of fundus height of the uterus, body height, weight and blood pressure, supplementation of iron and folic acid and administration of mebendazole for deworming. In the outreach setting, only the height measurement was dropped from the package. Figure 2 shows the transition of the number of ANC visits by different rounds in the Kroch Chhmar OD from January 2007 to June 2009. The overall number of ANC visits increased markedly after installation of the PBF scheme. Table 1 shows the ANC coverage before (January–September 2007) and after (January–September 2008) the introduction of the PBF scheme in the OD. The estimated ANC 1 coverage in the pre- and post-PBF support periods was 60.3% ($n=1118$) and 123.1% ($n=2321$), respectively. Similarly, higher coverage was detected in ANC 2, 3 and 4 after the commencement of the PBF scheme. A significant difference between before and after the introduction of GAVI HSS scheme was confirmed in all rounds of ANC ($P<0.001$), except ANC 5 ($P=0.426$).

Figure 2 shows the transition of the number of different immunization doses provided in the Kroch Chhmar OD from January 2007 to June 2009. The number of hepatitis B birth doses drastically increased after the commencement of the PBF scheme, whereas the volume of DPT hepatitis B 1, 2 and 3, and measles fluctuated but showed a slight upward trend over the period. Table 2 shows the immunization coverages in the pre- (January–September 2007) and post- (January–September 2008) PBF support periods. The estimated coverages of hepatitis B birth dose in each period were 0.3% ($n=6$) and 30.6% ($n=563$), respectively. Similarly, higher coverage was confirmed in DPT hepatitis B 2 and 3, and measles after the introduction of the PBF scheme. The coverage of DPT hepatitis B 1 decreased slightly in the post-PBF support period, although the difference was not statistically significant, whereas the coverage of the other immunizations (i.e. hepatitis B birth dose, DPT hepatitis B 2 and 3, and measles) was significantly higher after the commencement of the PBF scheme ($P<0.001$). In the post-PBF support period, inexplicably, the coverage of later
stages of DPT hepatitis B was higher (i.e. 88.5, 90.9 and 94.6% in DPT hepatitis B 1, 2 and 3, respectively).

According to the OD Director, although in the pre-PBF support period HC staff had paid less attention to how many people gathered to be vaccinated in remote areas during outreach immunization activities, they were encouraging village people to be immunized once the PBF scheme started.

Figure 3 shows the transition of the number of monthly outpatient consultation visits in the Kroch Chhmar OD from January 2006 to June 2009. From January 2006 to March 2007, the visits were roughly between 3000 and 4000. Since Cambodia experienced an outbreak of dengue fever for 6 months from April to September 2007 (IFCR 2008), there was a surge in the visits during this period. Since October 2007 (inception of the PBF scheme) until June 2009, the visits increased to approximately between 3500 and 4500.

The OD Director, Deputy Director and HC staff perceived that the increase of outpatient consultation visits was largely attributable to the extension of the practising time of HCs. In the pre-PBF support period, HCs were opened for a few hours in the morning only, because each HC staff practised privately in the afternoon to compensate for the low salary they received from the government. After the commencement of PBF support, the HCs were opened for 24 h since this public practice also pushed up the income of HC staff.

Although the coverage and quantity of the MNCH services had been improved, the OD Director was concerned about validity of data submitted by the HCs in the OD (i.e. over-reporting). The Director stated that the OD did not have sufficient authority to check the validity of data from HCs, although the MoH was developing a form to conduct a spot check in the near future.

### Quality of care

The serious shortage of health personnel has been a critical problem in Cambodia. To increase the number of midwives and allocate them in rural areas properly, since 2003 the Cambodian MoH has been developing primary midwives (PMWs) with a year-long training after the completion of the 10-year basic education. Concurrently, secondary midwives (SMWs) have been developed with a 4-year training comprising a 3-year secondary nursing course and a 1-year midwifery course, after the completion of the 12-year basic education.

