Piloting community-based surveillance among internally displaced populations in Iraq in response to the COVID-19 pandemic

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List of Abbreviations

CBS – Community-based surveillance

CBHS – Community-based health surveillance

CEBS – Community event-based surveillance

CHP – CBS health promoter

EBS – Event-based surveillance

EWARN – Early Warning, Alert and Response Network

IDP – Internally displaced person

IHR – International Health Regulations

IOM – International Organization for Migration

JEE – Joint External Evaluation

KAP – Knowledge, Attitude and Practices

MHD – Migration Health Division

MoH – Ministry of Health

PCR – Polymerase chain reaction

PHCC – Primary health-care centre

PPV – Positive predictive value

Background

During outbreaks such as that of the COVID-19 pandemic, there is concern regarding the ability to quickly detect and isolate suspect cases, investigate confirmed cases and trace and monitor the contacts of confirmed cases. This is especially true in densely populated areas, such as camps for internally displaced persons (IDPs), where respiratory viruses have been known to rapidly spread [1,2]. Case investigations and contact tracing are most effective when implemented early on before widespread community transmission, which makes early detection essential. These vital response actions require robust disease surveillance systems. Early warning through community-based surveillance (CBS) can improve timely detection to slow transmission, which is critical in densely populated areas.

CBS is an organized and rapid collection of information from health events identified in the community. CBS allows the systematic detection and reporting of events of public health significance within a community, by community members [3]. CBS has been used extensively in sub-Saharan Africa [4,5] and parts of Asia [6] to enhance the detection of priority diseases. From measles to cholera to Ebola, CBS initiatives have been prioritized in national disease surveillance system structures [7]. CBS initiatives have also been used in disease eradication programmes for smallpox, guinea worm and polio [3].

The main entry into the health-care and disease surveillance systems in Iraq occurs at health-care facilities; however, it is important to consider that the patients who present to health care facilities may have waited until their symptoms progressed to levels that were no longer manageable at home. In this scenario, only the more severe cases of disease are detected while less severe cases remain at home, still capable of transmitting the infectious agent to those around them. As of the Joint External Evaluation (JEE) of the core preparedness, detection, and response capacities required by the International Health Regulations (IHR) (2005) conducted in 2019, detection of outbreaks or health events remains passive; event-based surveillance has yet to be fully implemented at national and subnational levels in Iraq, including at the community level [8]. The International Organization for Migration (IOM) Migration Health Division (MHD) provides primary health-care services in multiple IDP camps in Iraq, in partnership with the Ministry of Health (MoH). In response to the COVID-19 pandemic, IOM MHD piloted CBS to prevent widespread disease transmission in selected IDP camps.

Methods

Preparation

Informational meetings were held with representatives from the World Health Organization's country office in Iraq and other partner organizations to understand the disease surveillance and reporting structure as well as Early Warning, Alert and Response Network (EWARN) requirements for primary health-care centres. Additional informational interviews were held with IOM EWARN focal points and governorate-level field teams to understand how community-level referrals could integrate into the screening and triage protocols implemented at primary health-care centres (PHCCs) in response to the COVID-19 pandemic. Further informational meetings were held with the management teams of each camp to discuss the implementation of this pilot. Communication channels were established with MoH laboratories with COVID-19 testing capabilities in each governorate so that laboratory results could be linked with CBS referral data to inform contact tracing efforts.

Programme structure

Four camps for internally displaced people (IDP) were selected for this pilot: Ameriat Al Fallujah (AAF) in Anbar, Debaga in Erbil, Jadaa-5 in Ninewa and Sheikhan in Dohuk. Qualified residents from each community were selected and hired as CBS Health Promoters (CHPs). Field team size was specific to each camp (1 team per 300 household, total n=58 individuals). There were a total of 29 CHP teams, each consisting of one man and one woman. Working hours aligned with PHCC hours. Each field team worked 4–6 hours a day, five days a week, supervised by a community-based surveillance team lead at the governorate level.

Governorate	Site (English)	Site (Arabic)	Classification	Population (mid-2020)	# CHPs
Anbar	AAF	مخيم عامرية الفلوجة	IDP camp then informal settlement*	5826	8
Dohuk	Sheikhan	مخيم شيخان	IDP camp	5172	6
Erbil	Debaga	مخيم ديبكه	IDP camp	10 500	14
Ninewa	Jaada-5	مخيم الجدعة ٥	IDP camp	25 530	30

Note: *AAF was reclassified as an informal settlement in November 2021.

