Cost analysis of integrated primary health care services in Pakistan

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Abstract

Background: Primary health care is central to achieving Universal Health Coverage and better health outcomes; however, it requires adequate resources for effective implementation.

Aim: To estimate the cost of implementing an integrated primary health care package in Sindh Province, Pakistan.

Methods: We developed an integrated primary health care service package and standard treatment guidelines for each service provided at 12 basic health units across 4 districts of Sindh Province. We then collected and analysed cost and service volume data for the health units using the CORE Plus tool, under 3 service delivery scenarios.

Results: Standard costs per service in health units that provided round-the-clock maternal care services decreased in scenarios 2 and 3 as service volumes increased, while standard costs did not decrease in health units that provided services for only 6 hours per day for 6 days a week. The average annual standard costs per 10 000 population in round-the-clock health units were US$ 38 315 for scenario 1, US$ 47 139 for scenario 2 and US$ 56 719 for scenario 3. For health units that provided services for only 6 hours per day for 6 days, the annual standard cost was US$ 22 800. Medicines, supplies and laboratory tests accounted for the highest proportion of the total costs, followed by staff salaries and operating costs. Staffing requirements increased for multiple roles.

Conclusion: Integrating services and analysing service costs regularly to align resources with care needs can help improve the cost-effectiveness of services at primary health centres.

Keywords: primary health care, universal health coverage, health care service, health care cost, maternal health, Sindh, Pakistan

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Background

Primary health care (PHC) aims to deliver a comprehensive package of essential services, including for noncommunicable diseases (NCDs), mental health conditions, communicable diseases such as HIV/AIDS, and emerging infections, alongside maternal, neonatal and child health care services (*1,2*). Despite its advantages, PHC coverage and effectiveness vary, largely due to inadequate financial allocations and limited essential resources (*3*). Consequently, progress on improving health indicators has been limited in developing countries (*4*).

Although evidence on PHC costing remains limited, the bottom-up approach has gained traction over the past 2 decades for its detailed and resource-sensitive methodology (*5*). One such tool, CORE Plus, developed by Management Sciences for Health (MSH) has been used to cost PHC services in Cambodia, Haiti and Guatemala, as well as HIV services in Rwanda and maternal and neonatal health care in Pakistan (*6–9*).

Pakistan, the sixth most populous lower-middle-income country, has an extensive PHC infrastructure comprising more than 5000 basic health units (BHUs), each serving a catchment population of 15 000–25 000 people. However, poor service quality has led to low utilisation, with fewer than 20% of the population relying on public PHC facilities (*10*). Some progress has been made by outsourcing services to non-government organizations (NGOs), although improvements remain limited (*11*).

Evidence shows that strengthening the capacity of providers to deliver core primary care functions is key to improving PHC services (*12*). Although global estimates are available for the annual per capita expenditure needed to deliver a basic PHC package, these costs vary significantly based on demography, geography, disease burden, resource availability and system capacity (*13*).

Until date, no study has provided complete cost estimates for comprehensively integrated PHC services under one framework . To address this gap, we developed an integrated PHC (iPHC) package and estimated standardised costs for PHC centres in Sindh Province, using a context-specific methodology. The objective was to calculate unit and total standard costs for implementing the iPHC package, based on disease burden and standard treatment guidelines (STGs), to inform need-based PHC financial planning.

Methods

This study was conducted in Sindh Province, Pakistan, where PHC services were not unified under an integrated model. Accordingly, the costing process began with the development of an iPHC package through stakeholder consultation. After developing the package,

STGs for each service were formulated collaboratively with subject matter experts. This was followed by the collection of data on service volumes in the catchment areas of selected PHC centres. The final stage involved a costing analysis based on the STGs and collected service volumes. The methodological steps are described.

Development of an iPHC package and STGs

Conducted between October 2022 and April 2024, the study began with the development of a context-specific iPHC package and corresponding STGs. A two-day consultative meeting was held, during which consensus was reached among stakeholders, including representatives of PHC management; the Sindh Healthcare Commission; Maternal, Neonatal and Child Health Programme; Expanded Programme on Immunisation; Nutrition Support Programme; and public health specialists. The package included outpatient management of common communicable and noncommunicable diseases, as well as services related to maternal and neonatal care, immunisation, family planning and child nutrition.