Midwifery capacities were perceived limited by midwives themselves, particularly PMWs, and other stakeholders. In the Kroch Chhmar OD, in addition to an existing SMW and four PMWs as of January 2007, one SMW and six PMWs were newly appointed to serve in the OD by the middle of 2008. Four newly appointed PMWs, who had been separately allocated to different HCs which had no other midwife, stated that they had no confidence in any of their knowledge and skills on birth spacing, ANC, delivery attendance and newborn care. Although all of them perceived a need to learn midwifery skills from experienced and skilled birth attendants, such mentors were

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**Table 1** Comparison of ANC coverage before (January–September 2007) and after (January–September 2008) the introduction of the PBF scheme in the Kroch Chhmar OD

<table>
<thead>
<tr>
<th>Coverage before the PBF (n = 1855)</th>
<th>Coverage after the PBF (n = 1885)</th>
<th>P-value for chi-square test</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANC1 1118 (60.3)</td>
<td>2321 (123.1)*</td>
<td>0.000b</td>
</tr>
<tr>
<td>ANC2 479 (25.8)</td>
<td>1280 (67.9)</td>
<td>0.000b</td>
</tr>
<tr>
<td>ANC3 249 (13.4)</td>
<td>607 (32.2)</td>
<td>0.000b</td>
</tr>
<tr>
<td>ANC4 69 (3.7)</td>
<td>295 (15.6)</td>
<td>0.000b</td>
</tr>
<tr>
<td>ANC5 95 (5.1)</td>
<td>86 (4.6)</td>
<td>0.426</td>
</tr>
</tbody>
</table>

*Chi-square test was performed assuming 100% coverage.

b P < 0.001.
not readily available. During the 1-year PMW course, they could experience only six deliveries. One of the PMWs mentioned that she did not remember well what she had learned on the PMW course. Another PMW stated that she had refused a pregnant woman from delivering at her HC since she was afraid of assisting the delivery due to a lack of experience. The same PMW mentioned that she learned midwifery skills from a traditional birth attendant since no other person on her worksite could teach her the skills.

We observed that when a woman delivered at a HC, she and her newborn were ‘roasted’ at the maternity ward of the HC, which could be a cause of dehydration of the mother and baby. ‘Roasting’ is the most popular and traditional post-natal activity in rural communities of Cambodia. A woman spends a minimum of 3 days and up to a month lying beside a fire or on a bed over charcoals where she is ‘roasted’ to revive her strength and replace the heat that is perceived to be lost during childbirth (National Institute of Statistics and ORC Macro 2001).

To improve the limited knowledge and skills of the PMWs, all of the six newly appointed PMWs had been additionally trained on ANC, birth attendance and newborn care at the National Maternal and Child Health Centre during the study period. According to a trainer of the Centre, it took 2 months for the PMWs to reach a minimum level of required skills, although SMWs required only 1 month to reach a satisfactory level. In order for the PMWs to sustain their knowledge and skills obtained in the 2-month training, a monitoring and supervision system was also introduced through the reorganization of supportive mechanisms among PHD, the OD and Kampong Cham Provincial Referral Hospital (top referral hospital in the province).

We observed that some HCs in the Kroch Chhmar OD provided ANC services without properly functioning materials such as weighing scales and sphygmomanometers until a donor agency provided the HCs with the items in September 2008.

The authors confirmed that at least four HCs in the OD employed a total of seven lay workers as HC staff. One of them provided health service users with outpatient consultations including prescription of medicine. This person had worked as a health staff before Khmer Rouge Regime (April 1974 to January 1979), but was not qualified as a health staff in the present health system. A woman who had been trained in midwifery at a military hospital, but was not a qualified midwife, provided maternal health services. A man was in charge of administering immunization activities.

