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# BMJ Open

## Effective coverage of curative child health services in rural Burkina Faso

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# Effective coverage of curative child health services in rural Burkina Faso

Koulidiati J-L<sup>1\*</sup>, Nesbitt RC<sup>1</sup>, Ouedraogo N<sup>1</sup>, Hien H<sup>2 3</sup>, Robyn PJ<sup>4</sup>, Compaoré P<sup>5</sup>, Souares A<sup>1§</sup>, and Brenner S<sup>1 §</sup>

<sup>1</sup> Institute of Public Health, Heidelberg University, Im Neuenheimer Feld 130.3, 69120 Heidelberg, Germany

<sup>2</sup> Centre Muraz, 01 BP 390 Bobo-Dioulasso 01, Burkina Faso

<sup>3</sup> Institut de recherche en science de la santé (IRSS), 399, avenue de la liberté, BP 545, Bobo-Dioulasso, Burkina Faso

<sup>4</sup> The World Bank, 1818 H Street, NW Washington, DC 20433 USA

<sup>5</sup> Ministry of Health, 01 BP 7009 Ouagadougou 01, Burkina Faso

§ Joint senior authors.

**\*Corresponding author:** Jean-Louis Koulidiati

E-mail: jean-louis.koulidiati@uni-heidelberg.de

Address: Institute of Public Health, Im Neuenheimer Feld 130.3, 69120 Heidelberg, Germany

Tel: (+49) 6221 56 35039 Fax: (+49) 6221 565948

## Summary

**Objective:** To estimate both crude and effective curative health services coverage provided by rural health facilities to under-five-year-old (U5YO) children in Burkina Faso.

**Methods:** We surveyed 1,298 child health providers and 1,681 clinical cases across 494 primary level health facilities, as well as 12,497 U5YO children across 7,694 households in the facilities' catchment areas. Facilities were scored based on a set of 25 functions along three quality of care dimensions: management of common childhood diseases, management of severe childhood diseases, and general service readiness. Linking service quality to service utilization, we estimated both crude and effective coverage of U5YO children by these selected curative services.

## Results

Measured performance quality among facilities was generally low with only 12.7% of facilities surveyed reaching our definition of high and 57.1% our definition of intermediate quality of care. The crude coverage was 69.5% while the effective coverages indicated that 5.3% and 44.6% of children who sought care for an illness episode received services of only high or high and intermediate quality respectively.

## Conclusion

Our study showed that the quality of U5YO child health services provided by primary level health facilities in Burkina Faso was low, resulting in relatively ineffective population coverage. Poor adherence to clinical treatment guidelines seemed to be main contributors to the gap between crude and effective coverage.

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3 **Strengths and limitations of this study**

- 4 2 ➤ This study brings new evidence on effective child health service coverage in low-  
5 3 income settings.  
6 4 ➤ Our findings are helpful to policy makers and health workers in adjusting current  
7 5 quality improvement processes.  
8 6 ➤ While our performance score accounted for both inputs and process elements related  
9 7 to technical quality of care, we were not able to include elements of outcome quality.  
10 8 ➤ While providing a thorough assessment of U5YO child service coverage provided by  
11 9 rural health care facilities at the primary level, our study does not provide any  
12 10 information on service coverage provided by higher levels of care such as district or  
13 11 regional hospitals.  
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## 1 Introduction

2 In spite of a recent decline in child mortality worldwide, Sub-Saharan Africa (SSA) continues  
3 to be the region with the highest child mortality rates globally.<sup>1</sup> Most of these deaths occur  
4 among under five-year-old children (U5YO) and are due to common infectious diseases  
5 (malaria, diarrhoea, pneumonia) and neonatal complications (preterm birth, prolonged labour,  
6 newborn sepsis) – all of which are preventable and/or treatable by commonly available and  
7 cost-effective interventions.<sup>1 2</sup>

8 Availability of and accessibility to effective child health services (CHS) are essential in  
9 reducing child mortality.<sup>3-6</sup> Child health interventions therefore need to ensure a combined  
10 focus on both access (i.e. removal of financial, geographical, or cultural barriers) to essential  
11 health services and high-standard quality of care provided by these services. While isolated  
12 removal of existing barriers to care may improve crude service coverage (i.e. number of  
13 service users able to access available services),<sup>7</sup> this may not result in an effective  
14 improvement of health outcomes as long as available service quality remains substandard.<sup>8 9</sup>  
15 By assessing the maximum possible health gain an individual can receive from a given health  
16 service, the concept of ‘effective coverage’ therefore adjusts the commonly used crude  
17 coverage estimates by the quality of the actual services received by a service user.<sup>10 11</sup>

18 Effective coverage has been increasingly used in the evaluation of maternal and child health  
19 programs.<sup>12-15</sup> For instance, Nesbitt et al. compared crude and effective coverage of pregnant  
20 women with facility-based obstetric services in Ghana and estimated that, although 68% of  
21 the women studied had service access, only 18% received high quality care provided by a  
22 skilled birth attendant.<sup>16</sup> Similarly, by comparing effective coverage of young children  
23 receiving malaria-related care from formal and informal health providers across SSA  
24 countries, Galactionova et al. found an enormous variance in estimates ranging from 8% to  
25 72% depending on country.<sup>8</sup>

26 To further contribute to the effective coverage literature, we estimated both crude and  
27 effective coverage of U5YO with CHS in Burkina Faso. Our focus hereby is on curative care  
28 (as opposed to preventive care such as vaccinations or nutrition supplementation) provided by  
29 primary level health facilities.

## 1 **Methods**

### 2 **Study Setting:**

3 In Burkina Faso, the health system follows a three-level pyramidal structure (central,  
4 intermediate and peripheral)<sup>17</sup>. At the peripheral or lower level, the *Centres de santé et de*  
5 *promotion sociale (CSPS)* function as entry point to the health system. CSPS represent health  
6 centers that provide minimum preventive and curative services to the community. Each CSPS  
7 serves a catchment area of several villages or sectors and employs a minimum staff consisting  
8 of at least one nurse, one midwife, and one nurse assistant (*Agent Itinérant de Santé (AIS)*).  
9 According to national quality assurance policies, both the nurse and midwife professionals  
10 have to be qualified to provide U5YO services.<sup>18 19</sup> Curative care utilization by U5YO in 2010  
11 was poor with only 50% of those children suffering from common infectious diseases (e.g.  
12 malaria, diarrhoea, pneumonia) having sought care at a health facilities.<sup>20</sup> As user fees were  
13 the main barrier to curative care utilization, the government started a subsidization program  
14 for U5YO in 2016.<sup>21 22</sup>

### 15 **Study design and study participants:**

16 We used cross-sectional facility and household data from the baseline survey of a  
17 government-led evaluation of a nation-wide performance-based financing program conducted  
18 between October 2013 and February 2014.<sup>23</sup> Regions and districts included into the evaluation  
19 study have been purposely selected on basis of low performance in identified maternal and  
20 child health indicators: (i) contraceptive prevalence rate; (ii) assisted deliveries; (iii) antenatal  
21 consultations (iv) post-natal consultations v) childhood vaccination coverage.

22  
23 **Facility sample:** A total of 494 CSPS located in 24 districts across six out of thirteen regions  
24 of the country were included, representing approximately 70% of all CSPS in these districts.  
25 Recently opened facilities (less than six months old) or other forms of primary care services  
26 (e.g. at high schools, colleges, garrisons or, prisons) were excluded. About 91% of selected  
27 facilities were considered rural CSPS.

28  
29 **Individual provider sample:** Across selected facilities, a total of 1,298 individual providers  
30 were included. This sample represents the staff on duty at the day of study visit at a given  
31 facility and included all CSPS employed staff cadres.

32

1 **U5YO case sample:** Across selected facilities, a total of 1,681 cases of U5YO children  
2 presenting to the outpatient department on the day of the study visit were included following a  
3 convenience sampling approach. Only first-time presentations (i.e. no follow-up visits) were  
4 included.  
5

6 **U5YO sample:** The household survey was conducted with a total of 7,694 households located  
7 in the catchment areas of the sampled facilities. Households were identified using a two-stage  
8 sampling technique. First, one village was randomly selected from all villages located within  
9 a given catchment area. Subsequently, within the selected village 15 households were  
10 randomly selected from all households identified to house at least one woman who had been  
11 pregnant or given birth within the previous two years. Among these households, we identified  
12 and included a total of 12,497 U5YO.  
13

#### 14 **Data Collection:**

15 The survey instruments used in this study are based on the Health Results Innovation Trust  
16 Fund's (HRITF) impact evaluation toolkit and adapted to the Burkina Faso context<sup>23</sup> :

- 17 a) A facility inventory was conducted at each sampled facility assessing the availability of  
18 staff, infrastructure, equipment, drugs, supplies, and consumables. Each facility head  
19 verbally completed a structured checklist and a research assistant verified availability and  
20 functionality of reported items. Inventory content was based on the service availability  
21 and readiness assessment (SARA) framework;<sup>24</sup>
- 22 b) For each U5YO case, the patient-provider interaction during consultation was directly  
23 observed and recorded by a trained research assistant using a structured checklist.<sup>25</sup>  
24 Checklist items were based on clinical activities outlined by the integrated management of  
25 childhood illness (IMCI) standards.<sup>26</sup> As the IMCI standards promote a generic approach  
26 to the initial health status assessment of a child regardless the individual chief complaint,  
27 health workers' adherence to this non-case-specific initial approach was observed in order  
28 to allow comparison between different cases.
- 29 c) A vignette-based knowledge assessment <sup>27</sup> including three different case scenarios was  
30 conducted with clinical staff to evaluate familiarity with specific IMCI standards as  
31 related to the case management of severely ill children (i.e. dehydration, fever, respiratory  
32 distress). A trained research assistant recorded steps in clinical management suggested by  
33 the health worker on a structured checklist. Additional information related to a health  
34 professional's qualification and IMCI training background, were also obtained.



d) A structured interview was conducted with the caregiver of each child in the U5YO population sample to collect information on any illness episodes and resultant care-seeking behaviour during the four weeks preceding the survey date.

Written informed consent was obtained from all study participants (i.e. health workers, patients, caregivers).

## Measures and Analysis

Effective coverage (EC) is defined as the relationship between individual need, service utilization, and service quality<sup>11 12 28</sup> and can be described as:

$$EC_{ij} = (Q_{ij} U_{ij} | N_{ij} = 1)$$

Where  $EC_{ij}$  is the effective coverage of individual  $i$  with health service  $j$ ;  $Q_{ij}$  is the expected quality of service  $j$  provided to individual  $i$ ;  $U_{ij}$  is the probability of individual  $i$  receiving service  $j$ ; and  $N_{ij}$  indicates all individuals  $i$  in need of service  $j$ .

For this study we defined *need*  $N$  as all U5YO reporting an illness episode during the past month. We defined *utilization*  $U$  as U5YO who actually sought care at the nearest facility. We defined *quality*  $Q$  as a facility or service specific score composed of three quality dimensions.<sup>24 29</sup>

a) Observed *management of common childhood diseases* (MCCD) consists of five process indicators related to health status review and four process indicators related to health status examination assessed by the case observation survey. Two of these process indicators (i.e. ‘weight check’ and ‘temperature check’) are further linked to the availability of essential input elements assessed by the facility inventory (i.e. ‘functional scale’ and ‘functional thermometer’);

b) Theoretical *management of severe childhood diseases* (MSCD) is based on provider knowledge on appropriate first-line management processes of 1) severe dehydration in a two-year-old (five process indicators), 2) breathing difficulties in a one-year-old (three process indicators), and 3) lethargy in a newborn (three process indicators) assessed by the three vignettes. Seven of these process indicators are further linked to the availability of essential input elements assessed by the facility inventory (see Table 1-B);

c) *General service readiness* is based on five structural indicators on availability of electricity, water, sanitation, patient transport, and waiting rooms assessed by the facility inventory.

1 Composite score generation included the following steps. Each indicator measuring inputs, or  
2 structures, was assigned a value of 1 if at least one unit of the observed item was available and  
3 functional at a given facility, otherwise 0. To account for the multiple case observations and  
4 vignettes conducted per facility, we averaged findings from multiple process measures at the  
5 facility level into a single facility-specific process measure, by assigning a value of 1 when a  
6 given process was observed in at least half of the observed instances and 0 if not. For those  
7 quality measures where process indicators could be linked to input indicators, we assigned a  
8 value of 1 only when both indicators were met, otherwise 0. Tables 1-A, 1-B, and 1-C provide  
9 an overview of the three quality dimensions including the respective process, input, and  
10 structural indicators together with overall facility performance across all sampled CSPA  
11 facilities. To further categorize facilities, we adjusted the resulting MCCD and MSCD  
12 performance scores by the characteristics of health professionals (i.e. professional  
13 qualification and IMCI training background) providing U5YO consultations and responding  
14 to the vignettes.

15  
16 For each of the three quality dimensions, facilities were then grouped into one of three  
17 categories of performance quality (high, intermediate, and low) based on the criteria shown in  
18 Table 2. For facilities that met different criteria levels for each dimension, we assigned them  
19 to the lower level. For instance, if a facility performed a high performance quality score but  
20 did not meet required staff characteristics, we assigned it to the intermediate level.

21 To estimate effective coverage, we defined *effective coverage* as the proportion of all U5YO  
22 in need who actually sought care at a facility categorized as at least high or intermediate  
23 performance quality.

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## 1 Results

### 2 Staffing

3 In our study, the clinical staff observed independently managing U5YO consultations at CSPA  
4 facilities included 64.1% nurses, 6.8% midwives and 29.1% AIS. Among health professionals  
5 responding to the vignettes, 74.1% were qualified to provide child health services and 32.7%  
6 reported to be trained in IMCI. In 66% of the studied CSPA, all observed U5YO consultations  
7 were performed by qualified health providers, but in only in 42.5% of CSPA consultations  
8 were provided by a health professional trained in IMCI.

### 10 Quality of Care functions

11 Table 1-A shows the percentage of facilities meeting each of the listed MCCD indicators. In  
12 regards to symptom review (indicators 1-5), frequencies for overall performance were highest  
13 for routine fever (94.1%), cough (83.4%), and diarrhoea (74.9%) reviews but not for routine  
14 ear problems (25.9%) and danger signs (38.6%). In regards to patient examination (indicators  
15 6-8), routine checks of body temperature and signs of anaemia were observed in 93.7% and  
16 77.1% of CSPA, but body weight and vaccination status review were observed in only 67.4%  
17 and 41.9% of CSPA.