STGs were developed to specify standard consultation time, treatment protocols and duration required for each service, in consultation with family physicians, obstetricians, nutritionists, paediatricians and public health experts. Based on the finalised list of conditions, daily and monthly surveillance forms were designed to collect service volume data from BHUs, private general practitioners within BHU catchment areas, and outreach health workers.

Finalisation of sites and data collection

Four districts were selected to ensure geographic and socioeconomic diversity. These included districts with predominantly plain terrain (Larkana and Matiari), desert landscape (Mithi) and mountainous terrain (Dadu), thereby covering the northern, central and southern regions of Sindh Province.

From each district, 3 BHUs – the main rural PHC centres – were selected: 2 24/7 BHUs (providing round-the-clock maternal care services throughout the week) and 1 6/6 BHU (open 6 days a week for 6 hours per day). Private general practitioners operating in these areas were also mapped. Table 1 presents the BHU details, catchment populations and general practitioner availability.

In each district, one coordinator and 6 data collectors were recruited and trained to collect service volume data included in the iPHC package. These data were obtained from health care workers at BHUs, private general practitioners, and outreach workers. Each district coordinator submitted completed data collection forms weekly to the core team, and the core team provided feedback to ensure data quality. All data were compiled using Microsoft Excel.

Data input into CORE Plus files and their sources

For each BHU, a CORE Plus file was created to capture all required data for cost analysis. These files included information on actual annual service volumes, expected incidence of conditions, STGs, list of required medicines and supplies with unit costs, as well as data related to catchment population, staff salaries, work time allocation, operating costs and revenue.

Actual service volumes and incidence

Service volumes data were extracted from the routine health management information system (HMIS) at each BHU. Outreach data were collected from lady health supervisors (LHSs) overseeing lady health workers (LHWs). Referrals made from BHUs and the community to higher-level facilities were also included to capture the total provider burden.

To estimate the expected services needed, 2 datasets were prepared. The first included observed volume from private general practitioners in the BHU catchment

Table 1 Selected basic health units by district, type, population and number of general practitioners

Health unit	District	Type	Catchment population	Number of general practitioners in catchment
UC Hala Old	Matiari	24/7	33 881	1
UC Nabi Baksh Jamali	Matiari	6/6	14 125	1
UC Sekhat	Matiari	24/7	13 100	2
UC Dhamrah	Larkana	24/7	41 171	2
UC Pathan	Larkana	6/6	36 715	1
UC Shahbaad	Larkana	24/7	40 624	2
UC Chelhar	Mithi	24/7	44 460	2
UC Mithi Gechu	Mithi	6/6	41 013	2
UC Mubarak Rind	Mithi	24/7	42 251	0
UC Makhdum Bilawal	Dadu	24/7	33 400	2
UC Mitho Babar	Dadu	24/7	30 206	2
UC Parya	Dadu	6/6	35 444	1

24/7 = open all-day for 7 days a week; 6/6 = open 6 hours for 6 days a week

areas. The second was based on the expected incidence of conditions in the population.

Standard treatment guidelines

STGs specified the time required for each type of provider to deliver a given service, the medicines and medical supplies used, and the relevant diagnostic investigations. For chronic conditions (e.g. hypertension, diabetes, depression, contraceptive provision), the treatment duration was standardised to one month.

Assumptions were applied regarding the proportion of patients requiring specific drugs, supplies or tests, based on literature.

Medicines, supplies and their costs

Unit costs for all essential medicines, medical supplies and laboratory tests were derived from the People's Primary Healthcare Initiative (PPHI) procurement rates (December 2023). Vaccine prices were obtained from the UNICEF vaccine pricing database (31 December 2023) (*14*).

Catchment population, salaries, operating costs and time allocation

Data on catchment population size, staff salaries and operating costs were obtained from PPHI administrative records. Operating costs included utilities, stationery and maintenance. Age and sex distributions were estimated using rural Sindh census data (*15*).

