

Original Research Article

Feasibility of nationwide mapping of health facilities and community health workers in low-resource humanitarian contexts: lessons from Afghanistan

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ABSTRACT

Background: Reliable, up-to-date data on health facilities and community health workers (CHWs) are essential for effective health system planning, particularly in fragile and humanitarian settings where information gaps are common. However, large-scale mapping exercises are often considered impractical in such contexts.

Methods: In 2025, a nationwide mapping of health posts and CHWs was conducted across all provinces of Afghanistan. A total of 1,291 community health supervisors were trained and deployed using a cascading model to collect georeferenced data through digital tools. Data collected included facility functionality, CHW demographics, education levels, and training status.

Results: The mapping covered 16,547 health posts and 32,849 CHWs, representing the first comprehensive CHW dataset since 2010. Findings confirmed that all health posts were operational. Approximately half of CHWs had at least a high school education. The use of digital tools improved data accuracy and timeliness, while local engagement enhanced implementation efficiency.

Conclusions: Nationwide mapping of health systems is feasible even in complex humanitarian settings. Key success factors include structured training, digital data collection, and strong local ownership. These findings highlight the importance of investing in routine mapping to strengthen evidence-based planning and optimize CHW deployment.

Keywords: Afghanistan, Community health workers, Digital health, Health systems mapping, Humanitarian settings, Primary health care

INTRODUCTION

Community health workers play a significant role in extending primary health care services in low-resource and humanitarian contexts.^{1,2} In fragile settings, nationwide data collection efforts are often perceived as logistically infeasible due to insecurity, limited infrastructure, and human resource constraints.^{3,4} As a result, health systems frequently rely on outdated or incomplete datasets, undermining evidence-based decision-making.

In Afghanistan, the health system relies heavily on community health workers (CHW) to provide preventive and limited services at community level. However, the absence of accurate and up-to-date data on CHW distribution, capacity, and health facility functionality remains a major barrier to effective planning and resource allocation.³

The objective of this assessment was to establish the distribution of community health workers and functionality of health facilities in Afghanistan. The secondary objective was to use this data to make policy

decisions on investments in the health system on employment, redeployment of community health workers and investments on maintenance of health facilities.

METHODS

Study design

A cross-sectional nationwide mapping exercise was conducted in 2025 covering all provinces of Afghanistan. All CHWs in all facilities were assessed. This was therefore a census of all CHWs and was conducted between March 2025 and September 2025.

Place of study

The mapping was conducted in all 32 provinces of Afghanistan. It was conducted in all 16, 547 health centres in the country.

Inclusion/exclusion criteria

All CHWs and all health centres were included in the mapping. It was a full census of all CHWs and all health facilities.

Data collection

Data were collected using tablet-based digital tools with georeferencing capability. Variables included: (i) health post functionality status; (ii) number of CHWs; (iii) demographic characteristics of the CHWs; (iv) education levels; (v) training status (whether they had received mandatory CHW training). Data were collected using tablet-based digital tools with georeferencing capability.⁵⁻⁸ A total of 1,291 community health supervisors were trained using a cascading training model. Supervisors were responsible for collecting standardized data at health post level. Data was coordinated through community-based health care (CBHC) structures, ensuring strong local ownership. Data quality assurance mechanisms included supervisor validation and real-time monitoring.

Data analysis

Data from the health post, health facility, village location and community health worker (CHW) datasets were cleaned and checked for completeness, consistency and potential duplicate records before analysis. The datasets were linked using available geographic and administrative identifiers, including province and district, to enable assessment of the distribution of health service delivery points and the community health workforce.

Descriptive statistical analysis was undertaken at national and provincial levels. Categorical variables were summarized using frequencies and percentages, while continuous variables were summarized using means and, where appropriate, measures of dispersion. Key indicators

included the number and proportion of active health posts; distribution of health posts and CHWs; CHW demographic and educational characteristics; initial and refresher training status; reported family-visit activities; health-post catchment households; and the ratio of CHWs to health posts. Province-level indicators were compared descriptively to identify geographic variation in the availability and characteristics of community-based health services.