Technical assistance such as midwifery clinical training, distribution of new medical equipment and the reorganization of supportive mechanisms between PHD, ODs and Kampong Cham Provincial Referral Hospital to support HC midwives, rather than the PBF schemes, was perceived by the OD and HC staff to play a vital role in increasing the capacity of existing staff. The OD Director commented that the technical assistance contributed to the improvement of quality of care, whereas the PBF schemes mainly boosted quantity of services.

### Financial and operational management

Receipt of the performance-based incentive involved the following steps: (1) the HCs submit a monthly activity report, (2) the OD develops a summary report based on the HCs’ reports and submits it to the PHD, (3) the PHD reviews the summary report and issues a bank cheque to the OD when approved by both the PHD Director and accountant chief, (4)
the OD cashes the cheque at a bank, (5) the OD disburses the incentives to the HCs based on the activity reports submitted and gets a receipt from each HC and finally (6) the OD submits the receipt to the PHD.

Immediately after the introduction of the PBF scheme, the OD experienced difficulties in calculating the amount of incentive claimed to the PHD and added workload for the financial management. However, the OD Director and accountant mentioned that they had acquired sufficient skills for financial management, thus, as long as the fund was supplied sufficiently, they were confident of continuing the fund management. In contrast, all HC staff perceived that the financial management at the HCs was kept simple and easy, monitoring service quantities and reporting them to the OD. All HC staff interviewed commented that their revenue has been boosted due to increased income from user fees as well as the incentive from the PBF schemes supported by GAVI HSS and UNFPA/AusAID. Some HC staff stated that they, using the financial incentive as well as the increased user fee income, purchased medicines and medical consumables such as gloves for their routine activities, which were always in short supply with delays.

In the face of a serious shortage of human resources, temporary HC staff including lay workers without medical qualification were prevalent mainly due to the staffing standards and US$24 monthly supplementation of staff salaries in case staffing was insufficient. Some of the lay workers assisted HC staff in providing health services including birth attendance. Incentives provided through the PBF schemes were mostly shared by all staff equally, therefore augmented the payment to the lay workers.

The PBF impacted the relation between different administrative levels. The OD Director stated that PHD/OD mutual relationship did not experience a big change, whereas OD/HCs co-operative relationships were significantly strengthened. The HC staff were more receptive to OD advice after the scheme came into force. The Director also mentioned that the turnover of OD and HC staff decreased and they tended to stay longer in the OD. Some HC staff commented that they got themselves motivated to inform village people of HC working hours and of their mobile phone numbers to be rung on demand.

**Discussion**

Earlier studies have reported valuable impacts of the GAVI HSS funding identified at national level in Cambodia and other countries (Ministry of Health 2006b; HLSP 2009; Naimoli 2009; Galichet *et al.* 2010; Grundy 2010). This brief assessment study, using both quantitative and qualitative methods, sought to examine the impacts of the PBF scheme supported by GAVI HSS on the quantity and quality of MNCH services and financial and operational management at the field level in Cambodia. The volume of almost all types of relevant services (i.e. ANC visits, immunizations and outpatient consultation visits) in the OD was significantly boosted in the post-PBF support period. The ANC 1 coverage after the inception of the PBF scheme exceeded 100%, which might be attributable to accident error in the estimation of the population and pregnancies in the OD. In addition, the larger number of women who had been expected to receive ANC 1 earlier (i.e. before the post-PBF support period) might rush to HCs for ANC 1 in the post-PBF support period. Between 2006 (2007 in some cases) and 2008, the other 9 of the 10 PBF recipient ODs similarly demonstrated an increase in the number of service provisions (Biacabe 2009). After the inception of the PBF scheme, the staff’s morale was boosted and operational management at the HC level was improved in the Kroch Chhmar OD. For instance, HCs started attracting larger number of village people to be immunized, extended their working hours, made staff available all day and encouraged village people to use HC services. Furthermore, some HCs, using the financial incentives and increased user fee income, independently purchased medicines and consumables to maintain their routine activities. At HCs in the other nine PBF recipient ODs, significant improvements have been observed in the availability of staff (Biacabe 2009; HLSP 2009), staff attitude, punctuality, client follow-up and outreach to villages where HC service utilization is low (HLSP 2009). However, these findings
of this study should be carefully interpreted. These improvements might not be only attributable to the PBF scheme assisted by GAVI HSS. Rather, the combination of the PBF schemes supported by GAVI HSS, UNFPA/AusAID and the Cambodian government worked interactively by motivating HC staff to catch larger numbers of reproductive age women and infants, and follow them up to maximize the financial incentives.