19 Table 1-B presents the overall percentage of facilities meeting each of the listed MSCD  
20 indicators. In scenario 1, providers would have administered appropriate initial treatment (i.e.  
21 immediate fluid resuscitation by intravenous or enteral route) and would have withheld  
22 immediate antibiotic administration given the viral cause of diarrhoea in the majority of CSPA  
23 (86% and 71.4% respectively). In contrast, providers in only 32.7% of CSPA would have  
24 withheld malaria treatments until further proof of parasitemia and in only 25.9% providers  
25 would have initiated indicated further care (i.e. admission for further reassessment and  
26 monitoring). In scenario two, providers in 76.1% of CSPA would have administered  
27 antibiotics, but only in 14.1% of CSPA, indicated further care (i.e. outpatient treatment with  
28 close follow-up) would have been implemented. In scenario three, although in the majority of  
29 CPSP (78.5%) providers would have referred the ill infant to a higher-level care facility, in  
30 only 39.2% and 7.2% of CSPA life-saving antibiotics and hypoglycaemia as potential cause of  
31 lethargy would have been adequately addressed, although the necessary drugs to do so were  
32 available in the majority of CSPA. .

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4 1  
5 2 Table 1-C presents the overall percentage of facilities meeting general service readiness  
6 3 indicators. The majority of facilities met general infrastructural readiness. However, only  
7 4 about half of facilities had water and soap for hand washing directly accessible in the  
8 5 consultation rooms (56.8%), and only 23.3% could directly access a vehicle for emergency  
9 6 patient transport.  
10 7

### 8 **Overall quality of care categorization**

9 Applying the criteria outlined in Table 2 to assign each CSPA to a performance quality  
10 10 category resulted in the distribution shown in Figure 1. For the MCCD dimension, 80.4% of  
11 11 CSPA were categorized as meeting high or intermediate quality, while only 19.6% of CSPA  
12 12 fell into the low quality category. A similar pattern was found for the general service  
13 13 readiness dimension with 84.6% of CSPA meeting high or intermediate performance quality.  
14 14 In contrast, only 49.4% of CSPA met high or intermediate MSCD quality, with more than half  
15 15 of facilities providing relatively poor management to children with critical health conditions.  
16 16 Taking all three dimensions together, 69.8% of CSPA met high or intermediate quality.  
17 17

### 18 **Crude and effective coverage for curative CHS**

19 19 Out of the total U5YO population sample, 614 (4.9%) experienced an illness episode during  
20 20 the four weeks prior to the survey date. Of these children in need for health care, 427 (69.5 %)  
21 21 actually sought facility-based care (i.e. crude coverage). Given that the majority of CSPA fell  
22 22 into the intermediate quality category, we estimated effective coverage for two scenarios:  
23 23 scenario A only considering facilities in the high quality category and scenario B considering  
24 24 both high and intermediate performing facilities. For effective coverage scenario A only 33  
25 25 (5.3 %) U5YO received high quality services; for scenario B 274 (44.6 %) U5YO were  
26 26 effectively covered (see Figure 2).  
27 27

## Discussion

Our study revealed two major findings regarding CHS provision in Burkina Faso. Firstly, there are existing gaps between crude and effective coverage. Secondly, performance quality related to the management of ill children provided by CSPS in our study area is generally sub-standard and varies greatly between quality dimensions.

Our study found that only about two thirds of ill U5YO presented to a CSPS, which in our study is assumed to be equivalent to crude service coverage. At this point, we were unable to explore the reasons of not seeking care for those non-using children in our sample – e.g. whether there are persisting access barriers or whether the child’s illness was treated at home or elsewhere outside the formal health system. Additional research will therefore be warranted to better understand the health-seeking behaviour of households caring for ill children not seeking care provided free through the CSPS system.

More disturbingly, we found the gap in effective coverage to be considerably wide, especially when considering only high quality facilities. These estimates might be biased to some extent, as we assumed every sick child to be taken to the CSPS closest to the household when estimating service use (available data did not allow for a more specific assessment). While this would not have affected our crude coverage estimation, it might have diminished the effective coverage estimates in cases where caretakers actually bypassed the closest CSPS in favour of a more distant facility with better quality.<sup>30</sup> However, our assumption is supported by the literature on primary health care utilization in SSA and we trust that our effective coverage estimates are sufficiently representative of the situation in Burkina Faso.<sup>31-35</sup>

Effective coverage estimates are heavily influenced and can be easily modulated depending on the indicators selected to measure service quality. Although the process, input, and structural indicators included in our quality score are informed by the work of other authors, they still can be considered selective or biased towards technical elements of the care delivery process.<sup>14 16</sup> Still, we understand that for health care provision to be effective, evidence-based clinical protocols (such as IMCI) need to be adhered to and can therefore be considered the gold standard against which quality should be measured.

In doing so, we observed quite some quality differences across CSPS within and across the measured dimensions. While observed MCCD processes did not meet IMCI standards, it became nevertheless obvious that providers still follow an assessment approach that seems to

1 be focused on or informed by the leading causes and symptoms among the U5YO population.  
2 The vignette-based assessment of MSCD, processes revealed that providers generally adhere  
3 to treatment guidelines regarding the initial management of severely ill infants (except for the  
4 newborn case in scenario 3), but deviate from protocol when making definitive care decisions.  
5 Similarly weak or inconsistent adherence to treatment guidelines contributing to low service  
6 quality in low-income settings has also been noted by other studies.<sup>36-38</sup>

7  
8 Besides inconsistencies in protocol adherence, an additional contribution to the low  
9 effectiveness of provided care might have been the fact that a large portion of observed U5YO  
10 consultations was actually conducted by health workers without adequate qualifications (i.e.  
11 AIS or providers without IMCI training) in the absence of any supervision by a more qualified  
12 staff member. Officially, AIS are not authorized to independently provide any curative care in  
13 Burkina Faso<sup>19</sup> and usually do not receive any specific skill trainings, such as IMCI.<sup>39</sup> In  
14 addition, inadequate equipment and supplies might have also contributed to some of the  
15 deviations from protocol, for instance many facilities had no malaria tests or otoscopes  
16 available, which might explain the less differentiated use of anti-malaria drugs or the limited  
17 focus on ear-related symptoms.<sup>40</sup>

18  
19 As with all studies on performance quality, our study faces some limitations regarding the  
20 assessment of the quality components included in our effective coverage estimates. To  
21 determine the quality of curative CHS, we relied on both direct observations and vignettes.<sup>25</sup>  
22 <sup>27</sup> A common bias to direct observation is the so-called Hawthorne effect, which describes  
23 higher performance under observation compared to non-observed situations, and may cause  
24 overestimation of actual performance.<sup>41</sup> In contrast, clinical vignettes might underestimate  
25 actual clinical competence, as a testing format based on abstract case scenarios might be  
26 unfamiliar to many health workers and has limitations in reflecting the realities of actual case  
27 management. Still, both instruments are considered standard in the assessment of health  
28 worker performance. In addition, to estimate the effective coverage for curative CHS, we used  
29 only indicators of content of care to assess a potential health gain. Using this approach leads  
30 to limitations because content of care may not directly translate into health gain.<sup>12</sup> Even  
31 though our indicators measured the diagnosis and the treatment's process, they did not capture  
32 patients' adherence to treatment or individual health outcomes (recovery, complications, etc.).  
33 While our study focus was on primary level health care facilities in rural areas, study regions  
34 and districts were purposely selected, which limits the generalizability of our results.

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3 1 However the large sample available to this study (representing around one third of primary  
4 2 level health care facilities in the country) still provides a sufficiently representative overview  
5 3 on effective coverage in Burkina Faso. With this study adding new evidence on the  
6 4 effectiveness of child health service coverage in low-income settings, the future focus should  
7 5 certainly include the effective coverage of U5YO in more urban areas and the effectiveness of  
8 6 services provided by hospitals. Additional research exploring the determinants of effective  
9 7 coverage (both demand side factors and supply side factors), will be necessary and helpful to  
10 8 decision makers to tailor health interventions more specifically to improve effective service  
11 9 coverage.  
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## 21 **Conclusion**

22 Comparing crude and effective service coverage of U5YO in rural Burkina Faso resulted in  
23 13 two major findings. First, there are existing gaps between crude and effective coverage.  
24 14 Second, the effectiveness of services provided to U5YO is extremely low, even when  
25 15 considering a less strict definition of service quality. The main reason for inadequate service  
26 16 quality appears to be related to the extent to which providers are enabled to implement and  
27 17 able to adhere to treatment protocols and guidelines. To improve effectiveness of U5YO  
28 18 service provision, both policy makers and health workers should review both the enforcement  
29 19 of evidence-based clinical protocols (e.g. through trainings, performance evaluations,  
30 20 supervision and coaching) and the adequacy of equipment and supplies available at the CSPS  
31 21 level.  
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## 1 **Author contributions**

2 AS, SB, RCN, JLK conceived and designed the paper. AS, NO, SB, HH and JLK were  
3 involved in data collection. JLK analysed the data and wrote the first draft of the manuscript.  
4 JLK, RCN, NO, HH, JR, PC, AS and SB reviewed and approved the final version of the  
5 paper.

## 6 **Data sharing statement**

7 For access to the entire data set used for this article, please contact Paul Jacob Robyn  
8 ([probyn@worldbank.org](mailto:probyn@worldbank.org))

## 9 **Ethics considerations**

10 The National Ethics Committee in Burkina Faso as well as the Ethical Committee of the  
11 Medical Faculty at Heidelberg University approved this study. For this study, we obtain  
12 written consent of all the respondents.

## 13 **Funding**

14 This study was funded by the World Bank through the Health Results Innovation Trust Fund

## 15 **Competing interests**

16 We used data from the baseline survey of the impact evaluation of the Performance Based  
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19 (HRITF). Nobila Ouedraogo and Aurelia Soares, who was the scientific coordinator of the  
20 baseline survey received salary from the World Bank. Jean-Louis Kouliadiati is a  
21 doctoral student at the University of Heidelberg and received payment from the World Bank  
22 during data collection. Stephan Brenner is currently partially employed on  
23 the abovementioned Impact Evaluation. Paul Jacob Robyn is a World Bank employee, based  
24 in Washington. Hervé Hien is employed at Centre Muraz and received payment from the  
25 World Bank during data collection only. None of the authors received any payment by the  
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27 did not interfere with design, data analysis, and writing of this manuscript in any way.

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**Table 1-A. Indicators and related performance of management of common childhood diseases (MCCD)**

	<b>Process Indicators</b>	Number (percentage) of all facilities with observed process	<b>Input Indicators</b>	Number (percentage) of all facilities with observed input	<b>Overall Facility Performance</b> Number (percentage) of all facilities with observed performance *
1.	Provider asks for at least two general danger signs §	191 (38.6)	N/A	N/A	191 (38.6)
2.	Provider asks for presence of fever	465 (94.1)	N/A	N/A	465 (94.1)
3.	Provider asks for presence of cough	412 (83.4)	N/A	N/A	412 (83.4)
4.	Provider asks for presence of diarrhoea	370 (74.9)	N/A	N/A	370 (74.9)
5.	Provider asks for presence of ear problems	128 (25.9)	N/A	N/A	128 (25.9)
6.	Provider checks child's weight	366 (74.1)	Functional scale available	448 (90.7)	333 (67.4)
7.	Provider checks child's temperature	477 (96.5)	Functional thermometer available	480 (97.1)	463 (93.7)
8.	Provider checks for signs of anaemia (conjunctivae, palms)	381 (77.1)	N/A	N/A	381 (77.1)
9.	Provider checks child's current vaccination status	207 (41.9)	N/A	N/A	207 (41.9)

N/A = not applicable

\* In instances where both process and input indicators were applicable, overall facility performance was positive once both indicators were met.

§ Per IMCI standard: four general danger signs need to be assessed (difficulties breastfeeding/taking any food, considerable vomiting, lethargy, convulsions). Due to generally low performance of this indicator if measured against this standard, we considered this process to be performed when at least two danger signs were reviewed.

**Table 1-B. Indicators and related performance of management of severe childhood diseases (MSCD)**

	<b>Process Indicators</b>	Number (percentage) of all facilities with observed process	<b>Input Indicators</b>	Number (percentage) of all facilities with observed input	<b>Overall Facility Performance</b> Number (percentage) of all facilities with observed performance *
<b>Vignette-based scenario 1: Viral illness with severe dehydration in 2-year-old</b>					
1.	Provider starts rehydration (either intravenous or enteral fluids)	445 (90.1)	Isotonic fluid <sup>a</sup> or oral rehydration salt and nasogastric tube in stock	486 (98.3)	439 (88.8)
2.	Provider administers a dose of paracetamol to lower fever	190 (38.4)	Paracetamol suppository in stock	424 (85.8)	165 (33.4)
3.	Provider recognizes viral origin of illness and withholds antibiotics until further evaluation.	353 (71.4)	N/A	N/A	353 (71.4)
4.	Provider withholds malaria treatment until parasitemia is confirmed	396 (80.1)	Malaria testing supplies in stock	203 (41.1)	162 (32.7)
5.	Provider admits patient for further observation and reassessment	128 (25.9)	N/A	N/A	128 (25.9)
<b>Vignette-based scenario 2: Breathing difficulties in 1-year-old with simple pneumonia</b>					
1.	Provider initiates antibiotic treatment at facility	380 (76.9)	Antibiotics in stock <sup>b</sup>	486 (98.3)	376 (76.1)
2.	Provider administers a dose of paracetamol to lower fever	331 (67)	Paracetamol suppository in stock	424 (85.8)	293 (59.3)
3.	Patient is discharged with close follow-up plan (opposed to admission or referral)	70 (14.1)	N/A	N/A	70 (14.1)
<b>Vignette-based scenario 3: Lethargic 1-month-old</b>					
1.	Provider administers a dose of injectable antibiotic	230 (46.5)	Ceftriaxone in stock	410 (83)	194 (39.2)
2.	Provider checks and controls hypoglycaemia	37 (7.5)	Dextrose solutions or dextrose containing IV fluids in stock	464 (93.9)	36 (7.2)
3.	Provider refers patient to higher level of care	388 (78.5)	N/A	N/A	388 (78.5)