Geographic coordinates recorded for health posts were assessed for completeness, validity and geographic plausibility and were used to visualize the spatial distribution of mapped health posts and health facilities across Afghanistan. Geographic information was analysed at province and district levels to examine the distribution of service delivery points and identify areas with relatively higher or lower concentrations of mapped health posts. Where geographic coordinates were available, health posts were plotted using latitude and longitude to produce a national spatial distribution map. The geospatial analysis was descriptive and focused on the geographic coverage and distribution of mapped service delivery points rather than spatial modelling or statistical tests of geographic clustering.

The analysis also examined the relationship between the distribution of health posts and the community health workforce by calculating the number of CHWs per health post and catchment households per health post and per CHW. These indicators were compared across provinces to describe differences in the intensity and potential reach of community-based service delivery.

No inferential statistical testing was undertaken because the assessment was designed primarily as a nationwide health-service mapping and descriptive assessment rather than a hypothesis-testing study. Results were presented using summary tables, graphs and maps to describe the national health-service delivery footprint, the characteristics and distribution of the CHW workforce, and geographic variation in service availability.

Ethical approval

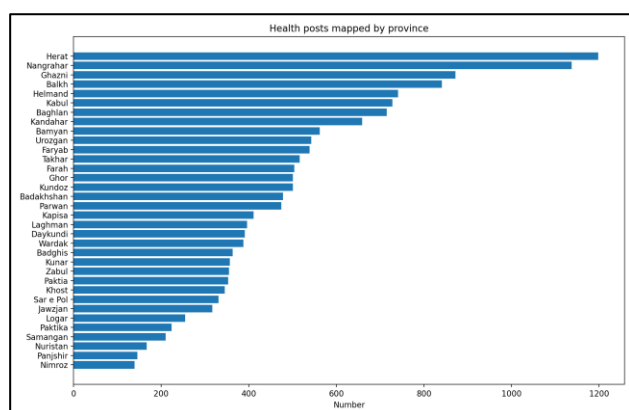
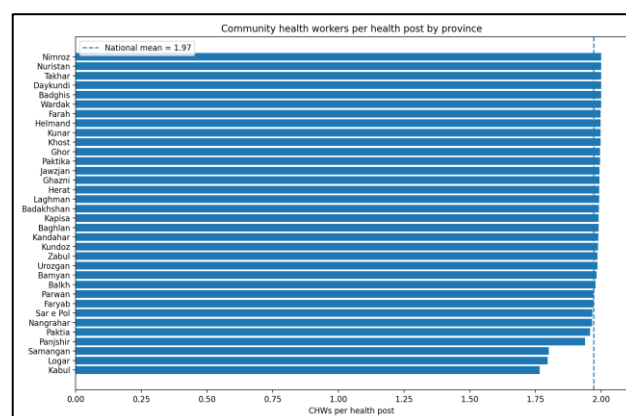
Ethical approval was obtained from the Ministry of Health.

RESULTS

Digital data collection improved completeness and accuracy, consistent with findings from similar settings. The mapping exercise achieved full national coverage, documenting 16,657 health posts and 32,849 CHWs. This represents the first complete CHW dataset since 2010. All mapped health posts were functional. Approximately 50% of CHWs had at least a high school education. Digital data collection improved completeness and accuracy, consistent with findings from similar settings.⁵

Table 1: Distribution of mapped health posts and community health workers by province.