Technical staff were interviewed onsite to determine the allocation of their working hours between clinical services and administrative tasks.

Cost analysis

Costs were estimated for 3 scenarios using the CORE Plus tool. In the first scenario, the standard costs for the iPHC package were calculated based on the actual service volumes delivered at BHUs and through outreach during 2023. Scenario 2 included all maternal, neonatal and child health (MNCH) services, along with general practitioner reported volumes for other conditions. Scenario 3 included the cost of delivering the full MNCH package and 50% of the estimated service needs for other conditions.

Figure 1 illustrates cost category breakdowns across all scenarios in 6/6 and 24/7 BHUs, showing proportional expenditures by service type [e.g. treatment of common illnesses, integrated management of neonatal and childhood illness (IMNCI), maternal care, immunisation] and cost category. In all BHUs, medicines, supplies and laboratory tests accounted for the highest proportion of total costs, followed by salaries and operating costs.

Results

When compared with the expected need based on prevalence estimates from the literature, utilisation patterns suggested adequate use of maternal care, excluding family planning, as well as child health, immunisation and communicable disease services. In contrast, NCD services were underutilised.

Standard costs per service in 24/7 BHUs decreased in scenarios 2 and 3, as service volumes increased. In contrast, costs in 6/6 BHUs increased under scenario 2 and did not decrease in scenario 3 (Table 2). To enable comparisons across BHUs with different catchment sizes, a proxy indicator – cost per 10 000 population – was used.

The average annual standard cost per 10 000 population in 24/7 BHUs under scenario 1 (actual service volumes) ranged from US$ 23 012 to US$ 48 390 with a mean of US$ 38 315. For scenarios 2 and 3, the mean increased to US$ 47 139 and US$ 56 719, respectively (Table 2). In 6/6 BHUs, costs under scenario 1 ranged from US$ 19 308 to US$ 32 795 (mean = US$22 800), increasing to US$ 45 062 and US$ 56 521 in scenarios 2 and 3, respectively.

Cost distribution patterns are shown in Figure 1, highlighting the average percentage breakdown of costs in 6/6 and 24/7 BHUs across all 3 scenarios. In 6/6 BHUs, medicines, supplies and laboratory tests accounted for the highest proportion of total costs, followed by technical, administrative and support staff salaries, and operating costs. The same cost distribution pattern was observed in 24/7 BHUs.