N/A = not applicable

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\* In instances where both process and input indicators were applicable, overall facility performance was positive once both indicators were met.  
<sup>a</sup> (Ringer lactate or normal saline)  
<sup>b</sup> Amoxicillin or Cotrimoxazole or Ceftriaxone

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**Table 1-C. Indicators and related performance of general service readiness**

	<b>Process Indicators</b>	<b>Structural Indicators</b>	<b>Overall Facility Performance</b> Number (percentage) of all facilities with observed performance
1.	N/A	Functional electricity source available	412 (83.4)
2.	N/A	Functional water source and soap available in the consultation room	281 (56.8)
3.	N/A	Functional toilet facilities available	480 (97.2)
4.	N/A	Functional emergency vehicle available	115 (23.3)
5.	N/A	Patient waiting room available	406 (82.2)

N/A = not applicable

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**Table 2. Categories of facility quality based on performance scores**

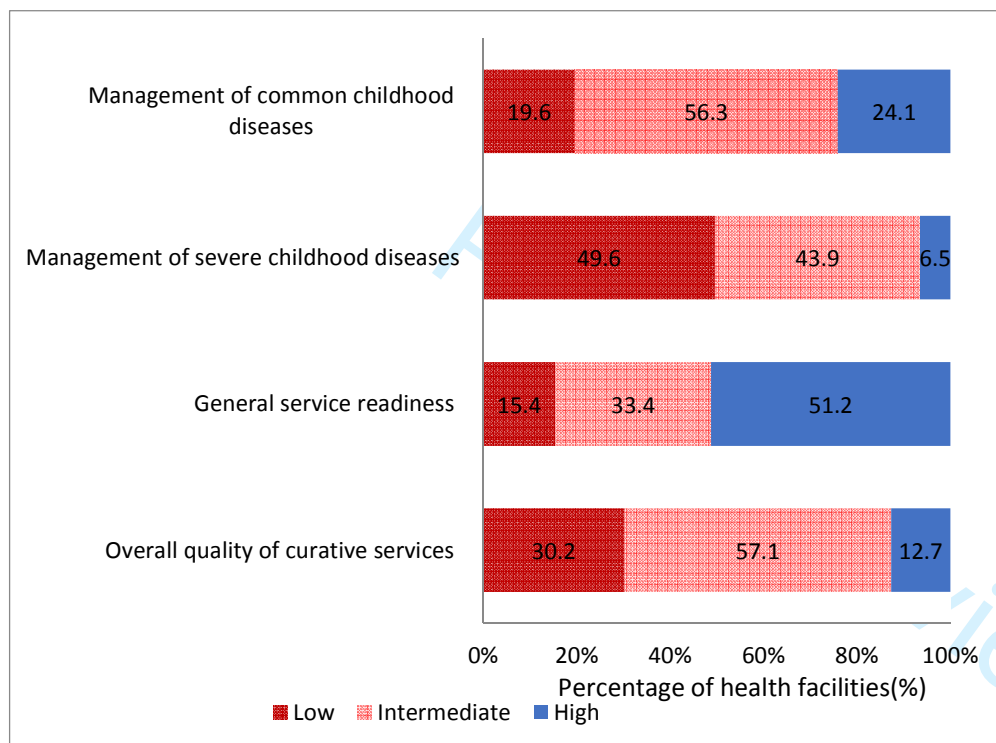
Performance quality	Criteria MCCD <sup>a</sup>	Criteria MSCD <sup>b</sup>	Criteria General service readiness <sup>c</sup>
<b>High</b>	<ul style="list-style-type: none"> <li>• Performance score <math>\geq 7</math></li> <li>• All observed cases attended by a qualified HCW§</li> <li>• All observed cases attended by a HCW trained in IMCI</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score <math>\geq 8</math></li> <li>• All vignettes based-scenarios answered by at least two-third* of qualified HCW§</li> <li>• All vignettes based-scenarios answered by at least one HCW trained in IMCI</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score <math>\geq 4</math></li> </ul>
<b>Intermediate</b>	<ul style="list-style-type: none"> <li>• Performance score 5-6</li> <li>• All observed cases attended by a qualified HCW§</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score 6-7</li> <li>• All vignettes based-scenarios answered by at least two-third of qualified HCW</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score = 3</li> </ul>
<b>Low</b>	<ul style="list-style-type: none"> <li>• Performance score <math>&lt; 5</math></li> </ul>	<ul style="list-style-type: none"> <li>• Performance score <math>&lt; 6</math></li> </ul>	<ul style="list-style-type: none"> <li>• Performance score <math>&lt; 3</math></li> </ul>

HCW = health care worker; HF= Health facility; MCCD = management of common childhood diseases; MSCD = management of severe childhood diseases

<sup>a</sup> maximum possible score = 9; <sup>b</sup> maximum possible score = 11; <sup>c</sup> maximum possible score = 5

§ Qualified healthcare worker: According to the national policy of quality assurance, nurse and midwife/midwife assistant are qualified to perform U5YO curative consultations.

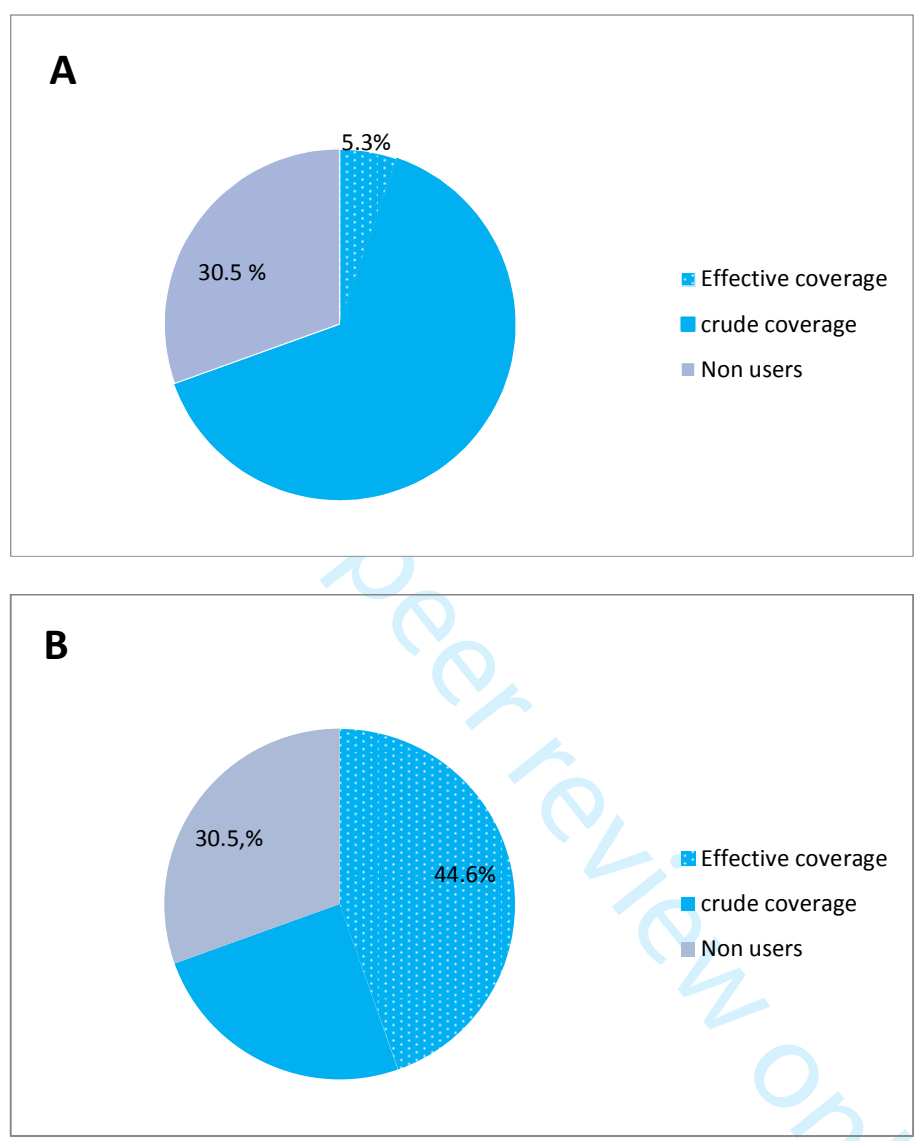
\* We used the cut-off of two third because the minimum requirement staff at CSPS level is composed of two third of qualified HCW for U5YO curative consultations (1 nurse, 1 midwife /midwife assistant) and 1 AIS.



**Figure 1. Proportion of health facilities per performance quality category (n=494)**



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**Figure 2. Crude coverage and effective coverage for curative CHS:**  
**A)** Scenario 1, high quality only    **B)** Scenario 2, High and intermediate quality

# BMJ Open

## Measuring effective coverage of curative child health services in rural Burkina Faso: a cross-sectional study

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# Measuring effective coverage of curative child health services in rural Burkina Faso: a cross-sectional study

Koulidiati J-L<sup>1\*</sup>, Nesbitt RC<sup>1</sup>, Ouedraogo N<sup>1</sup>, Hien H<sup>2 3</sup>, Robyn PJ<sup>4</sup>, Compaoré P<sup>5</sup>, Souares A<sup>1§</sup>, and Brenner S<sup>1 §</sup>

<sup>1</sup> Institute of Public Health, Heidelberg University, Im Neuenheimer Feld 130.3, 69120 Heidelberg, Germany

<sup>2</sup> Centre Muraz, 01 BP 390 Bobo-Dioulasso 01, Burkina Faso

<sup>3</sup> Institut de recherche en science de la santé (IRSS), 399, avenue de la liberté, BP 545, Bobo-Dioulasso, Burkina Faso

<sup>4</sup> The World Bank, 1818 H Street, NW Washington, DC 20433 USA

<sup>5</sup> Ministry of Health, 01 BP 7009 Ouagadougou 01, Burkina Faso

§ Joint senior authors.

**\*Corresponding author:** Jean-Louis Koulidiati

E-mail: jean-louis.koulidiati@uni-heidelberg.de

Address: Institute of Public Health, Im Neuenheimer Feld 130.3, 69120 Heidelberg, Germany

Tel: (+49) 6221 56 35039 Fax: (+49) 6221 565948

## Summary

**Objective:** To estimate both crude and effective curative health services coverage provided by rural health facilities to under-five-year-old (U5YO) children in Burkina Faso.

**Methods:** We surveyed 1,298 child health providers and 1,681 clinical cases across 494 primary level health facilities, as well as 12,497 U5YO children across 7,347 households in the facilities' catchment areas. Facilities were scored based on a set of indicators along three quality of care dimensions: management of common childhood diseases, management of severe childhood diseases, and general service readiness. Linking service quality to service utilization, we estimated both crude and effective coverage of U5YO children by these selected curative services.

## Results

Measured performance quality among facilities was generally low with only 12.7% of facilities surveyed reaching our definition of high and 57.1% our definition of intermediate quality of care. The crude coverage was 69.5% while the effective coverages indicated that 5.3% and 44.6% of children reporting an illness episode received services of only high or high and intermediate quality respectively.

## Conclusion

Our study showed that the quality of U5YO child health services provided by primary level health facilities in Burkina Faso was low, resulting in relatively ineffective population coverage. Poor adherence to clinical treatment guidelines combined with the lack of equipment and qualified clinical staff that performed U5YO consultations seemed to be contributors to the gap between crude and effective coverage.

## Strengths and limitations of this study

- Using multiple data sources (direct observation, vignettes, facility inventories) this study comprehensively assessed U5YO child service performance of first line health facilities.
- We conducted this study in around five hundred of primary level health facilities and within seven thousands households across six regions in Burkina Faso.
- While our performance score accounted for both inputs and process elements related to technical quality of care, we were not able to include elements of outcome quality.
- Our study does not provide any information on service coverage provided by higher levels of care such as district or regional hospitals.

## 1 Introduction

2 In spite of a recent decline in child mortality worldwide, Sub-Saharan Africa (SSA) continues  
3 to be the region with the highest child mortality rates globally.<sup>1</sup> Most of these deaths occur  
4 among under five-year-old children (U5YO) and are due to common infectious diseases  
5 (malaria, diarrhoea, pneumonia) – all of which are preventable and/or treatable by commonly  
6 available and cost-effective interventions.<sup>1 2</sup>

7 Availability of and accessibility to effective child health services (CHS) are essential in  
8 reducing child mortality.<sup>3-6</sup> Child health interventions therefore need to ensure a combined  
9 focus on both access (i.e. removal of financial, geographical, or cultural barriers) to essential  
10 health services and high-standard quality of care provided by these services. While isolated  
11 removal of existing barriers to care may improve crude service coverage (i.e. number of  
12 service users able to access available services),<sup>7</sup> this may not result in an effective  
13 improvement of health outcomes especially if available service quality remains substandard.<sup>8</sup>

14 <sup>9</sup> By assessing the maximum possible health gain an individual can receive from a given  
15 health service, the concept of ‘effective coverage’ therefore adjusts the commonly used crude  
16 coverage estimates by the quality of the actual services received by a service user.<sup>10 11</sup>

17 Effective coverage has been increasingly used in the evaluation of maternal and child health  
18 programs.<sup>12-15</sup> For instance, Nesbitt et al. compared crude and effective coverage of pregnant  
19 women with facility-based obstetric services in Ghana and estimated that, although 68% of  
20 the women studied had service access, only 18% received high quality care provided by a  
21 skilled birth attendant.<sup>16</sup> Similarly, by comparing effective coverage of young children  
22 receiving malaria-related care from formal and informal health providers across SSA  
23 countries, Galactionova et al. found an enormous variance in estimates ranging from 8% to  
24 72% depending on country.<sup>8</sup>

25 While in Burkina Faso U5YO service coverage has been previously assessed along crude  
26 coverage<sup>17 18</sup>, this is the first study to our knowledge that tries to estimate both crude and  
27 effective coverage. We estimated both crude and effective coverage of U5YO with CHS in  
28 Burkina Faso. Our focus hereby is on curative care (as opposed to preventive care such as  
29 vaccinations or nutrition supplementation) provided by primary level health facilities.