Province	Health posts	Active HPs	CHWs	CHWs/HP	Female CHWs (%)	Any training (%)	Family visits (%)
Herat	1198	1184	2387	2.0	50.1	94.7	97.9
Nangrahar	1137	1071	2235	2.0	50.0	88.8	95.4
Ghazni	872	777	1738	2.0	50.0	23.5	80.0
Balkh	841	836	1664	2.0	65.4	71.2	98.6
Helmand	741	728	1480	2.0	49.3	91.7	97.5
Kabul	728	667	1286	1.8	55.8	53.8	94.6
Baghlan	715	695	1423	2.0	50.7	89.9	96.3
Kandahar	659	655	1311	2.0	55.0	79.8	98.6
Bamyan	562	555	1114	2.0	59.2	83.4	95.0
Urozgan	543	529	1078	2.0	48.2	92.4	97.1
Faryab	539	539	1062	2.0	58.0	94.7	98.2
Takhar	516	515	1032	2.0	49.8	99.1	99.6
Farah	504	457	1007	2.0	50.0	98.4	84.3
Kundoz	501	493	996	2.0	49.9	78.3	97.4
Ghor	501	495	1000	2.0	51.5	99.0	98.6
Badakhshan	478	477	952	2.0	49.5	95.4	98.8
Parwan	474	473	934	2.0	53.0	90.8	97.5
Kapisa	411	354	818	2.0	55.4	61.7	93.4
Laghman	396	377	789	2.0	50.1	92.3	91.1
Daykundi	391	391	782	2.0	64.2	94.1	99.6
Wardak	388	386	776	2.0	49.9	80.5	96.4
Badghis	363	362	726	2.0	49.3	98.6	99.6
Kunar	357	344	713	2.0	49.9	78.4	96.5
Zabul	355	330	705	2.0	49.9	90.9	92.8
Paktia	353	327	691	2.0	49.8	65.4	94.8
Khost	345	328	689	2.0	49.8	70.7	90.1
Sar e Pol	331	324	651	2.0	49.9	99.7	98.9
Jawzjan	317	314	632	2.0	53.2	87.8	98.4
Logar	255	233	458	1.8	54.2	84.9	85.6
Paktika	224	215	447	2.0	49.9	83.2	96.2
Samangan	210	179	378	1.8	43.6	97.6	95.0
Nuristan	167	161	334	2.0	50.0	77.5	97.3
Panjshir	146	143	283	1.9	50.5	95.0	96.8
Nimroz	139	139	278	2.0	63.3	98.6	98.2

**Figure 1: Distribution of mapped health posts by province.****Figure 2: Community health workers per health post by province.**

Health service delivery footprint

The 2025 nationwide mapping exercise identified 16,657 health posts and 32,849 community health workers (CHWs) across Afghanistan. Of the mapped health posts, 16,053 (96.4%) were reported as active at the time of assessment. The mapped health posts served an estimated 2,607,415 households, corresponding to a mean catchment population of approximately 156.5 households per health post. Overall, the mapping identified 1.97 CHWs per health post, or approximately 79.4 catchment households per CHW.

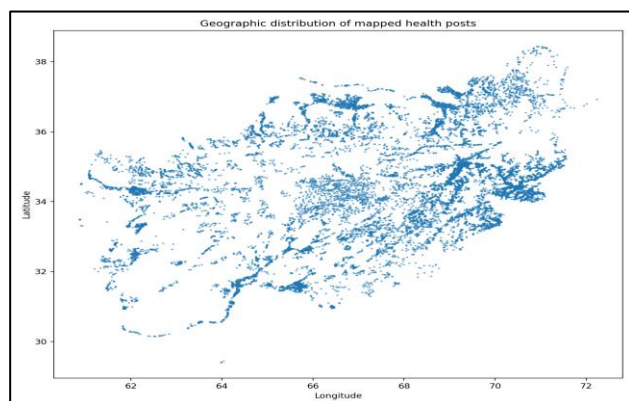


Figure 3: Geographic distribution of mapped health posts.

Geographical distribution

Health posts were distributed across all provinces included in the national mapping as in Table 1. The provincial distribution demonstrated substantial variation in the number of mapped health posts and in the density of CHWs relative to health posts. This indicates differences in the organization and intensity of community-level service delivery. Figure 1 presents the distribution of mapped health posts by province, while Figure 2 summarizes the corresponding CHW-to-health-post ratio.