Though the investment in HSS could potentially dilute the impact on immunization, in reality it created additional impacts on MNCH, particularly the increased coverage of ANC, on top of the increased immunization coverage. In addition, it led to improvements in operational management. Thus, this immunization focused grant, in collaboration with other PBF schemes, could provide the broader health system with synergies in terms of MNCH services. For increased demand for health services, since the PBF mainly worked on the supply side, we regret that our study did not clearly demonstrate the effect on the demand side (target population).

As above, the study results indicate that PBF is a useful tool to increase quantity of health services. However, when implementing PBF, several health system weaknesses involved should be addressed. These are the quality of health services, data validation and capacity for financial management.

The PBF in the Kroch Chhmar OD did not effectively ensure the quality of health services. First, the newly appointed PMWs were not confident in providing quality MNCH services at all. It was evident that these PMWs could not ensure the quality of the services at least before participating in the additional 2-month training at the National Maternal and Child Health Centre. Second, some HCs in the Kroch Chhmar OD provided ANC services without properly functioning materials such as weighing scales and sphygmomanometers until a donor agency provided the HCs with the items in September 2008. Therefore, although the number of ANC visits was significantly increased in the OD, the quality of ANC services provided during the period was arguable. Third, although it was not the PBF scheme but the government staffing standard and salary supplementation that caused this issue, by providing additional salary supplementation to the temporary staff that were often unqualified lay workers, the PBF indirectly contributed to such practice. Fourth, according to an observational study on clinical skills conducted at 12 HCs in the other PBF recipient ODs, injection technique and safety were satisfactory according to national standards (Biacabe 2009), whereas the quality of ANC was generally insufficient to properly assess potential risks associated with pregnancy and delivery, and to provide adequate information on danger signs to pregnant women (Biacabe 2009). These HCs also merely provided outpatients with medicines after a very brief questionnaire on symptoms, without any clinical examination (Biacabe 2009).

Several studies conducted in other countries, however, have observed improvements of quality of care attributable to PBF. For example, in Egypt, significant improvements in the quality of family planning, ANC and childcare services have been observed after the installation of a PBF scheme (Huntington et al. 2010). In Rwanda, PBF was also successful in boosting service utilization and improving quality of services considerably (Rusa et al. 2009). In these cases, the PBF disbursement was subject to the quality improvement of care (Rusa et al. 2009; Huntington et al. 2010).

Indicators on the quality of care, however, were not considered in the PBF in Cambodia. Indicators on the quality of care could be included in the scheme. Technical assistance such as midwifery clinical training and the reorganization of supportive mechanisms for HC midwives was perceived by the OD and HC staff to play a critical role in increasing the capacity of existing staff. As the OD Director’s comment indicated, cooperation between financial inputs such as PBF and technical assistance can contribute to the assurance of the quality of care while the quantity expands largely due to the former.