## 1 **Methods**

### 2 **Study Setting:**

3 Burkina Faso is a low-income country<sup>19</sup> located in West Africa. This landlocked country  
4 covers an area of 274,200 square kilometers with a population of about 18.4 million, of  
5 which about 18% are U5YO children.<sup>20</sup> In 2015, the neonatal mortality rate and the under-  
6 five mortality rate were 26.2 and 88.5 per 1,000 live births respectively.<sup>21</sup> Malaria, diarrhoea  
7 and acute respiratory infections are the leading causes of deaths in U5YO.<sup>22</sup> In Burkina Faso,  
8 the health system follows a three-level pyramidal structure (central, intermediate and  
9 peripheral)<sup>23</sup>. At the peripheral or lower level, the *Centres de santé et de promotion sociale*  
10 (*CSPS*) function as entry point to the health system. CSPS represent health centers that  
11 provide minimum preventive and curative services to the community. Each CSPS serves a  
12 catchment area of several villages or sectors and employs a minimum staff consisting of at  
13 least one nurse, one midwife, and one nurse assistant (*Agent Itinérant de Santé (AIS)*).  
14 According to national quality assurance policies, both the nurse and midwife professionals  
15 have to be qualified to provide U5YO services.<sup>24 25</sup> Curative care utilization by U5YO in 2010  
16 was poor with only 50% of those children suffering from common infectious diseases (e.g.  
17 malaria, diarrhoea, pneumonia) having sought care at a health facilities.<sup>26</sup> As user fees were  
18 the main barrier to curative care utilization, the government started a subsidization program  
19 for U5YO in 2016.<sup>27 28</sup>

### 20 **Study design and study participants:**

21 We used cross-sectional facility and household data from the baseline survey of a  
22 government-led evaluation of a nation-wide performance-based financing program conducted  
23 between October 2013 and February 2014.<sup>29</sup> Regions and districts included into the evaluation  
24 study have been purposely selected on basis of low performance in identified maternal and  
25 child health indicators: (i) contraceptive prevalence rate; (ii) assisted deliveries; (iii) antenatal  
26 consultations (iv) post-natal consultations v) childhood vaccination coverage.

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28 **Facility sample:** A total of 513 CSPS located in 24 districts across six out of thirteen regions  
29 of the country were included, representing approximately 70% of all CSPS in these districts.  
30 We excluded 19 CSPS as they represented either recently opened facilities (less than six  
31 months in service) or did not provide general primary care services (e.g. at high schools,  
32 colleges, garrisons or, prisons), resulting in a final sample of 494 CSPS. About 91% of  
33 selected facilities were considered rural CSPS.

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5 2 **Individual provider sample:** Across selected facilities, a total of 1,298 individual providers  
6 3 were included. This sample represents the staff on duty at the day of study visit at a given  
7 4 facility and included all CSPS employed staff cadres.  
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11 6 **U5YO case sample:** Across selected facilities, a total of 1,681 cases of U5YO children  
12 7 presenting to the outpatient department on the day of the study visit were included following a  
13 8 convenience sampling approach. Only first-time presentations (i.e. no follow-up visits) were  
14 9 included.  
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19 11 **U5YO sample:** Households were identified using a two-stage sampling technique. First, one  
20 12 village was randomly selected from all villages located within a given catchment area.  
21 13 Second, in each selected village households qualified for inclusion if at least one pregnant  
22 14 woman or a woman who gave birth within the previous two years was living in the household  
23 15 at the day of survey. All eligible households per village were then listed and 15 of them  
24 16 randomly selected to be surveyed. This way we identified 7,410 households, of which 60  
25 17 households across 4 villages could not be surveyed for logistical reasons, while in 3 villages  
26 18 only 14 instead of 15 households were surveyed due to the limited number of eligible  
27 19 households. The resulting final sample therefore included only 7,347 households.  
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## 38 22 **Data Collection:**

39 23 The survey instruments used in this study are based on the Health Results Innovation Trust  
40 24 Fund's (HRITF) impact evaluation toolkit and adapted to the Burkina Faso context<sup>29 30</sup> :

- 41 25 a) A facility inventory was conducted at each sampled facility assessing the availability of  
42 26 staff, infrastructure, equipment, drugs, supplies, and consumables. Each facility head  
43 27 verbally completed a structured checklist and a research assistant verified availability and  
44 28 functionality of reported items. Inventory content was based on the service availability  
45 29 and readiness assessment (SARA) framework;<sup>31</sup>  
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48 30 b) For each U5YO case, the patient-provider interaction during consultation was directly  
49 31 observed and recorded by a trained research assistant using a structured checklist.<sup>32</sup>  
50 32 Checklist items were based on clinical activities outlined by the integrated management of  
51 33 childhood illness (IMCI) standards.<sup>33</sup> As the IMCI standards promote a generic approach  
52 34 to the initial health status assessment of a child regardless the individual chief complaint,  
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1 health workers' adherence to this non-case-specific initial approach was observed in order  
2 to allow comparison between different cases.

3 c) A vignette-based knowledge assessment<sup>34</sup> including three different case scenarios  
4 conducted with clinical staff to evaluate familiarity with specific IMCI standards as  
5 related to the case management of severely ill children (i.e. dehydration, fever, respiratory  
6 distress). Each scenario represented a typical cases relevant to IMCI<sup>30 33</sup> and was adapted  
7 to Burkina context<sup>35</sup>. A trained research assistant recorded steps in clinical management  
8 suggested by the health worker on a structured checklist. Additional information related to  
9 a health professional's qualification and IMCI training background, were also obtained.

10 d) A structured interview was conducted with the caregiver of each child in the U5YO  
11 population sample to collect information on any illness episodes and resultant care-  
12 seeking behaviour during the four weeks preceding the survey date.

13 Written informed consent was obtained from all study participants (i.e. health workers,  
14 patients, caregivers).

## 15 Measures and Analysis

16 Effective coverage (EC) is defined as the relationship between service utilization conditional  
17 on true need and the service quality received<sup>11 12 36</sup> and can be described as:

$$31 \quad EC_{ij} = (Q_{ij} U_{ij} | N_{ij} = 1)$$

32 Where  $EC_{ij}$  is the effective coverage of individual  $i$  with health service  $j$ ;  $Q_{ij}$  is the expected  
33 quality of service  $j$  provided to individual  $i$ ;  $U_{ij}$  is the probability of individual  $i$  receiving  
34 service  $j$ ; and  $N_{ij}$  indicates all individuals  $i$  in true need of service  $j$ .

35 For this study we defined *true need*  $N$  as all U5YO reporting an illness episode during the past  
36 month. We defined *utilization*  $U$  as U5YOs who actually sought care at the nearest facility.  
37 Our definition of utilization conditional on true need followed the underpinnings by Shengelia  
38 et al.<sup>11</sup> Given the data available to us, we defined true need based on reported illness<sup>37 38</sup>,  
39 while utilization is a function of perceived need among those with reported true need.

40 Based on Donabedian framework and the indices developed by Gouws et al. to assess the  
41 quality of child healthcare, we defined *quality*  $Q$  as a facility or service specific score  
42 composed of three quality dimensions:<sup>39 40</sup>

43 a) Observed *management of common childhood diseases* (MCCD) consists of five process  
44 indicators related to health status review and four process indicators related to health  
45 status examination assessed by the case observation survey. Two of these process  
46 indicators (i.e. 'weight check' and 'temperature check') are further linked to the  
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3 1 availability of essential input elements assessed by the facility inventory (i.e. ‘functional  
4 2 scale’ and ‘functional thermometer’). This dimension reflects the validated indices 1 and 2  
5 3 (Integrated child assessment based on IMCI guidelines and facility readiness to deliver  
6 4 IMCI) developed by Gouws et al.

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9 **b)** Theoretical *management of severe childhood diseases* (MSCD) is based on provider  
10 6 knowledge on appropriate first-line management processes of 1) severe dehydration in a  
11 7 two-year-old (five process indicators), 2) breathing difficulties in a one-year-old (three  
12 8 process indicators), and 3) lethargy in a newborn (three process indicators) assessed by the  
13 9 three vignettes. Seven of these process indicators are further linked to the availability of  
14 10 essential input elements assessed by the facility inventory. This dimension reflects indices  
15 11 3 and 4 (capacity to manage severe illness using vignettes and capacity to manage severe  
16 12 illness given availability of essential drugs) developed by Gouws et al.

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18 **c)** *General service readiness* is based on five structural indicators on availability of  
19 14 electricity, water, sanitation, patient transport, and waiting rooms assessed by the facility  
20 15 inventory. This dimension reflects structural elements relevant to essential facility  
21 16 infrastructure based on the Donabedian framework.

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18 Composite score generation included the following steps. Each indicator measuring inputs, or  
19 19 structures, was assigned a value of 1 if at least one unit of the observed item was available and  
20 20 functional at a given facility, otherwise 0. To account for the multiple case observations and  
21 21 vignettes conducted per facility, we averaged findings from multiple process measures at the  
22 22 facility level into a single facility-specific process measure, by assigning a value of 1 when a  
23 23 given process was observed in at least half of the observed instances and 0 if not. For those  
24 24 quality measures where process indicators could be linked to input indicators, we assigned a  
25 25 value of 1 only when both indicators were met, otherwise 0. Tables 1-A, 1-B, and 1-C provide  
26 26 an overview of the three quality dimensions including the respective process, input, and  
27 27 structural indicators together with overall facility performance across all sampled CSPS  
28 28 facilities.

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To further categorize facilities, we combined the resulting MCCD and MSCD performance  
scores with the characteristics of health professionals (i.e. professional qualification and IMCI  
training background) providing U5YO consultations and responding to the vignettes. For each  
of the three quality dimensions, facilities were then grouped into one of three categories of  
performance quality (high, intermediate, and low) based on the criteria shown in Table 2.<sup>14 16</sup>

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1 For facilities that met different criteria levels for each dimension, we assigned them to the  
2 lower level. For instance, if a facility performed a high performance quality score but did not  
3 met required staff characteristics, we assigned it to the intermediate level.  
4 To estimate effective coverage, we defined *effective coverage* as the proportion of all U5YO  
5 in need who actually sought care at a facility categorized as at least high or intermediate  
6 performance quality.

For peer review only

## 1 Results

### 3 U5YO characteristics

4 Across the 7,347 households surveyed, we identified and included a total of 12,497 U5YO.  
5 Of these children, 614 (4.9%) experienced an illness episode during the four weeks prior to  
6 the survey date. Among these children, 463 (75.4%) had fever, 63 (10.2%) had diarrhoea, 20  
7 (3.2%) had cough and 68 (11.07%) had other conditions.

### 8 Staffing

9 In our study, the clinical staff observed independently managing U5YO consultations at CSPS  
10 facilities included 64.1% nurses, 6.8% midwives and 29.1% AIS. Among health professionals  
11 responding to the vignettes, 74.1% were qualified to provide child health services and 32.7%  
12 reported to be trained in IMCI. In 66% of the studied CSPS, all observed U5YO consultations  
13 were performed by qualified health providers, but only in 42.5% of CSPS consultations were  
14 provided by a health professional trained in IMCI.

### 16 Quality of Care functions

17 Table 1-A shows the percentage of facilities meeting each of the listed MCCD indicators. In  
18 regards to symptom review (indicators 1-5), frequencies for overall performance were highest  
19 for routine fever (94.1%), cough (83.4%), and diarrhoea (74.9%) reviews but not for routine  
20 ear problems (25.9%) and danger signs (38.6%). In regards to patient examination (indicators  
21 6-8), routine checks of body temperature and signs of anaemia were observed in 93.7% and  
22 77.1% of CSPS, but body weight and vaccination status review were observed in only 67.4%  
23 and 41.9% of CSPS.

25 Table 1-B presents the overall percentage of facilities meeting each of the listed MSCD  
26 indicators. In scenario 1, providers would have administered appropriate initial treatment (i.e.  
27 immediate fluid resuscitation by intravenous or enteral route) and would have withheld  
28 immediate antibiotic administration given the viral cause of diarrhoea in the majority of CSPS  
29 (86% and 71.4% respectively). In contrast, providers in only 32.7% of CSPS would have  
30 withheld malaria treatments until further proof of parasitemia and in only 25.9% providers  
31 would have initiated indicated further care (i.e. admission for further reassessment and  
32 monitoring). In scenario two, providers in 76.1% of CSPS would have administered  
33 antibiotics, but only in 14.1% of CSPS, indicated further care (i.e. outpatient treatment with

1 close follow-up) would have been implemented. In scenario three, although in the majority of  
2 CPSP (78.5%) providers would have referred the ill infant to a higher-level care facility, in  
3 only 39.2% and 7.2% of CSPPS life-saving antibiotics and hypoglycaemia as potential cause of  
4 lethargy would have been adequately addressed, although the necessary drugs to do so were  
5 available in the majority of CSPPS.

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7 Table 1-C presents the overall percentage of facilities meeting general service readiness  
8 indicators. The majority of facilities met general infrastructural readiness. However, only  
9 about half of facilities had water and soap for hand washing directly accessible in the  
10 consultation rooms (56.8%), and only 23.3% could directly access a vehicle for emergency  
11 patient transport.

### 12 13 **Overall quality of care categorization**

14 Applying the criteria outlined in Table 2 to assign each CSPPS to a performance quality  
15 category resulted in the distribution shown in Figure 1. For the MCCD dimension, 80.4% of  
16 CSPPS were categorized as meeting high or intermediate quality, while only 19.6% of CSPPS  
17 fell into the low quality category. A similar pattern was found for the general service  
18 readiness dimension with 84.6% of CSPPS meeting high or intermediate performance quality.  
19 In contrast, only 49.4% of CSPPS met high or intermediate MSCD quality, with more than half  
20 of facilities providing relatively poor management to children with critical health conditions.  
21 Taking all three dimensions together, 69.8% of CSPPS met high or intermediate quality.

### 22 23 **Crude and effective coverage for curative CHS**

24 Out of the 614 children who experienced an illness episode, 427 (69.5 %) actually sought  
25 facility-based care (i.e. crude coverage). Given that the majority of CSPPS fell into the  
26 intermediate quality category, we estimated effective coverage for two scenarios: scenario A  
27 only considering facilities in the high quality category and scenario B considering both high  
28 and intermediate performing facilities. For effective coverage scenario A only 33 (5.3 %) U5YO  
29 received high quality services; for scenario B 274 (44.6 %) U5YO were effectively  
30 covered (see Figure 2).

## Discussion

Our study revealed two major findings regarding CHS provision in Burkina Faso. Firstly, there are existing gaps between crude and effective coverage. Secondly, performance quality related to the management of ill children provided by CSPPS in our study area is generally sub-standard and varies greatly between quality dimensions.