Table 2. Educational attainment of community health workers.

Educational category	Number of CHWs	Percent
Illiterate	11100	33.8
High school graduated	5757	17.5
Primary School	5551	16.9
Secondary School	5026	15.3
Secondary school graduated	3511	10.7
Bachelor's degree	1904	5.8

Characteristics of community health workers

Among the 32,849 CHWs mapped, 52.4% were female. The mean age of CHWs was 39.5 years. Educational

attainment varied substantially across the CHW workforce. Overall, 49.3% had educational attainment at or above high-school level (Table 2). This indicates that a considerable proportion of the workforce had relatively limited formal educational preparation for community-level service delivery.

Training and capacity development

Training coverage was high when initial and refresher training were considered together. Overall, 83.0% of CHWs received either initial or refresher training (Table 3). However, only 33.3% had documentation indicating completion of all phases of initial training. Refresher training during the six months preceding the assessment was reported for 68.4% of CHWs. These findings suggest that overall exposure to training was relatively high, but completion of the full initial training package was less consistent.

Table 3: Training status of community health workers.

Training indicators	Number of CHWs	Percent
Initial training: all phases received	10941	33.3
Initial training: some phases received	5348	16.3
Initial training: not received	16560	50.4
Any initial/refresher training	27268	83.0
Refresher training in last 6 months	22479	68.4

The refresher-training profile also showed variation across technical areas. The most frequently reported refresher-training areas are presented in Table 4. This is exposure to various trainings rather than mutually exclusive categories, because an individual CHW could have received training in more than one technical area.

Table 4: Most frequently reported refresher-training areas.

Refresher training area	CHWs reported	Percent of all CHWs
CBNP	18134	55.2
Malaria	16986	51.7
Tuberculosis	16318	49.7
Total sanitation	15756	48.0
C-IMCI	15336	46.7
CBNC	15049	45.8
SBC	12381	37.7
Infection prevention	11042	33.6
Emergency response (IRI + AWD)	10849	33.0
RUD	10335	31.5

Community-level service delivery

Family visits were widely reported as part of CHW service delivery. 95.4% of CHWs reported conducting family visits. Taken together with the relatively high proportion of CHWs reporting some form of training, this indicates broad deployment of the community health workforce. Nevertheless, the variation between provinces in CHW availability per health post suggests that access to community-based services was not uniform nationally.

DISCUSSION

The Afghanistan experiences challenges prevailing assumptions that large-scale health system mapping is not feasible in humanitarian settings.^{7,9,10} Several enabling factors contributed to success. The cascading training model enabled rapid scale-up of data collection capacity using existing human resources, consistent with WHO recommendations on CHW programme strengthening.¹ Tablet-based data collection improved efficiency and data quality, aligning with growing evidence on digital health tools in low-resource settings.⁵⁻⁸ Engagement of CBHC officers and community-level supervisors enhanced both implementation and sustainability, a key determinant of CHW programme success.^{7,9}

The findings reveal substantial untapped potential within the CHW workforce, particularly given the relatively high education levels observed.¹¹ This creates opportunities for role differentiation, task shifting, and enhanced service delivery. Furthermore, the dataset provides a foundation for integration into national health information systems and supports ongoing health system strengthening efforts.^{9,10,12}

The value of the mapping extended beyond the generation of descriptive information. Prior to the assessment, the Ministry of Public Health lacked recent, comprehensive and sufficiently granular information on the distribution, characteristics and training status of CHWs to support evidence-informed workforce planning. The assessment therefore provided an important management instrument for moving from generalized assumptions about workforce availability to decisions based on the actual distribution and characteristics of the workforce. The results were used to inform decisions on the deployment and redistribution of CHWs to areas of greater need. They also supported decisions concerning training priorities and the types of training required by different groups of CHWs. This illustrates how a mapping exercise can move beyond being a one-time data collection activity and become a practical planning and management tool.