The OD Director was concerned about the validity of data or over-reporting of services provided by the HCs to the OD. Actually, in the post-PBF support period, inexplicably, the coverage of later stage of DPT hepatitis B was higher. This might be attributable to errors in filling in the register book and reporting to upper administrative levels, and/or over-reporting, particularly in the later stages to show better performances. As Biacabe (2009) reported, a formal data quality audit (DQA) was conducted by the MoH in all the 10 ODs in 2008, following GAVI methodology and guidelines. The result showed a 90% accuracy of data (Biacabe 2009), whereas worldwide, Lim et al. (2008) identified that the GAVI Immunization Service Support significantly increased the difference between countries’ official reports based on service provider registries and coverage demonstrated by surveys such as Demographic and Health Surveys. Survey based DPT 3 immunization coverage has improved more gradually and not to the level indicated by countries’ official estimates (Lim et al. 2008). The PBF assisted by the GAVI HSS funding was well harmonized and interacted with the other PBF models supported by UNFPA/AusAID and the Cambodian government. However, performance-based payment methods could have the potential effects on incentivizing inaccurate reporting. Although the data collection and analysis methods applied in this study could be adapted as part of monitoring and evaluation, a robust but feasible data validation mechanism should be in place. Authority to implement routine DQA or spot checks could be decentralized to the OD level.

The PBF and operational cost disbursement were far swifter than the MoH budget endowment, ensuring timely disbursement of the incentives to the Kroch Chhmar OD and its HC staff on the basis of their performance, and implementation of activities as originally scheduled such as supervisions and meeting with village health volunteers. The PBF scheme also strengthened the capacity for financial management at the OD level and the relationships between the OD and HCs. Although the capacity for financial management and procedures has increased in Kroch Chhmar OD, it was still weak in other PBF recipient ODs (Biacabe 2009). Sharing of experiences on this matter between Kroch Chhmar OD and other recipient ODs could strengthen the capacity of the latter ODs.

Other health system weaknesses beyond PBF should be also addressed simultaneously for entire HSS.

The authors would note the fundamental issues of the delay in government budget endowment (normally a few months’ delay) and overhead subtraction by higher levels of health administration before reaching the field level. The PBF scheme might consolidate a bypass cash flow from GAVI to OD.
In Cambodia, 5–10% of the health budget is subtracted even before it leaves central government, and more money is then siphoned off as funds are channelled down from the MoH to PHDs, to ODs and to HCs (Transparency International 2006). Therefore, the PBF might contribute to the continuation of such delay and siphoning by compensating the local cash flow outside the government endowment. Furthermore, the sustainability of the PBF schemes is also of concern. Though the Cambodian MoH proactively employed the approach to facilitate the continuum of MNCH care and mainly funded it, the MoH still relied on the financial assistance from the Global Health Initiative (GAVI) and development partners.

The scheme ensured financial resources, but the imbalance between financial, human and material resources was still obstructing the service delivery. Human resource shortages, particularly of midwives, were one of the main limitations of the whole of Cambodia (WHO 2006) even after the installation of the PBF. In addition, the short supply of medicines and consumables such as gloves was still prevalent, leading to compromised service utilization and lower quality of care. This is important from the service user’s viewpoint since they tend to perceive the availability of medical supplies and products to be a token of better health services (Matsuoka et al. 2010). To address the broader aspects of MNCH, a balanced input of resources and strengthening of all six building blocks of a health system are necessary. In this regard, co-operation between PBF and technical assistance could be critical for HSS, since it could effectively cover a wider range of the building blocks of a health system at a time. It should be noted that the interventions for HSS should also address the barriers to accessing health services faced by service users in low-income countries, because many interventions have focused much on service providers’ barriers (e.g. improving the health professionals’ skills, provisions of medical supplies and health facilities) (Ensor and Cooper 2004).