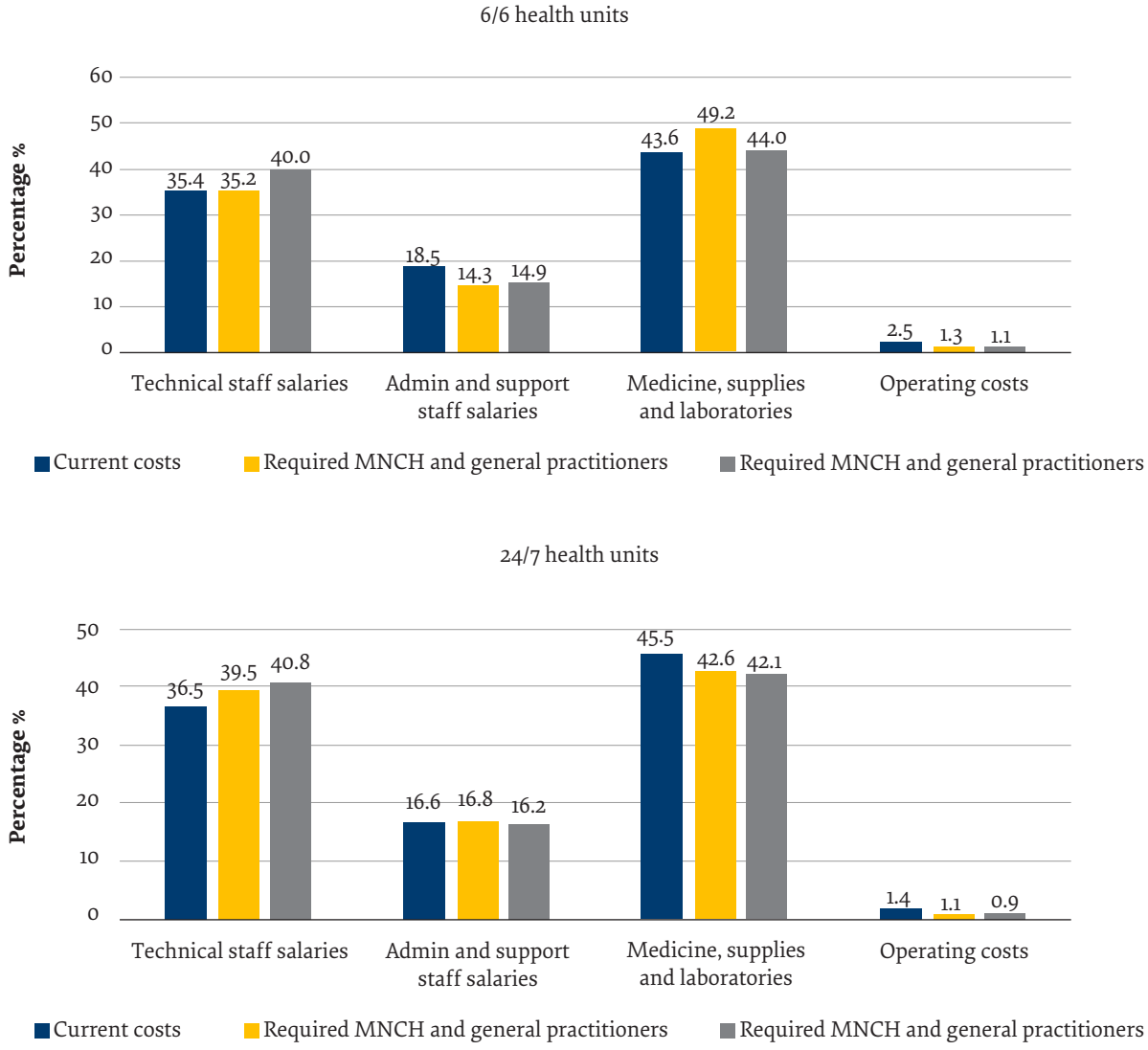
As shown in Figure 2, the average cost distribution by service type indicates that in 24/7 BHUs, maternal care accounted for the highest proportion of expenditure (mean = 43.3%), followed by treatment of common

Table 2 Standard costs per service and per 10 000 population at 24/7 and 6/6 basic health units under 3 scenarios

Type	Scenario	Mean total cost per 10 000 population (US$)	Range (US$)	Mean cost per service (US$)	Range (US$)
24/7	Scenario 1	38 315	23 012–48 390	3.3	2.7–3.6
	Scenario 2	47 139	26 931–58 080	2.7	2.5–3.4
	Scenario 3	56 719	42 194–66 456	2.5	2.3–2.8
6/6	Scenario 1	22 800	19 308–32 795	2.4	2.0–2.9
	Scenario 2	45 062	37 031–50 797	2.7	2.5–3.0
	Scenario 3	56 521	51 593–60 548	2.3	2.2–2.5

Scenario 1: actual service volumes; Scenario 2: required MNCH services plus general practitioner volumes; Scenario 3: required MNCH services plus 50% of expected volumes for other conditions.

Figure 1 Average percentage of costs at 6/6 and 24/7 health units for the 3 scenarios



conditions (25.6%), child health (22.3%) and immunisation (8.7%). In scenarios 2 and 3, treatment of common conditions became the largest cost component, followed by maternal care, child health, and vaccination services.

At current service volumes, treatment of common conditions accounted for the highest proportion of expenditure in the 4 6/6 BHUs (mean = 37.2%), followed by child health (28.5%), maternal care (22.0%), and vaccination (12.1%) services. This distribution pattern remained stable in scenarios 2 and 3.