Our study found that only about two thirds of ill U5YO presented to a CSPPS, which in our study is assumed to be equivalent to crude service coverage. At this point, we were unable to explore the reasons of not seeking care for those non-using children in our sample – e.g. whether there are persisting access barriers or whether the child’s illness was treated at home or elsewhere outside the formal health system. Additional research will therefore be warranted to better understand the health-seeking behaviour of households caring for ill children not seeking care provided free through the CSPPS system.

More disturbingly, we found the gap in effective coverage to be considerably wide, especially when considering only high quality facilities. These estimates might be biased to some extent, as we assumed every sick child to be taken to the CSPPS closest to the household when estimating service use (available data did not allow for a more specific assessment). While this would not have affected our crude coverage estimation, it might have diminished the effective coverage estimates in cases where caretakers actually bypassed the closest CSPPS in favour of a more distant facility with better quality.<sup>41</sup> However, our assumption is supported by the literature on primary health care utilization in SSA and we trust that our effective coverage estimates are sufficiently representative of the situation in Burkina Faso.<sup>42-46</sup>

Effective coverage estimates are heavily influenced and can be easily modulated depending on the indicators selected to measure service quality. Although the process, input, and structural indicators included in our quality score are informed by the work of other authors, they still can be considered selective or biased towards technical elements of the care delivery process.<sup>40 47</sup> Still, we understand that for health care provision to be effective, evidence-based clinical protocols (such as IMCI) need to be adhered to and can therefore be considered the gold standard against which quality should be measured.

In doing so, we observed quite some differences between the measured quality dimensions used in this study. While observed MCCD processes did not meet IMCI standards, it became nevertheless obvious that providers still follow an assessment approach that seems to be

1 focused on or informed by the leading causes and symptoms among the U5YO population.  
2 The vignette-based assessment of MSCD, processes revealed that providers generally adhere  
3 to treatment guidelines regarding the initial management of severely ill infants (except for the  
4 newborn case in scenario 3), but deviate from protocol when making definitive care decisions.  
5 Similarly weak or inconsistent adherence to treatment guidelines contributing to low service  
6 quality in low-income settings has also been noted by other studies.<sup>47-49</sup> While our study  
7 revealed that most of rural facilities had access to basic infrastructures, some structural  
8 differences may still remain not picked up by our survey.

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10 Several studies have reported on the effectiveness of IMCI guidelines<sup>5 6</sup> and reasons of low  
11 adherence. Lack of IMCI-based training and shortage of equipment are commonly identified  
12 contributors to low adherence.<sup>50</sup> Some authors also point to that the lack of motivation to  
13 adhere to guidelines in combination with high workload.<sup>51 52</sup> Besides inconsistencies in  
14 protocol adherence, an additional contribution to the low effectiveness of provided care might  
15 have been the fact that a large portion of observed U5YO consultations was actually  
16 conducted by health workers without adequate qualifications (i.e. AIS or providers without  
17 IMCI training) in the absence of any supervision by a more qualified staff member. Officially,  
18 AIS are not authorized to independently provide any curative care in Burkina Faso<sup>25</sup> and  
19 usually do not receive any specific skill trainings, such as IMCI.<sup>53</sup> In addition, inadequate  
20 equipment and supplies might have also contributed to some of the deviations from protocol,  
21 for instance many facilities had no malaria tests or otoscopes available, which might explain  
22 the less differentiated use of anti-malaria drugs or the limited focus on ear-related  
23 symptoms.<sup>54</sup>

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25 As with all studies on performance quality, our study faces some limitations regarding the  
26 assessment of the quality components included in our effective coverage estimates. To  
27 determine the quality of curative CHS, we relied on both direct observations and vignettes.<sup>32</sup>  
28 <sup>34</sup> A common bias to direct observation is the so-called Hawthorne effect, which describes  
29 higher performance under observation compared to non-observed situations, and may cause  
30 overestimation of actual performance.<sup>55</sup> In contrast, clinical vignettes might underestimate  
31 actual clinical competence, as a testing format based on abstract case scenarios might be  
32 unfamiliar to many health workers and has limitations in reflecting the realities of actual case  
33 management. Still, both instruments are considered standard in the assessment of health  
34 worker performance.

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3 1 Estimating effectiveness, we measured quality based on content of care focusing on both  
4 2 health care inputs (infrastructure, supplies, provider knowledge) and processes (aspects of  
5 3 actual or theoretical case management). While providing a comprehensive measure of  
6 4 effectiveness of care, a content of care approach may only approximate an individual's health  
7 5 gain in so far, as it does not capture aspects such as patient adherence to treatment or  
8 6 individual health outcomes (recovery, complications, etc.).<sup>12</sup>. Nevertheless, the indicators  
9 7 included in our quality score are considered measures relevant in reducing child mortality and  
10 8 morbidity<sup>4-6</sup>.

11 9 For the indicator on danger signs used in the MCCD dimension, we accepted positive  
12 10 performance already when at least two danger signs were reviewed. This was done in order to  
13 11 better facilitate score aggregation given the overall poor performance observed in respect to  
14 12 danger sign assessment. It needs to be noted, that this approach actually overestimates  
15 13 providers' overall performance. Similarly, the thresholds applied to categorizing facility  
16 14 performance are relatively arbitrary even though we relied on the work of other authors.<sup>14 16</sup>

17 15 As the categorization approach affects heavily whether a facility was grouped as high or low  
18 16 performing, we presented the two scenarios of effective coverage to again allow for some  
19 17 room in our estimation.

20 18 Another limitation of this study is that although we focus on U5YO and infants, we  
21 19 purposefully exclude early neonatal conditions directly related to birth. In addition, while our  
22 20 study focus was on primary level health care facilities in rural areas, generalizability of our  
23 21 findings might be limited given that study regions and districts were purposely selected. Still,  
24 22 the relatively large facility sample available to us (around one third of primary level health  
25 23 care facilities in the country) nevertheless provides a relatively broad overview on effective  
26 24 coverage in Burkina Faso. With this study adding new evidence on the effectiveness of child  
27 25 health service coverage in low-income settings, the future focus should certainly include the  
28 26 effective coverage of U5YO in more urban areas and the effectiveness of services provided by  
29 27 hospitals. Additional research exploring the determinants of effective coverage (both demand  
30 28 side factors and supply side factors), will be necessary and helpful to decision makers to tailor  
31 29 health interventions more specifically to improve effective service coverage.  
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### 31 **Conclusion**

32 32 Comparing crude and effective service coverage of U5YO in rural Burkina Faso resulted in  
33 33 two major findings. First, there are existing gaps between crude and effective coverage.



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3 1 Second, the effectiveness of services provided to U5YO is extremely low, even when  
4 2 considering a less strict definition of service quality. While our quality assessment relied on  
5 3 content of care measured as guideline adherence, we also assessed the availability of essential  
6 4 equipment and supplies required to implement these protocol, as well as main provider-  
7 5 specific characteristics. The pattern observed in our study is that lack of supplies hardly  
8 6 seemed to influence non-adherence or IMCI guidelines. Non-adherence rather seems to be an  
9 7 issue specific to the individual provider or service staffing with quite a number of unqualified  
10 8 health workers actually providing clinical care to U5YOs. To improve effectiveness of U5YO  
11 9 service provision, both policy makers and health workers should review and adjust the  
12 10 implementation of evidence-based clinical protocols (e.g. through trainings, performance  
13 11 evaluations, supervision and coaching) to the human and structural resources available at the  
14 12 CSPS level.  
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## 1 **Author contributions**

2 AS, SB, RCN, JLK conceived and designed the paper. AS, NO, SB, HH and JLK were  
3 involved in data collection. JLK analysed the data and wrote the first draft of the manuscript.  
4 JLK, RCN, NO, HH, JR, PC, AS and SB reviewed and approved the final version of the  
5 paper.

## 6 **Data sharing statement**

7 For access to the entire data set used for this article, please contact Paul Jacob Robyn  
8 ([probyn@worldbank.org](mailto:probyn@worldbank.org))

## 9 **Ethics considerations**

10 The National Ethics Committee in Burkina Faso as well as the Ethical Committee of the  
11 Medical Faculty at Heidelberg University approved this study. For this study, we obtain  
12 written consent of all the respondents.

## 13 **Funding**

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## 15 **Competing interests**

16 We used data from the baseline survey of the impact evaluation of the Performance Based  
17 Financing program in Burkina Faso. The impact evaluation, including data collection for the  
18 survey, is funded by the World Bank through the Health Results Innovation Trust Fund  
19 (HRITF). Nobila Ouedraogo and Aurelia Soares, who was the scientific coordinator of the  
20 baseline survey received salary from the World Bank. Jean-Louis Kouliadiati is a  
21 doctoral student at the University of Heidelberg and received payment from the World Bank  
22 during data collection. Stephan Brenner is currently partially employed on  
23 the abovementioned Impact Evaluation. Paul Jacob Robyn is a World Bank employee, based  
24 in Washington. Hervé Hien is employed at Centre Muraz and received payment from the  
25 World Bank during data collection only. None of the authors received any payment by the  
26 World Bank for the analysis presented in this manuscript and for the writing. The World Bank  
27 did not interfere with design, data analysis, and writing of this manuscript in any way.

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**Table 1-A. Indicators and related performance of management of common childhood diseases (MCCD)**

	<b>Process Indicators (based on direct observation)</b>	Number (percentage) of all facilities with observed process	<b>Input Indicators</b>	Number (percentage) of all facilities with observed input	<b>Overall Facility Performance</b> Number (percentage) of all facilities with observed performance *
1.	Provider asks for at least two general danger signs §	191 (38.6)	N/A	N/A	191 (38.6)
2.	Provider asks for presence of fever	465 (94.1)	N/A	N/A	465 (94.1)
3.	Provider asks for presence of cough	412 (83.4)	N/A	N/A	412 (83.4)
4.	Provider asks for presence of diarrhoea	370 (74.9)	N/A	N/A	370 (74.9)
5.	Provider asks for presence of ear problems	128 (25.9)	N/A	N/A	128 (25.9)
6.	Provider checks child's weight	366 (74.1)	Functional scale available	448 (90.7)	333 (67.4)
7.	Provider checks child's temperature	477 (96.5)	Functional thermometer available	480 (97.1)	463 (93.7)
8.	Provider checks for signs of anaemia (conjunctivae, palms)	381 (77.1)	N/A	N/A	381 (77.1)
9.	Provider checks child's current vaccination status	207 (41.9)	N/A	N/A	207 (41.9)

N/A = not applicable

\* In instances where both process and input indicators were applicable, overall facility performance was positive once both indicators were met.

§ Per IMCI standard: four general danger signs need to be assessed (difficulties breastfeeding/taking any food, considerable vomiting, lethargy, convulsions). Due to generally low performance of this indicator if measured against this standard, we considered this process to be performed when at least two danger signs were reviewed.

**Table 1-B. Indicators and related performance of management of severe childhood diseases (MSCD)**

	<b>Process Indicators (based on vignettes)</b>	Number (percentage) of all facilities with observed process	<b>Input Indicators</b>	Number (percentage) of all facilities with observed input	<b>Overall Facility Performance</b> Number (percentage) of all facilities with observed performance *
<b>Vignette-based scenario 1: Viral illness with severe dehydration in 2-year-old</b>					
1.	Provider starts rehydration (either intravenous or enteral fluids)	445 (90.1)	Isotonic fluid <sup>a</sup> or oral rehydration salt and nasogastric tube in stock	486 (98.3)	439 (88.8)
2.	Provider administers a dose of paracetamol to lower fever	190 (38.4)	Paracetamol suppository in stock	424 (85.8)	165 (33.4)
3.	Provider recognizes viral origin of illness and withholds antibiotics until further evaluation.	353 (71.4)	N/A	N/A	353 (71.4)
4.	Provider withholds malaria treatment until parasitemia is confirmed	396 (80.1)	Malaria testing supplies in stock	203 (41.1)	162 (32.7)
5.	Provider admits patient for further observation and reassessment	128 (25.9)	N/A	N/A	128 (25.9)
<b>Vignette-based scenario 2: Breathing difficulties in 1-year-old with simple pneumonia</b>					
1.	Provider initiates antibiotic treatment at facility	380 (76.9)	Antibiotics in stock <sup>b</sup>	486 (98.3)	376 (76.1)
2.	Provider administers a dose of paracetamol to lower fever	331 (67)	Paracetamol suppository in stock	424 (85.8)	293 (59.3)
3.	Patient is discharged with close follow-up plan (opposed to admission or referral)	70 (14.1)	N/A	N/A	70 (14.1)
<b>Vignette-based scenario 3: Lethargic 1-month-old</b>					
1.	Provider administers a dose of injectable antibiotic	230 (46.5)	Ceftriaxone in stock	410 (83)	194 (39.2)
2.	Provider checks and controls hypoglycaemia	37 (7.5)	Dextrose solutions or dextrose containing IV fluids in stock	464 (93.9)	36 (7.2)
3.	Provider refers patient to higher level of care	388 (78.5)	N/A	N/A	388 (78.5)

N/A = not applicable

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\* In instances where both process and input indicators were applicable, overall facility performance was positive once both indicators were met.