One of major limitations of this study was a simple before/after comparison of outcomes at a single site. Better analyses could have been made if the outcomes in the Kroch Chhmar OD were compared with a control site. The comparability between the pre- and post-PBF support periods could be an issue when, for example, vaccines were not available due to import delays in one of the periods. Since each OD has its own background, the representativeness of the Kroch Chhmar OD is arguable and the findings may not be generalizable to the entire PBF recipient ODs. In this regard, the authors sought to complement the findings by reviewing the relevant studies conducted in the country (Blacabe 2009; HLSP 2009). Regarding the estimated health service coverage, the accuracy of numerators could be incomplete, as indicated by the higher coverage of later stage of DPT hepatitis B. In addition, the accuracy of denominators is not completely ensured (e.g. 1853, the estimated number of pregnancies in the pre-PBF support period), as seen in other countries (Bosch-Capblanch 2009). There is an inherent limitation in indicating service coverage in proportion because the denominators are mathematically derived from census data and estimated population growth rate. However, despite a range of inaccuracy, the denominators are fixed and the proportions at least reflect the actual change in the number of services provided. Regarding the quality of care, observational study could probe a more faithful level of midwifery knowledge and skills. The advantages and disadvantages of qualitative research methods should also be noted. In an SSI, an interviewee may comfortably talk in a more relaxed atmosphere, thus the interviewer could be able to collect in-depth information studied (Boyce and Neale 2006). However, the answers are prone to bias (Boyce and Neale 2006) and subjective, making data standardization and comparison difficult. In an FGD, since the participants build on each other’s ideas through ‘piggybacking’ (Leung and Savithiri 2009), they could balance their views with those of others, and the quality of information provided could be controlled to a certain extent. However, the answers may again have been prone to the modest bias. The same questions were asked both in FGDs and SSIs to minimize the disadvantages of the methods.

In conclusion, the combination of several PBF models facilitating the continuum of MNCH care contributed to the increase in the volume of MNCH services. However, to improve the quality of the services, indicators on the quality of care could be included in the scheme. In addition, co-operation between PBF models and technical assistance is crucial to assure the quality of care. The data collection and analysis methods applied in this study could be adapted as part of monitoring and evaluation. However, a robust but feasible data validation mechanism should be in place, as a PBF could incentivize inaccurate reporting. The capacity for financial management should be strengthened in other PBF recipient ODs. Kroch Chhmar OD could help them improve the capacity by sharing experiences. To address the broader aspects of MNCH, a balanced input of resources and strengthening of all six building blocks of a health system are necessary. Again, in this respect, co-operation between PBF models and technical assistance would be useful. These policy implications for national level could be highlighted, based on the analyses of this study and review of relevant studies. Though the findings in one district are insufficient to lead both nationwide and Alliance-wide policies, the compilation of such field-based evidence should guide them.

The authors also realized that since the study was aimed to overview the impact of the scheme, the study included a rather broad set of objectives. Thus, the authors strongly suggest that, considering the limitations above, further assessment be conducted for a more detailed and critical analysis. For instance, a potential further assessment would be conducted in the entire PBF recipient ODs and control sites, and include statistical analyses (i.e. comparison of pre and post, and comparison with control sites) and more in-depth qualitative study on the quality of care applying observational methods. The authors hope that this study will serve as an entry point for such assessment.

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**Notes**

1. BCG (vaccination against tuberculosis), measles and three doses each of DPT and polo vaccine (excluding polo vaccine given at birth).
2. The first grant (2007) and second (2008–15) were in line with the Cambodian National Health Sector Strategic Plan for 2003–07 and for 2008–15, respectively.
3. Since January 2009, it has been revised from any consultation visits to a visit for a child under 5 year of age.
4. The MPA is composed of maternal and child health and reproductive health services, communicable and non-communicable diseases services, health education and promotion and outreach services—see Ministry of Health (2007).
5. This PMW course was supposed to be terminated by the end of 2012.
6. This SMW course was supposed to be terminated by the end of 2012. Since May 2009, a new SMW course was initiated, which was a 3-year midwifery course after the completion of a 12-year basic education.
7. According to the MoH, 60 and 39% of user-fee income should be utilized as monetary incentive for health facility staff, and for operational cost, respectively. The rest of 1% is to be paid to the Ministry of Economic and Finance.
8. Six building blocks of a health system are health service delivery, health workforce, health information system, medical supplies and technologies, health financing and leadership and governance (WHO 2007).

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