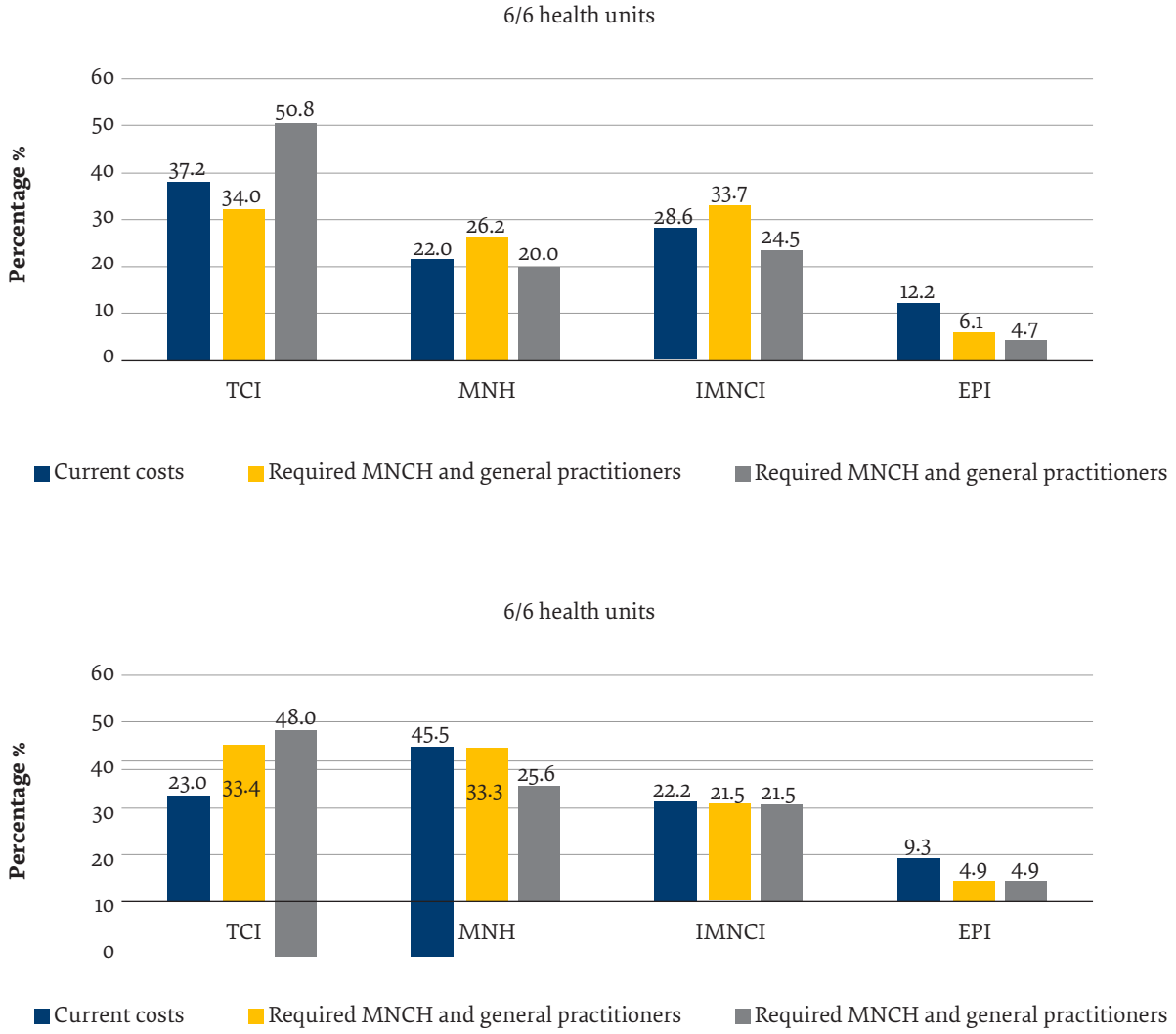
Table 3 presents the average number of staff required per 10 000 population under each scenario. In 24/7 BHUs under scenario 1 (actual service volumes), the average required staff per 10 000 population was 0.81 for medical officers, 0.72 for women medical officers (WMOs), 1.17 for lady health visitors (LHVs), 1.17 for dispensers, 0.68 for vaccinators, and 1.02 for LHWs. Under scenarios 2 and 3, the staffing requirements for medical officers and dispensers increased, while needs for other roles remained unchanged.