The availability of geographic information is particularly important in a country such as Afghanistan, where difficult terrain, insecurity, population displacement and substantial variation in access to services can create major challenges for equitable health-service delivery. Mapping the location of health posts and linking this information

with CHW availability and catchment characteristics provides a more complete picture of the community health platform than administrative records alone. Such information can help identify areas where health posts may exist but have insufficient human resources, as well as areas where the distribution of CHWs may not correspond to the size of the population or service delivery needs. Periodic updating of these data could therefore support more equitable allocation of limited human and financial resources.

The assessment also demonstrates the potential of digital approaches to strengthen routine health-system management in resource-constrained and humanitarian environments. The use of tablets with georeferencing reduced reliance on paper-based processes and enabled standardized collection of information across a large geographic area. Digital data collection also creates the possibility of updating rather than repeatedly rebuilding the database. If integrated into routine monitoring systems, the mapping platform could provide a mechanism for tracking changes in CHW deployment, training, functionality of health posts and geographic coverage over time. This would transform the exercise from a periodic census into a living information resource for programme planning and performance management.

The relatively high reported coverage of training and family-visit activities also suggests that the CHW platform represents an established community-level delivery mechanism rather than a workforce that is merely present on paper. Nevertheless, the variation observed between provinces highlights the importance of looking beyond national averages. National figures can conceal important geographic differences in workforce availability, training and service delivery. Provincial and district-level analysis is therefore essential for identifying gaps and prioritizing corrective action. In this respect, the mapping provides a useful foundation for equity-oriented planning, particularly when combined with information on population size, poverty, vulnerability, disease burden and access to health facilities.

The methodology followed in this assessment has potential applicability beyond Afghanistan. Conducting a nationwide census of CHWs and mapping health-service delivery points in a low-income, high-risk and operationally constrained environment demonstrates that comprehensive health-system information can be generated even where conventional survey infrastructure is weak. The combination of standardized digital tools, georeferencing, cascading training, existing government and CBHC structures, and decentralized supervision provides a potentially replicable model for other humanitarian and fragile settings. Adaptation would, however, be necessary to reflect differences in geography, security, health-system organization, digital infrastructure and the maturity of community health programmes.

The findings should be interpreted considering the limitations of a cross-sectional mapping exercise. The assessment provides a snapshot of health-service availability and CHW characteristics during the study period and cannot by itself establish changes over time or determine whether the presence of a health post or CHW translates into effective or high-quality service delivery. Some information, particularly relating to training and service activities, was based on reported or documented information and may therefore be subject to reporting error. In addition, geographic presence does not necessarily imply physical accessibility to populations because insecurity, terrain, seasonal barriers and population movement may affect actual access to services. Despite these limitations, the assessment provides an important empirical baseline for strengthening the community health system and demonstrates the feasibility and operational value of systematic health-service mapping in a complex humanitarian context. Although the mapping was designed as a national census, the quality of the findings depended on the completeness and accuracy of information reported at health-post level, and some variables may therefore have been subject to reporting or measurement error. The cross-sectional design provides a snapshot of the CHW and health-post situation during 2025 and cannot assess changes over time or establish causal relationships. In addition, the absence of comparable, consistently collected national CHW data from previous years limits assessment of trends in workforce distribution and training. Finally, while georeferenced data enabled assessment of geographic distribution, the analysis was primarily descriptive and did not necessarily capture broader contextual factors such as population need, accessibility, workload, quality of services, or health outcomes.

CONCLUSION

Nationwide mapping of health facilities and CHWs is both feasible and highly valuable in low-resource humanitarian contexts. With appropriate investment in training, digital tools, and local ownership, countries can generate high-quality data to support evidence-based planning, optimize CHW deployment, and strengthen primary health care systems.^{9,10,12} Routine mapping should be considered a core health system function, rather than an optional activity.

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