<sup>a</sup> (Ringer lactate or normal saline)

<sup>b</sup> Amoxicillin or Cotrimoxazole or Ceftriaxone

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**Table 1-C. Indicators and related performance of general service readiness**

	<b>Process Indicators</b>	<b>Structural Indicators</b>	<b>Overall Facility Performance</b> Number (percentage) of all facilities with observed performance
1.	N/A	Functional electricity source available	412 (83.4)
2.	N/A	Functional water source and soap available in the consultation room	281 (56.8)
3.	N/A	Functional toilet facilities available	480 (97.2)
4.	N/A	Functional emergency vehicle available	115 (23.3)
5.	N/A	Patient waiting room available	406 (82.2)

N/A = not applicable

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**Table 2. Categories of facility quality based on performance scores**

Performance quality	Criteria MCCD <sup>a</sup>	Criteria MSCD <sup>b</sup>	Criteria General service readiness <sup>c</sup>
<b>High</b>	<ul style="list-style-type: none"> <li>• Performance score<sup>d</sup> ≥7</li> <li>• All observed cases attended by a qualified HCW§</li> <li>• All observed cases attended by a HCW trained in IMCI</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score ≥8</li> <li>• All vignettes based-scenarios answered by at least two-third* of qualified HCW§</li> <li>• All vignettes based-scenarios answered by at least one HCW trained in IMCI</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score ≥4</li> </ul>
<b>Intermediate</b>	<ul style="list-style-type: none"> <li>• Performance score 5-6</li> <li>• All observed cases attended by a qualified HCW§</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score 6-7</li> <li>• All vignettes based-scenarios answered by at least two-third of qualified HCW</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score = 3</li> </ul>
<b>Low</b>	<ul style="list-style-type: none"> <li>• Performance score &lt;5</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score &lt;6</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score &lt;3</li> </ul>

HCW = health care worker; **HF**= Health facility; MCCD = management of common childhood diseases; MSCD = management of severe childhood diseases

<sup>a</sup> maximum possible score = 9; <sup>b</sup> maximum possible score = 11; <sup>c</sup> maximum possible score = 5 <sup>d</sup> performance score: high (≥70% of the maximum possible score) ; intermediate (50-69%); low (<50%)

§ Qualified healthcare worker: According to the national policy of quality assurance, nurse and midwife/midwife assistant are qualified to perform U5YO curative consultations.

\* We used the cut-off of two third because the minimum requirement staff at CSPS level is composed of two third of qualified HCW for U5YO curative consultations (1 nurse, 1 midwife /midwife assistant) and 1 AIS.

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**Figure 1. Proportion of health facilities per performance quality category (n=494)**

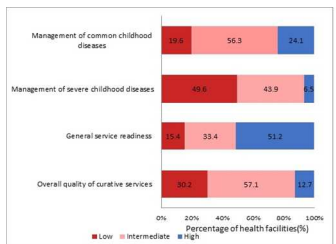
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3 **Figure 2. Crude coverage and effective coverage for curative CHS:**

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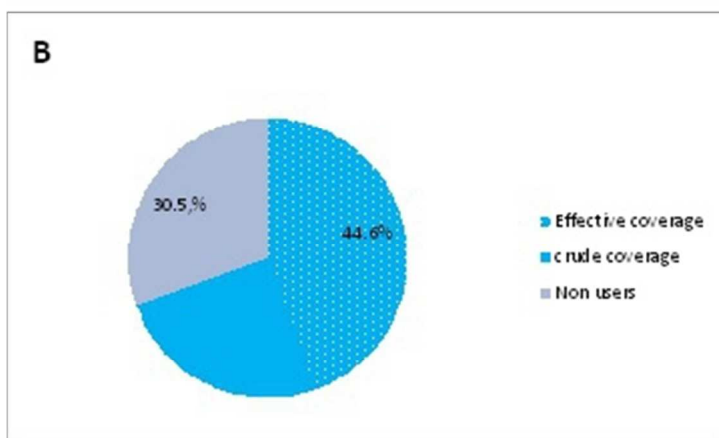
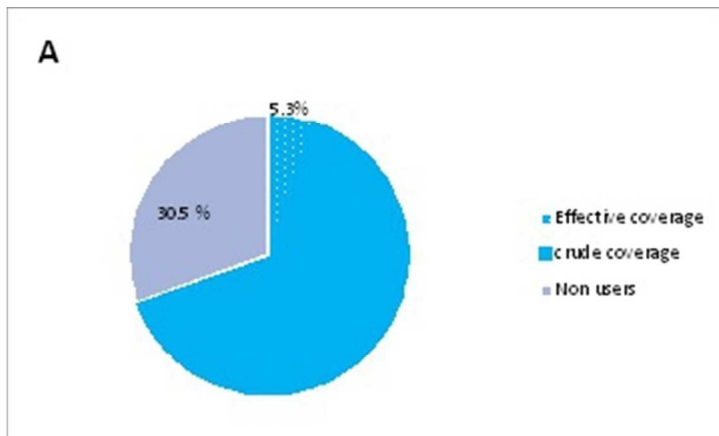
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# BMJ Open

## Measuring effective coverage of curative child health services in rural Burkina Faso: a cross-sectional study

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Keywords:	Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, PRIMARY CARE, PAEDIATRICS

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# Measuring effective coverage of curative child health services in rural Burkina Faso: a cross-sectional study

Koulidiati J-L<sup>1\*</sup>, Nesbitt RC<sup>1</sup>, Ouedraogo N<sup>1</sup>, Hien H<sup>2 3</sup>, Robyn PJ<sup>4</sup>, Compaoré P<sup>5</sup>, Souares A<sup>1§</sup>, and Brenner S<sup>1 §</sup>

<sup>1</sup> Institute of Public Health, Heidelberg University, Im Neuenheimer Feld 130.3, 69120 Heidelberg, Germany

<sup>2</sup> Centre Muraz, 01 BP 390 Bobo-Dioulasso 01, Burkina Faso

<sup>3</sup> Institut de recherche en science de la santé (IRSS), 399, avenue de la liberté, BP 545, Bobo-Dioulasso, Burkina Faso

<sup>4</sup> The World Bank, 1818 H Street, NW Washington, DC 20433 USA

<sup>5</sup> Ministry of Health, 01 BP 7009 Ouagadougou 01, Burkina Faso

§ Joint senior authors.

**\*Corresponding author:** Jean-Louis Koulidiati

E-mail: jean-louis.koulidiati@uni-heidelberg.de

Address: Institute of Public Health, Im Neuenheimer Feld 130.3, 69120 Heidelberg, Germany

Tel: (+49) 6221 56 35039 Fax: (+49) 6221 565948



## Summary

**Objective:** To estimate both crude and effective curative health services coverage provided by rural health facilities to under-five-year-old (U5YO) children in Burkina Faso.

**Methods:** We surveyed 1,298 child health providers and 1,681 clinical cases across 494 primary level health facilities, as well as 12,497 U5YO children across 7,347 households in the facilities' catchment areas. Facilities were scored based on a set of indicators along three quality of care dimensions: management of common childhood diseases, management of severe childhood diseases, and general service readiness. Linking service quality to service utilization, we estimated both crude and effective coverage of U5YO children by these selected curative services.

## Results

Measured performance quality among facilities was generally low with only 12.7% of facilities surveyed reaching our definition of high and 57.1% our definition of intermediate quality of care. The crude coverage was 69.5% while the effective coverages indicated that 5.3% and 44.6% of children reporting an illness episode received services of only high or high and intermediate quality respectively.

## Conclusion

Our study showed that the quality of U5YO child health services provided by primary level health facilities in Burkina Faso was low, resulting in relatively ineffective population coverage. Poor adherence to clinical treatment guidelines combined with the lack of equipment and qualified clinical staff that performed U5YO consultations seemed to be contributors to the gap between crude and effective coverage.

## Strengths and limitations of this study

- Using multiple data sources (direct observation, vignettes, facility inventories) this study comprehensively assessed U5YO child service performance of first line health facilities.
- We conducted this study in around five hundred primary level health facilities and within seven thousands households across six regions in Burkina Faso.
- While our performance score accounted for both inputs and process elements related to technical quality of care, we were not able to include elements of outcome quality.
- Our study does not provide any information on service coverage provided by higher levels of care such as district or regional hospitals.

## 1 Introduction

2 In spite of a recent decline in child mortality worldwide, Sub-Saharan Africa (SSA) continues  
3 to be the region with the highest child mortality rates globally.<sup>1</sup> Most of these deaths occur  
4 among under five-year-old children (U5YO) and are due to common infectious diseases  
5 (malaria, diarrhoea, pneumonia) – all of which are preventable and/or treatable by commonly  
6 available and cost-effective interventions.<sup>1 2</sup>

7 Availability of and accessibility to effective child health services (CHS) are essential in  
8 reducing child mortality.<sup>3-6</sup> Child health interventions therefore need to ensure a combined  
9 focus on both access (i.e. removal of financial, geographical, or cultural barriers) to essential  
10 health services and high-standard quality of care provided by these services. While isolated  
11 removal of existing barriers to care may improve crude service coverage (i.e. number of  
12 service users able to access available services),<sup>7</sup> this may not result in an effective  
13 improvement of health outcomes especially if available service quality remains substandard.<sup>8</sup>

14 <sup>9</sup> By assessing the maximum possible health gain an individual can receive from a given  
15 health service, the concept of ‘effective coverage’ therefore adjusts the commonly used crude  
16 coverage estimates by the quality of the actual services received by a service user.<sup>10 11</sup>

17 Effective coverage has been increasingly used in the evaluation of maternal and child health  
18 programs.<sup>12-15</sup> For instance, Nesbitt et al. compared crude and effective coverage of pregnant  
19 women with facility-based obstetric services in Ghana and estimated that, although 68% of  
20 the women studied had service access, only 18% received high quality care provided by a  
21 skilled birth attendant.<sup>16</sup> Similarly, by comparing effective coverage of young children  
22 receiving malaria-related care from formal and informal health providers across SSA  
23 countries, Galactionova et al. found an enormous variance in estimates ranging from 8% to  
24 72% depending on country.<sup>8</sup>

25 While in Burkina Faso U5YO service coverage has been previously assessed along crude  
26 coverage<sup>17 18</sup>, this is the first study to our knowledge that tries to estimate both crude and  
27 effective coverage. We estimated both crude and effective coverage of U5YO with CHS in  
28 Burkina Faso. Our focus hereby is on curative care (as opposed to preventive care such as  
29 vaccinations or nutrition supplementation) provided by primary level health facilities.

## 1 **Methods**

### 2 **Study Setting:**

3 Burkina Faso is a low-income country<sup>19</sup> located in West Africa. This landlocked country  
4 covers an area of 274,200 square kilometers with a population of about 18.4 million, of which  
5 about 18% are U5YO children.<sup>20</sup> In 2015, the neonatal mortality rate and the under-five  
6 mortality rate were 26.2 and 88.5 per 1,000 live births respectively.<sup>21</sup> Malaria, diarrhoea and  
7 acute respiratory infections are the leading causes of deaths in U5YO.<sup>22</sup> In Burkina Faso, the  
8 health system follows a three-level pyramidal structure (central, intermediate and  
9 peripheral)<sup>23</sup>. At the peripheral or lower level, the *Centres de santé et de promotion sociale*  
10 (*CSPS*) function as entry point to the health system. CSPS represent health centers that  
11 provide minimum preventive and curative services to the community. Each CSPS serves a  
12 catchment area of several villages or sectors and employs a minimum staff consisting of at  
13 least one nurse, one midwife, and one outreach health worker (*Agent Itinérant de Santé*  
14 (*AIS*)). According to national quality assurance policies, both the nurse and midwife  
15 professionals have to be qualified to provide U5YO services.<sup>24 25</sup> Curative care utilization by  
16 U5YO in 2010 was poor with only 50% of those children suffering from common infectious  
17 diseases (e.g. malaria, diarrhoea, pneumonia) having sought care at a health facility.<sup>26</sup> As user  
18 fees were the main barrier to curative care utilization, the government started a subsidization  
19 program offering free services for all U5YO in 2016.<sup>27 28</sup>

### 20 **Study design and study participants:**

21 We used cross-sectional facility and household data from the baseline survey of a  
22 government-led evaluation of a nation-wide performance-based financing program conducted  
23 between October 2013 and February 2014.<sup>29</sup> Regions and districts included into the evaluation  
24 study have been purposely selected on basis of low performance in identified maternal and  
25 child health indicators: (i) contraceptive prevalence rate; (ii) assisted deliveries; (iii) antenatal  
26 consultations (iv) post-natal consultations v) childhood vaccination coverage.

27  
28 **Facility sample:** A total of 513 CSPS located in 24 districts across six out of thirteen regions  
29 of the country were included, representing approximately 70% of all CSPS in these districts.  
30 We excluded 19 CSPS as they represented either recently opened facilities (less than six  
31 months in service) or did not provide general primary care services (e.g. at high schools,  
32 colleges, garrisons or, prisons), resulting in a final sample of 494 CSPS. About 91% of  
33 selected facilities were considered rural CSPS.

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5 2 **Individual provider sample:** Across selected facilities, a total of 1,298 individual providers  
6 3 were included. This sample represents the staff on duty at the day of study visit at a given  
7 4 facility and included all CSPS employed staff cadres.  
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11 6 **U5YO case sample:** Across selected facilities, a total of 1,681 cases of U5YO children  
12 7 presenting to the outpatient department on the day of the study visit were included following a  
13 8 convenience sampling approach. Only first-time presentations (i.e. no follow-up visits) were  
14 9 included.  
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19 11 **U5YO sample:** Households were identified using a two-stage sampling technique. First, one  
20 12 village was randomly selected from all villages located within a given catchment area.  
21 13 Second, in each selected village households qualified for inclusion if at least one pregnant  
22 14 woman or a woman who gave birth within the previous two years was living in the household  
23 15 at the day of survey. All eligible households per village were then listed and 15 of them  
24 16 randomly selected to be surveyed. This way we identified 7,410 households, of which 60  
25 17 households across 4 villages could not be surveyed for logistical reasons, while in 3 villages  
26 18 only 14 instead of 15 households were surveyed due to the limited number of eligible  
27 19 households. The resulting final sample therefore included only 7,347 households.  
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## 38 22 **Data Collection:**

39 23 The survey instruments used in this study are based on the Health Results Innovation Trust  
40 24 Fund's (HRITF) impact evaluation toolkit and adapted to the Burkina Faso context<sup>29 30</sup> :

- 41 25 a) A facility inventory was conducted at each sampled facility assessing the availability of  
42 26 staff, infrastructure, equipment, drugs, supplies, and consumables. Each facility head  
43 27 verbally completed a structured checklist and a research assistant verified availability and  
44 28 functionality of reported items. Inventory content was based on the service availability  
45 29 and readiness assessment (SARA) framework;<sup>31</sup>  
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48 30 b) For each U5YO case, the patient-provider interaction during consultation was directly  
49 31 observed and recorded by a trained research assistant using a structured checklist.<sup>32</sup>  
50 32 Checklist items were based on clinical activities outlined by the integrated management of  
51 33 childhood illness (IMCI) standards.<sup>33</sup> As the IMCI standards promote a generic approach  
52 34 to the initial health status assessment of a child regardless the individual chief complaint,  
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- 1 health workers' adherence to this non-case-specific initial approach was observed in order  
 2 to allow comparison between different cases.  
 3 c) A vignette-based knowledge assessment<sup>34</sup> including three different case scenarios  
 4 conducted with clinical staff to evaluate familiarity with specific IMCI standards as  
 5 related to the case management of severely ill children (i.e. dehydration, fever, respiratory  
 6 distress). Each scenario represented a typical cases relevant to IMCI<sup>30 33</sup> and was adapted  
 7 to Burkina context<sup>35</sup>. A trained research assistant recorded steps in clinical management  
 8 suggested by the health worker on a structured checklist. Additional information related to  
 9 a health professional's qualification and IMCI training background, were also obtained.  
 10 d) A structured interview was conducted with the caregiver of each child in the U5YO  
 11 population sample to collect information on any illness episodes and resultant care-  
 12 seeking behaviour during the four weeks preceding the survey date.  
 13 Written informed consent was obtained from all study participants (i.e. health workers,  
 14 patients, caregivers).