In 6/6 BHUs, staffing requirements increased for multiple roles. In addition to medical officers and dispensers, the WMOs and LHVs increased, indicating broader service delivery gaps, particularly in maternal and clinical care.

Discussion

This is the first study in Pakistan to estimate the costs of implementing an iPHC package using a locally contextualized approach and STGs. Although a costed essential package of health services based on national evidence is available, it does not integrate all PHC services within a unified framework and does not account for local variation (*16*). This study provides cost estimates across 3 scenarios that reflect differences in care-seeking behaviour and service availability.

Figure 2 Average proportion of standard costs according to nature of services for 6/6 and 24/7 health units for the 3 scenarios



Values represent the mean number of staff required per 10 000 population.
MNCH = maternal, neonatal and child health; GP = general practitioner.

Scenario 3 assumes that only 50% of adults with minor conditions seek care, based on evidence that many self-manage minor ailments such as acute respiratory infections and diarrhoea. In contrast, scenario 2 includes service volumes reported by private general practitioners in the catchment area and is therefore considered a more realistic basis for extrapolating population-level demand and planning resources accordingly.

Service utilisation data showed that 24/7 BHUs provided maternal care services beyond the estimated need, while uptake was lower in 6/6 BHUs. Antenatal, delivery and postnatal care were widely accessed, but contraceptive services remained significantly underutilised among eligible women. This suggests that although 24/7 BHUs are effectively delivering pregnancy-related services, access to family planning still requires strengthening.

Utilisation was relatively high for childhood illness services, including those delivered through the IMNCI strategy, as well as for immunisation and communicable diseases. However, NCD services were underutilised, indicating a need to enhance community-based screening and referral systems. A study on the cost and financing needs of the basic package of health services in Afghanistan also found that service utilisation in public facilities was well below 50% for certain conditions (17).

In this study, the average cost per service was lower in 6/6 BHUs than in 24/7 BHUs, likely due to underutilisation of resource-intensive maternal care services in the former. The average standard cost per service in 24/7 BHUs under scenario 1 ranged from US$ 2.76 to US$ 3.82, decreasing to US$ 2.50–US$ 3.40 in scenario 2 and further to US$ 2.10–US$ 2.80 in scenario 3. These findings suggest that higher service volumes are associated with lower unit costs, particularly for maternal care, where utilisation exceeded the estimated need in scenarios 2 and 3. In contrast, unit costs increased in 6/6 BHUs, reflecting the continued introduction of underutilised

Table 3 Required staffing per 10 000 population in 24/7 and 6/6 health units under 3 scenarios

Scenarios	Medical officers	WMOs	LHVs	Vaccinators	LHWs	Dispensers	Nutrition assistants
24/7 health units							
Scenario 1 – current volumes	0.8	0.7	1.2	0.7	1	1.2	0.3
Scenario 2 – required MNCH + general practitioner volumes	1.4	0.7	1.1	0.6	1.5	1.9	0.3
Scenario 3 – required MNCH + 50% of other conditions	2.2	0.7	1.1	0.6	1.5	2.7	0.3
6/6 health units							
Scenario 1 – current volumes	0.6	0.4	0.4	0.5	1	1.0	0.3
Scenario 2 – required MNCH + general practitioner volumes	1.2	0.7	1.1	0.6	1.8	1.7	0.3
Scenario 3 – required MNCH + 50% of other conditions	2.3	0.7	1.1	0.6	1.8	2.9	0.3

Values represent the mean number of staff required per 10 000 population.
MNCH = maternal, neonatal and child health; WMOs = women health officers; LHVs = lady health visitors; LHWs = lady health workers

services. Comparison with other studies is limited, as global experience shows that the cost of integrated service packages varies substantially based on service scope, delivery models, remuneration levels, and local prices of medicines and supplies (*18*). However, previous studies from Pakistan and Ghana reported PHC service costs ranging from US$ 4.10 to US$ 5.16 (*19,20*).

Total annual standard costs based on actual volumes ranged from US$ 46 323 to US$ 198 722, increasing progressively across scenarios. This variation was driven by differences in catchment population size (13 100–44 460) and staff salaries, including hardship allowances for remote postings. Similar variation was reported in India, where average annual costs of PHC facilities ranged from US$ 83 837 to US$ 105 299 (*21,22*).

In all scenarios, the largest share of expenditure was on medicines, supplies and laboratory tests, followed by technical, administrative and support staff salaries, and operating costs. This contrasts with findings in other studies, where salaries dominate costs – likely due to the lack of disaggregated salary data (*20–23*).

In 24/7 BHUs under scenario 1, maternal care services accounted for the highest proportion of expenditure, followed by treatment of common illnesses, child health and immunisation. In scenarios 2 and 3, treatment of common illnesses became the largest expenditure category. The high maternal care costs may be due to high staffing requirements for 24/7 services and strong service uptake.

In 6/6 BHUs, treatment of common illnesses consistently accounted for the highest proportion of expenditure, followed by child health, maternal care and immunisation. These trends highlight higher utilisation of 24/7 BHUs for maternal care, and the underuse of such services in 6/6 BHUs.

Staffing requirements increased substantially across scenarios. In 24/7 BHUs, the number of medical officers and dispensers required per 10 000 population increased progressively, especially in scenario 3, while the need for other staff remained stable. In 6/6 BHUs, similar patterns were observed, but the needs also increased for women medical officers and lady health visitors, indicating limited maternal care provision at these sites. This aligns with findings from Afghanistan, where meeting population needs could require a two- to threefold increase in workforce (*17*).

Notably, the estimated need for LHWs was 2-3 times lower than the number currently deployed across all scenarios, suggesting significant underutilisation. The LHW strategic Plan 2022–2028 calls for expanding their role, particularly in community education on communicable and noncommunicable diseases, as part of the essential health package (*24*).

Study limitations

Several limitations should be noted. First, the costing methodology captured only recurrent costs and did not include capital expenditures. Second, standard costs were not compared with actual expenditures due to the integrated nature of PHC service delivery and the lack of disaggregated financial data. Third, the estimation of service need relied on provider-assigned diagnoses, which may vary in accuracy. Fourth, the data obtained from BHUs, outreach workers and general practitioners may have been subject to reporting bias. Finally, estimates of service need were based on national and regional prevalence data, and may not reflect district-level variations. Actual disease burdens are likely to differ by location.

Comparison with other studies is limited, because the cost of iPHC packages varies widely depending on service scope, delivery models, provider remuneration, and local prices. This variability limits the generalisability and benchmarking of findings across settings.

Conclusion

Improving allocative efficiency in primary health care requires integrated service delivery and systematic estimation of population-level needs. A reduced disease

burden can lower future service demand and associated costs. This study offers a replicable model to support evidence-based planning and resource allocation in similar settings.

Recommendations

The study highlights key operational and policy priorities for strengthening PHC. Service standards should be improved across all BHUs, particularly in underperforming 6/6 BHUs. The iPHC package should be piloted and evaluated against existing vertical programmes to determine cost-effectiveness. District-level surveillance should be expanded to include all providers and accurately estimate local service needs. Regular costing reviews should be institutionalised and district health managers trained in their implementation. Community health workers should be more effectively engaged and supported to promote healthy behaviours and reduce disease burden, which would help lower service costs over time.

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Conflict of interest: None declared.

Analyse des coûts des services de soins de santé primaires intégrés au Pakistan

Résumé

Contexte : Les soins de santé primaires sont essentiels pour instaurer la couverture sanitaire universelle et améliorer les résultats de santé. Toutefois, leur mise en œuvre efficace nécessite des ressources adéquates.

Objectif : Estimer le coût de la mise en œuvre d'un ensemble intégré de services de soins de santé primaires dans la province du Sindh (Pakistan).

Méthodes : Nous avons élaboré un ensemble intégré de services de soins de santé primaires ainsi que des lignes directrices thérapeutiques normalisées pour chaque prestation proposée dans 12 unités de soins de santé de base réparties dans quatre districts de la province du Sindh. Nous avons ensuite recueilli et analysé les données relatives aux coûts et aux volumes de services des unités de santé à l'aide de l'outil CORE Plus, selon trois scénarios de prestation.