## 15 Measures and Analysis

16 Effective coverage (EC) is defined as the relationship between service utilization conditional  
 17 on true need and the service quality received<sup>11 12 36</sup> and can be described as:

$$31 \quad EC_{ij} = (Q_{ij} U_{ij} | N_{ij} = 1)$$

32 Where  $EC_{ij}$  is the effective coverage of individual  $i$  with health service  $j$ ;  $Q_{ij}$  is the expected  
 33 quality of service  $j$  provided to individual  $i$ ;  $U_{ij}$  is the probability of individual  $i$  receiving  
 34 service  $j$ ; and  $N_{ij}$  indicates all individuals  $i$  in true need of service  $j$ .

35 For this study we defined *true need*  $N$  as all U5YO reporting an illness episode during the past  
 36 month. We defined *utilization*  $U$  as U5YOs who actually sought care at the nearest facility.  
 37 Our definition of utilization conditional on true need followed the underpinnings by Shengelia  
 38 et al.<sup>11</sup> Given the data available to us, we defined true need based on reported illness<sup>37 38</sup>,  
 39 while utilization is a function of perceived need among those with reported true need.

40 Based on Donabedian framework and the indices developed by Gouws et al. to assess the  
 41 quality of child healthcare, we defined *quality*  $Q$  as a facility or service specific score  
 42 composed of three quality dimensions:<sup>39 40</sup>

- 43 a) Observed *management of common childhood diseases* (MCCD) consists of five process  
 44 indicators related to health status review and four process indicators related to health  
 45 status examination assessed by the case observation survey. Two of these process  
 46 indicators (i.e. 'weight check' and 'temperature check') are further linked to the  
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3 1 availability of essential input elements assessed by the facility inventory (i.e. ‘functional  
4 2 scale’ and ‘functional thermometer’). This dimension reflects the validated indices 1 and 2  
5 3 (Integrated child assessment based on IMCI guidelines and facility readiness to deliver  
6 4 IMCI) developed by Gouws et al.

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9 **b)** Theoretical *management of severe childhood diseases* (MSCD) is based on provider  
10 6 knowledge on appropriate first-line management processes of 1) severe dehydration in a  
11 7 two-year-old (five process indicators), 2) breathing difficulties in a one-year-old (three  
12 8 process indicators), and 3) lethargy in a newborn (three process indicators) assessed by the  
13 9 three vignettes. Seven of these process indicators are further linked to the availability of  
14 10 essential input elements assessed by the facility inventory. This dimension reflects indices  
15 11 3 and 4 (capacity to manage severe illness using vignettes and capacity to manage severe  
16 12 illness given availability of essential drugs) developed by Gouws et al.

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18 **c)** *General service readiness* is based on five structural indicators on availability of  
19 14 electricity, water, sanitation, patient transport, and waiting rooms assessed by the facility  
20 15 inventory. This dimension reflects structural elements relevant to essential facility  
21 16 infrastructure based on the Donabedian framework.

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18 Composite score generation included the following steps. Each indicator measuring inputs, or  
19 19 structures, was assigned a value of 1 if at least one unit of the observed item was available and  
20 20 functional at a given facility, otherwise 0. To account for the multiple case observations and  
21 21 vignettes conducted per facility, we averaged findings from multiple process measures at the  
22 22 facility level into a single facility-specific process measure, by assigning a value of 1 when a  
23 23 given process was observed in at least half of the observed instances and 0 if not. For those  
24 24 quality measures where process indicators could be linked to input indicators, we assigned a  
25 25 value of 1 only when both indicators were met, otherwise 0. Tables 1-A, 1-B, and 1-C provide  
26 26 an overview of the three quality dimensions including the respective process, input, and  
27 27 structural indicators together with overall facility performance across all sampled CSPS  
28 28 facilities.

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To further categorize facilities, we combined the resulting MCCD and MSCD performance  
scores with the characteristics of health professionals (i.e. professional qualification and IMCI  
training background) providing U5YO consultations and responding to the vignettes. For each  
of the three quality dimensions, facilities were then grouped into one of three categories of  
performance quality (high, intermediate, and low) based on the criteria shown in Table 2.<sup>14 16</sup>

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3 1 For facilities that met different criteria levels for each dimension, we assigned them to the  
4 2 lower level. For instance, if a facility performed a high performance quality score but did not  
5 3 met required staff characteristics, we assigned it to the intermediate level.

6 4 To estimate effective coverage, we defined *effective coverage* as the proportion of all U5YO  
7 5 in need who actually sought care at a facility categorized as at least high or intermediate  
8 6 performance quality.  
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For peer review only



## 1 Results

### 3 U5YO characteristics

4 Across the 7,347 households surveyed, we identified and included a total of 12,497 U5YO.  
5 Of these children, 614 (4.9%) experienced an illness episode during the four weeks prior to  
6 the survey date. Among these children, 463 (75.4%) had fever, 63 (10.2%) had diarrhoea, 20  
7 (3.2%) had cough and 68 (11.07%) had other conditions.

### 8 Staffing

9 In our study, the clinical staff observed independently managing U5YO consultations at CSPS  
10 facilities included 64.1% nurses, 6.8% midwives and 29.1% AIS. Among health professionals  
11 responding to the vignettes, 74.1% were qualified to provide child health services and 32.7%  
12 reported to be trained in IMCI. In 66% of the studied CSPS, all observed U5YO consultations  
13 were performed by qualified health providers, but only in 42.5% of CSPS consultations were  
14 provided by a health professional trained in IMCI.

### 16 Quality of Care functions

17 Table 1-A shows the percentage of facilities meeting each of the listed MCCD indicators. In  
18 regards to symptom review (indicators 1-5), frequencies for overall performance were highest  
19 for routine fever (94.1%), cough (83.4%), and diarrhoea (74.9%) reviews but not for routine  
20 ear problems (25.9%) and danger signs (38.6%). In regards to patient examination (indicators  
21 6-8), routine checks of body temperature and signs of anaemia were observed in 93.7% and  
22 77.1% of CSPS, but body weight and vaccination status review were observed in only 67.4%  
23 and 41.9% of CSPS.

25 Table 1-B presents the overall percentage of facilities meeting each of the listed MSCD  
26 indicators. In scenario 1, providers would have administered appropriate initial treatment (i.e.  
27 immediate fluid resuscitation by intravenous or enteral route) and would have withheld  
28 immediate antibiotic administration given the viral cause of diarrhoea in the majority of CSPS  
29 (86% and 71.4% respectively). In contrast, providers in only 32.7% of CSPS would have  
30 withheld malaria treatments until further proof of parasitemia and in only 25.9% providers  
31 would have initiated indicated further care (i.e. admission for further reassessment and  
32 monitoring). In scenario two, providers in 76.1% of CSPS would have administered  
33 antibiotics, but only in 14.1% of CSPS, indicated further care (i.e. outpatient treatment with

1 close follow-up) would have been implemented. In scenario three, although in the majority of  
2 CSPS (78.5%) providers would have referred the ill infant to a higher-level care facility, in  
3 only 39.2% and 7.2% of CSPS life-saving antibiotics and hypoglycaemia as potential cause of  
4 lethargy would have been adequately addressed, although the necessary drugs to do so were  
5 available in the majority of CSPS. Interestingly, for most combined indicators in Tables 1-A  
6 and 1-B high availability of input components (except isotonic fluid, malaria, scales) appeared  
7 not to be related to more frequent health worker performance in the respective to the related  
8 process.

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10 Table 1-C presents the overall percentage of facilities meeting general service readiness  
11 indicators. The majority of facilities met general infrastructural readiness. However, only  
12 about half of facilities had water and soap for hand washing directly accessible in the  
13 consultation rooms (56.8%), and only 23.3% could directly access a vehicle for emergency  
14 patient transport.

### 15 16 **Overall quality of care categorization**

17 Applying the criteria outlined in Table 2 to assign each CSPA to a performance quality  
18 category resulted in the distribution shown in Figure 1. For the MCCD dimension, 80.4% of  
19 CSPA were categorized as meeting high or intermediate quality, while only 19.6% of CSPA  
20 fell into the low quality category. A similar pattern was found for the general service  
21 readiness dimension with 84.6% of CSPA meeting high or intermediate performance quality.  
22 In contrast, only 49.4% of CSPA met high or intermediate MSCD quality, with more than half  
23 of facilities providing relatively poor management to children with critical health conditions.  
24 Taking all three dimensions together, 69.8% of CSPA met high or intermediate quality.

### 25 26 **Crude and effective coverage for curative CHS**

27 Out of the 614 children who experienced an illness episode, 427 (69.5 %) actually sought  
28 facility-based care (i.e. crude coverage). Given that the majority of CSPA fell into the  
29 intermediate quality category, we estimated effective coverage for two scenarios: scenario A  
30 only considering facilities in the high quality category and scenario B considering both high  
31 and intermediate performing facilities. For effective coverage scenario A only 33 (5.3 %) U5YO  
32 received high quality services; for scenario B 274 (44.6 %) U5YO were effectively  
33 covered (see Figure 2).

## Discussion

Our study revealed two major findings regarding CHS provision in Burkina Faso. Firstly, there are existing gaps between crude and effective coverage. Secondly, performance quality related to the management of ill children provided by CSPPS in our study area is generally sub-standard and varies greatly between quality dimensions.

Our study found that only about two thirds of ill U5YO presented to a CSPPS, which in our study is assumed to be equivalent to crude service coverage. At this point, we were unable to explore the reasons of not seeking care for those non-using children in our sample – e.g. whether there are persisting access barriers or whether the child’s illness was treated at home or elsewhere outside the formal health system. Additional research will therefore be warranted to better understand the health-seeking behaviour of households caring for ill children not seeking care provided free through the CSPPS system.

More disturbingly, we found the gap in effective coverage to be considerably wide, especially when considering only high quality facilities. These estimates might be biased to some extent, as we assumed every sick child to be taken to the CSPPS closest to the household when estimating service use (available data did not allow for a more specific assessment). While this would not have affected our crude coverage estimation, it might have diminished the effective coverage estimates in cases where caretakers actually bypassed the closest CSPPS in favour of a more distant facility with better quality.<sup>41</sup> However, our assumption is supported by the literature on primary health care utilization in SSA and we trust that our effective coverage estimates are sufficiently representative of the situation in Burkina Faso.<sup>42-46</sup>

Effective coverage estimates are heavily influenced and can be easily modulated depending on the indicators selected to measure service quality. Although the process, input, and structural indicators included in our quality score are informed by the work of other authors, they still can be considered selective or biased towards technical elements of the care delivery process.<sup>40 47</sup> Still, we understand that for health care provision to be effective, evidence-based clinical protocols (such as IMCI) need to be adhered to and can therefore be considered the gold standard against which quality should be measured.

In doing so, we observed quite some differences between the measured quality dimensions used in this study. While observed MCCD processes did not meet IMCI standards, it became nevertheless obvious that providers still follow an assessment approach that seems to be

1 focused on or informed by the leading causes and symptoms among the U5YO population.  
2 The vignette-based assessment of MSCD, processes revealed that providers generally adhere  
3 to treatment guidelines regarding the initial management of severely ill infants (except for the  
4 newborn case in scenario 3), but deviate from protocol when making definitive care decisions.  
5 Similarly weak or inconsistent adherence to treatment guidelines contributing to low service  
6 quality in low-income settings has also been noted by other studies.<sup>47-49</sup> While our study  
7 revealed that most of rural facilities had access to basic infrastructures, some structural  
8 differences may still remain not picked up by our survey. Comparing input and process  
9 indicators, we observed that lack of supplies hardly seemed to influence non-adherence of  
10 IMCI guidelines. Comparing eight low-income countries, Leslie et al. also found limited  
11 correlation between structural aspects and the process of providing evidence-based maternal  
12 and child health has also been care.<sup>50</sup>

13  
14 Several studies have reported on the effectiveness of IMCI guidelines<sup>56</sup> and reasons of low  
15 adherence. Lack of IMCI-based training and shortage of equipment are commonly identified  
16 contributors to low adherence.<sup>51</sup> Some authors also point to that the lack of motivation to  
17 adhere to guidelines in combination with high workload.<sup>52 53</sup> Besides inconsistencies in  
18 protocol adherence, an additional contribution to the low effectiveness of provided care might  
19 have been the fact that a large portion of observed U5YO consultations was actually  
20 conducted by health workers without adequate qualifications (i.e. AIS or providers without  
21 IMCI training) in the absence of any supervision by a more qualified staff member. Officially,  
22 AIS are not authorized to independently provide any curative care in Burkina Faso<sup>25</sup> and  
23 usually do not receive any specific skill trainings, such as IMCI.<sup>54</sup> In addition, inadequate  
24 equipment and supplies might have also contributed to some of the deviations from protocol,  
25 for instance many facilities had no malaria tests or otoscopes available, which might explain  
26 the less differentiated use of anti-malaria drugs or the limited focus on ear-related  
27 symptoms.<sup>51</sup>

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29 As with all studies on performance quality, our study faces some limitations regarding the  
30 assessment of the quality components included in our effective coverage estimates. To  
31 determine the quality of curative CHS, we relied on both direct observations and vignettes.<sup>32</sup>  
32<sup>34</sup> A common bias to direct observation is the so-called Hawthorne effect, which describes  
33 higher performance under observation compared to non-observed situations, and may cause  
34 overestimation of actual performance.<sup>55</sup> In contrast, clinical vignettes might underestimate

1 actual clinical competence, as a testing format based on abstract case scenarios might be  
2 unfamiliar to many health workers and has limitations in reflecting the realities of actual case  
3 management. Still, both instruments are considered standard in the assessment of health  
4 worker performance.