Résultats : Les coûts standard par service dans les unités de santé qui fournissent des services de soins maternels 24 heures sur 24 ont diminué dans les scénarios 2 et 3, sous l'effet de l'augmentation du volume de services. En revanche, aucune diminution n'a été observée dans les unités ouvertes uniquement six heures par jour, six jours par semaine. Les coûts annuels moyens standard pour 10 000 habitants dans les unités ouvertes 24 heures sur 24 s'élevaient à 38 315 dollars des États-Unis (US), à 47 139 dollars US et à 56 719 dollars US pour les scénarios 1, 2 et 3, respectivement. Pour les unités de santé ne fournissant des services que six heures par jour, six jours par semaine, le coût annuel standard était de 22 800 dollars US. Les médicaments, les fournitures et les examens de laboratoire constituaient la part la plus importante des coûts, suivis des salaires du personnel et des frais de fonctionnement. Les besoins en personnel ont augmenté pour plusieurs fonctions.

Conclusion : L'intégration des services et l'analyse régulière de leurs coûts visant à aligner les ressources sur les besoins en soins permettraient d'améliorer le rapport coût-efficacité des services dans les centres de santé primaires.

تحليل تكاليف خدمات الرعاية الصحية الأولية المتكاملة في باكستان

شيراز شيخ، جريش ماهيشوري، سائمة عباد، غلام أكبر

الخلاصة

الخلفية: لا غنى عن الرعاية الصحية الأولية لتحقيق التغطية الصحية الشاملة وتحسين المخرجات الصحية؛ ولكنها تتطلب موارد كافية للتنفيذ الفعال.

الأهداف: هدفت هذه الدراسة الى تقدير تكلفة تنفيذ حزمة متكاملة من خدمات الرعاية الصحية الأولية في إقليم السند بباكستان.

طرق البحث: أعددنا حزمة متكاملة من خدمات الرعاية الصحية الأولية ومبادئ توجيهية علاجية معيارية لكل خدمة مقدمة في 12 وحدة صحية أساسية في 4 مقاطعات في إقليم السند. ثم جمعنا البيانات المتعلقة بالتكاليف وحجم الخدمات في الوحدات الصحية وأجرينا تحليلاً لها باستخدام الأداة CORE Plus، في إطار 3 سيناريوهات لتقديم الخدمات.

النتائج: انخفضت التكاليف المعيارية لكل خدمة في الوحدات الصحية التي تقدم خدمات رعاية الأمهات على مدار الساعة في السيناريوهين 2 و3 مع زيادة حجم الخدمات، في حين لم تنخفض التكاليف المعيارية في الوحدات الصحية التي تقدم الخدمات لمدة 6 ساعات فقط في اليوم على مدى 6 أيام في الأسبوع. وبلغ متوسط التكاليف المعيارية السنوية لكل 10000 نسمة في الوحدات الصحية التي تقدم الخدمات على مدار الساعة 38315

دولارًا أمريكيًّا للسيناريو 1، و47139 دولارًا أمريكيًّا للسيناريو 2، و56719 دولارًا أمريكيًّا للسيناريو 3. وبالنسبة للوحدات الصحية التي تقدم الخدمات لمدة 6 ساعات فقط في اليوم على مدى 6 أيام في الأسبوع، بلغت التكلفة المعيارية السنوية 22800 دولار أمريكي. واستأثرت الأدوية والإمدادات والفحوص المختبرية بأعلى نسبة من إجمالي التكاليف، تلتها مرتبات الموظفين وتكاليف التشغيل. وزادت الاحتياجات من الموظفين لأداء أدوار متعددة.

الاستنتاجات: يمكن أن يساعد إدماج الخدمات وتحليل تكاليف الخدمات بانتظام من أجل مواءمة الموارد مع احتياجات الرعاية على تحسين مردودية الخدمات في مراكز الرعاية الصحية الأولية.

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