5 Estimating effectiveness, we measured quality based on content of care focusing on both  
6 health care inputs (infrastructure, supplies, provider knowledge) and processes (aspects of  
7 actual or theoretical case management). While providing a comprehensive measure of  
8 effectiveness of care, a content of care approach may only approximate an individual's health  
9 gain in so far, as it does not capture aspects such as patient adherence to treatment or  
10 individual health outcomes (recovery, complications, etc.).<sup>12</sup> Nevertheless, the indicators  
11 included in our quality score are considered measures relevant in reducing child mortality and  
12 morbidity<sup>4-6</sup>.

13 For the indicator on danger signs used in the MCCD dimension, we accepted positive  
14 performance already when at least two danger signs were reviewed. This was done in order to  
15 better facilitate score aggregation given the overall poor performance observed in respect to  
16 danger sign assessment. It needs to be noted, that this approach actually overestimates  
17 providers' overall performance. Similarly, the thresholds applied to categorizing facility  
18 performance are relatively arbitrary even though we relied on the work of other authors.<sup>14 16</sup>

19 As the categorization approach affects heavily whether a facility was grouped as high or low  
20 performing, we presented the two scenarios of effective coverage to again allow for some  
21 room in our estimation.

22 Further, by defining true need we assumed every reported U5YO illness episode would  
23 actually require a medical care visit (including milder forms of illness). This rather  
24 conservative estimation might have overestimated the actual true need in our study population  
25 and thus likely underestimated both crude and effective coverage.

26 Another limitation of this study is that although we focus on U5YO and infants, we  
27 purposefully exclude early neonatal conditions directly related to birth. In addition, while our  
28 study focus was on primary level health care facilities in rural areas, generalizability of our  
29 findings might be limited given that study regions and districts were purposely selected. Still,  
30 the relatively large facility sample available to us (around one third of primary level health  
31 care facilities in the country) nevertheless provides a relatively broad overview on effective  
32 coverage in Burkina Faso. With this study adding new evidence on the effectiveness of child  
33 health service coverage in low-income settings, the future focus should certainly include the  
34 effective coverage of U5YO in more urban areas and the effectiveness of services provided by

1 hospitals. Additional research exploring the determinants of effective coverage (both demand  
2 side factors and supply side factors), will be necessary and helpful to decision makers to tailor  
3 health interventions more specifically to improve effective service coverage.  
4

## 5 **Conclusion**

6 Comparing crude and effective service coverage of U5YO in rural Burkina Faso resulted in  
7 two major findings. First, there are existing gaps between crude and effective coverage.  
8 Second, the effectiveness of services provided to U5YO is extremely low, even when  
9 considering a less strict definition of service quality. While our quality assessment relied on  
10 content of care measured as guideline adherence, we also assessed the availability of essential  
11 equipment and supplies required to implement these protocol, as well as main provider-  
12 specific characteristics. The pattern observed in our study is that lack of supplies hardly  
13 seemed to influence non-adherence of IMCI guidelines. Non-adherence rather seems to be an  
14 issue specific to the individual provider or service staffing with quite a number of unqualified  
15 health workers actually providing clinical care to U5YOs. To improve effectiveness of U5YO  
16 service provision, both policy makers and health workers should review and adjust the  
17 implementation of evidence-based clinical protocols (e.g. through trainings, performance  
18 evaluations, supervision and coaching) to the human and structural resources available at the  
19 CSPS level.  
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## 1 **Author contributions**

2 AS, SB, RCN, JLK conceived and designed the paper. AS, NO, SB, HH and JLK were  
3 involved in data collection. JLK analysed the data and wrote the first draft of the manuscript.  
4 JLK, RCN, NO, HH, JR, PC, AS and SB reviewed and approved the final version of the  
5 paper.

## 6 **Data sharing statement**

7 For access to the entire data set used for this article, please contact Paul Jacob Robyn  
8 ([probyn@worldbank.org](mailto:probyn@worldbank.org))

## 9 **Ethics considerations**

10 The National Ethics Committee in Burkina Faso as well as the Ethical Committee of the  
11 Medical Faculty at Heidelberg University approved this study. For this study, we obtain  
12 written consent of all the respondents.

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## 15 **Competing interests**

16 We used data from the baseline survey of the impact evaluation of the Performance Based  
17 Financing program in Burkina Faso. The impact evaluation, including data collection for the  
18 survey, is funded by the World Bank through the Health Results Innovation Trust Fund  
19 (HRITF). Nobila Ouedraogo and Aurelia Soares, who was the scientific coordinator of the  
20 baseline survey received salary from the World Bank. Jean-Louis Kouliadiati is a  
21 doctoral student at the University of Heidelberg and received payment from the World Bank  
22 during data collection. Stephan Brenner is currently partially employed on  
23 the abovementioned Impact Evaluation. Paul Jacob Robyn is a World Bank employee, based  
24 in Washington. Hervé Hien is employed at Centre Muraz and received payment from the  
25 World Bank during data collection only. None of the authors received any payment by the  
26 World Bank for the analysis presented in this manuscript and for the writing. The World Bank  
27 did not interfere with design, data analysis, and writing of this manuscript in any way.

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**Table 1-A. Indicators and related performance of management of common childhood diseases (MCCD)**

	<b>Process Indicators (based on direct observation)</b>	Number (percentage) of all facilities with observed process	<b>Input Indicators</b>	Number (percentage) of all facilities with observed input	<b>Overall Facility Performance</b> Number (percentage) of all facilities with observed performance *
1.	Provider asks for at least two general danger signs §	191 (38.6)	N/A	N/A	191 (38.6)
2.	Provider asks for presence of fever	465 (94.1)	N/A	N/A	465 (94.1)
3.	Provider asks for presence of cough	412 (83.4)	N/A	N/A	412 (83.4)
4.	Provider asks for presence of diarrhoea	370 (74.9)	N/A	N/A	370 (74.9)
5.	Provider asks for presence of ear problems	128 (25.9)	N/A	N/A	128 (25.9)
6.	Provider checks child's weight	366 (74.1)	Functional scale available	448 (90.7)	333 (67.4)
7.	Provider checks child's temperature	477 (96.5)	Functional thermometer available	480 (97.1)	463 (93.7)
8.	Provider checks for signs of anaemia (conjunctivae, palms)	381 (77.1)	N/A	N/A	381 (77.1)
9.	Provider checks child's current vaccination status	207 (41.9)	N/A	N/A	207 (41.9)

N/A = not applicable

\* In instances where both process and input indicators were applicable, overall facility performance was positive once both indicators were met.

§ Per IMCI standard: four general danger signs need to be assessed (difficulties breastfeeding/taking any food, considerable vomiting, lethargy, convulsions). Due to generally low performance of this indicator if measured against this standard, we considered this process to be performed when at least two danger signs were reviewed.

**Table 1-B. Indicators and related performance of management of severe childhood diseases (MSCD)**

	<b>Process Indicators (based on vignettes)</b>	Number (percentage) of all facilities with observed process	<b>Input Indicators</b>	Number (percentage) of all facilities with observed input	<b>Overall Facility Performance</b> Number (percentage) of all facilities with observed performance *
<b>Vignette-based scenario 1: Viral illness with severe dehydration in 2-year-old</b>					
1.	Provider starts rehydration (either intravenous or enteral fluids)	445 (90.1)	Isotonic fluid <sup>a</sup> or oral rehydration salt and nasogastric tube in stock	486 (98.3)	439 (88.8)
2.	Provider administers a dose of paracetamol to lower fever	190 (38.4)	Paracetamol suppository in stock	424 (85.8)	165 (33.4)
3.	Provider recognizes viral origin of illness and withholds antibiotics until further evaluation.	353 (71.4)	N/A	N/A	353 (71.4)
4.	Provider withholds malaria treatment until parasitemia is confirmed	396 (80.1)	Malaria testing supplies in stock	203 (41.1)	162 (32.7)
5.	Provider admits patient for further observation and reassessment	128 (25.9)	N/A	N/A	128 (25.9)
<b>Vignette-based scenario 2: Breathing difficulties in 1-year-old with simple pneumonia</b>					
1.	Provider initiates antibiotic treatment at facility	380 (76.9)	Antibiotics in stock <sup>b</sup>	486 (98.3)	376 (76.1)
2.	Provider administers a dose of paracetamol to lower fever	331 (67.0)	Paracetamol suppository in stock	424 (85.8)	293 (59.3)
3.	Patient is discharged with close follow-up plan (opposed to admission or referral)	70 (14.1)	N/A	N/A	70 (14.1)
<b>Vignette-based scenario 3: Lethargic 1-month-old</b>					
1.	Provider administers a dose of injectable antibiotic	230 (46.5)	Ceftriaxone in stock	410 (83.0)	194 (39.2)
2.	Provider checks and controls hypoglycaemia	37 (7.5)	Dextrose solutions or dextrose containing IV fluids in stock	464 (93.9)	36 (7.2)
3.	Provider refers patient to higher level of care	388 (78.5)	N/A	N/A	388 (78.5)

N/A = not applicable

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\* In instances where both process and input indicators were applicable, overall facility performance was positive once both indicators were met.  
<sup>a</sup> (Ringer lactate or normal saline)  
<sup>b</sup> Amoxicillin or Cotrimoxazole or Ceftriaxone

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**Table 1-C. Indicators and related performance of general service readiness**

	<b>Process Indicators</b>	<b>Structural Indicators</b>	<b>Overall Facility Performance</b> Number (percentage) of all facilities with observed performance
1.	N/A	Functional electricity source available	412 (83.4)
2.	N/A	Functional water source and soap available in the consultation room	281 (56.8)
3.	N/A	Functional toilet facilities available	480 (97.2)
4.	N/A	Functional emergency vehicle available	115 (23.3)
5.	N/A	Patient waiting room available	406 (82.2)

N/A = not applicable

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**Table 2. Categories of facility quality based on performance scores**

Performance quality	Criteria MCCD <sup>a</sup>	Criteria MSCD <sup>b</sup>	Criteria General service readiness <sup>c</sup>
<b>High</b>	<ul style="list-style-type: none"> <li>• Performance score <sup>d</sup> ≥7</li> <li>• All observed cases attended by a qualified HCW§</li> <li>• All observed cases attended by a HCW trained in IMCI</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score ≥8</li> <li>• All vignettes based-scenarios answered by at least two-third* of qualified HCW§</li> <li>• All vignettes based-scenarios answered by at least one HCW trained in IMCI</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score ≥4</li> </ul>
<b>Intermediate</b>	<ul style="list-style-type: none"> <li>• Performance score 5-6</li> <li>• All observed cases attended by a qualified HCW§</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score 6-7</li> <li>• All vignettes based-scenarios answered by at least two-third of qualified HCW</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score = 3</li> </ul>
<b>Low</b>	<ul style="list-style-type: none"> <li>• Performance score &lt;5</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score &lt;6</li> </ul>	<ul style="list-style-type: none"> <li>• Performance score &lt;3</li> </ul>

HCW = health care worker; **HF**= Health facility; MCCD = management of common childhood diseases; MSCD = management of severe childhood diseases  
<sup>a</sup> maximum possible score = 9; <sup>b</sup> maximum possible score = 11; <sup>c</sup> maximum possible score = 5 <sup>d</sup> performance score: high (≥70% of the maximum possible score) ; intermediate (50-69%); low (<50%)  
 § Qualified healthcare worker: According to the national policy of quality assurance, nurse and midwife/midwife assistant are qualified to perform U5YO curative consultations.  
 \* We used the cut-off of two third because the minimum requirement staff at CSPS level is composed of two third of qualified HCW for U5YO curative consultations (1 nurse, 1 midwife /midwife assistant) and 1 AIS.



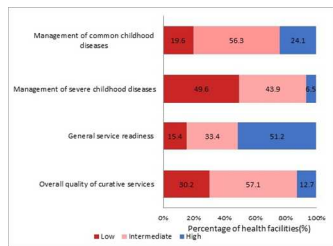
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5 **Figure 1. Proportion of health facilities per performance quality category (n=494)**  
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5 **Figure 2. Crude coverage and effective coverage for curative CHS:**

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7 **A) Scenario 1, high quality only    B) Scenario 2, High and intermediate quality**  
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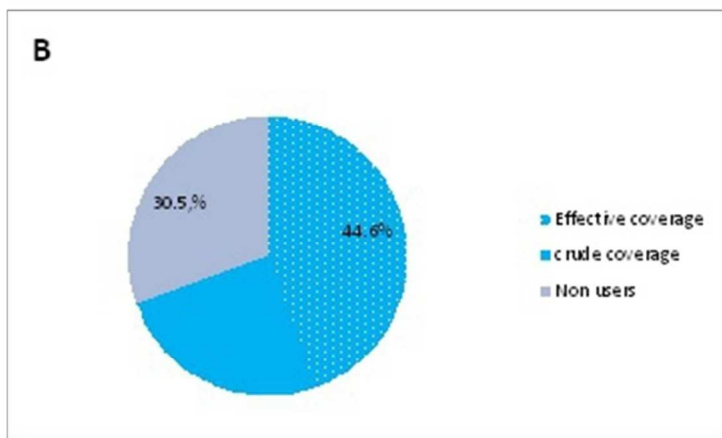
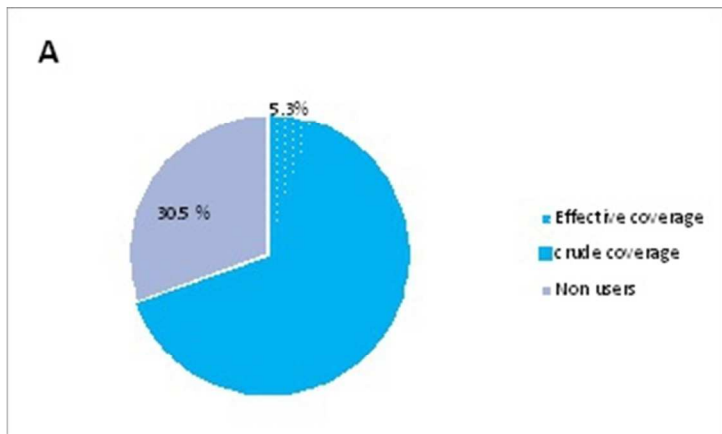
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