Programme components

Event-based surveillance refers to the capture and analysis of any information from outside the health facilities (hospitals, clinics, health posts) about health-related events which could represent a threat to human health [7]. At the community level, community event-based surveillance (CEBS) is intended to capture unstructured information that might otherwise escape a national surveillance system [7]. Community-based health surveillance (CBHS) is usually conducted for one or more specific disease(s) of interest, with a focus on epidemic-prone diseases. Elements of CEBS and CBHS were combined to create a tailored, comprehensive community-based surveillance programme for COVID-19 in Iraq. This programme was developed in line with existing guidance documents [7,9] and consisted of components: (i) community mapping, (ii) event-based surveillance (EBS), (iii) active case finding, (iv) misinformation tracking and (v) contact tracing, all at the community level.

Programme components

Community mapping

Community mapping was conducted to understand the community structure and health status of the residents and identify areas within the IDP camps where residents who were at greater risk for severe complications from COVID-19 (such as, households with residents older than 60 years; households that have residents with chronic health conditions; households with children, pregnant or postpartum women) were located [10]. Permission to conduct community mapping was sought from camp management teams in each location; however, this permission was not granted for the camp in Erbil, Iraq due to potential security concerns.

Community mapping was conducted at the beginning of the pilot programme (May–June 2021) except in Debaga in Erbil.

Event-based surveillance

Key informants within the community were sensitized on symptoms of COVID-19 and how to notify the CBS team. When EBS alerts were received, CHPs went to investigate and symptomatic individuals were referred for evaluation at the PHCC within the camp.

Active case finding

Active case finding was conducted through interviews with heads of households during door-to-door visits throughout the camps. When community alerts were identified, symptomatic individuals were referred for evaluation at the PHCC within the camp.

Misinformation tracking

Monitoring and tracking rumors or circulating misinformation was conducted to allow for health promotion and educational outreach to address any misconceptions surrounding COVID-19 topics, including disease transmission, symptoms of concern and isolation or quarantine, how people could protect themselves, and eventual vaccination.

Contact tracing

Monitoring of close contacts who shared living space with COVID-19 cases was conducted daily through household visits. If contacts developed symptoms, they were referred for evaluation at the PHCC within the camp. Contact tracing was conducted on an ad-hoc basis where feasible; however, delays in obtaining laboratory test results caused frequent challenges.

Defining the community alert

The community alert definition for COVID-19 was created by simplifying the clinical suspect case definition, focusing on symptoms of concern for COVID-19 [11] and phrased in language that CBS field teams without formal medical training would understand. At the beginning of the pilot programme, the symptom constellation that constituted a community alert for COVID-19 included fever, cough, shortness of breath and loss of taste or smell. As the pandemic progressed and new Delta and Omicron variants emerged, the most common symptoms shifted to include more common cold-like symptoms, such as nasal congestion and sore throat [12, 13]. As such, the community alert definition was adapted as needed to follow suit. Referral algorithms using the current community alert definition were built into the data collection tool to provide guidance to the CBS field teams on when to refer community members for evaluation at the PHCC.

Active case finding, event-based surveillance and misinformation tracking were conducted from June 2021 through June 2022. Community mapping, active case finding, event-based surveillance and rumor tracking were conducted through interviews with heads of households. Consent to participate was collected at each visit. Rumor tracking data was shared with the Risk Communication and Community Engagement teams. Additional CHPs activities included health promotion on leishmaniasis and scabies, mass COVID-19 vaccination campaign sensitization, and surveys to understand vaccine hesitancy.

Training the CBS Teams

IOM field teams reached out to the management teams within each camp and requested a list of individuals who had university degrees and relevant work experience (for example, residents who had previously worked in community outreach positions, health education, or previous United Nations or non-governmental organization experience). Potential CHPs were interviewed by governorate-level IOM field teams. Selected candidates were provided with multiday onboarding and training modules that covered (i) an introduction to CBS; (ii) COVID-19 signs, symptoms, transmission and the community alert definition; (iii) community engagement and risk communication; (iv) data collection; (v) reporting; and (vi) an overall review.

A member of IOM's MHD team based in each of the four governorates served as the team leader for CBS activities in their location. IOM MHD conducted a week-long training-of-trainers session virtually, due to COVID-19 restrictions. CBS team leaders then conducted the in-person multiday trainings for the recruited CHPs in their respective governorates. Refresher trainings were conducted on an as-needed basis – for example, when the referral algorithm was updated to reflect the real-time adaptation of the community alert definition.

Data collection

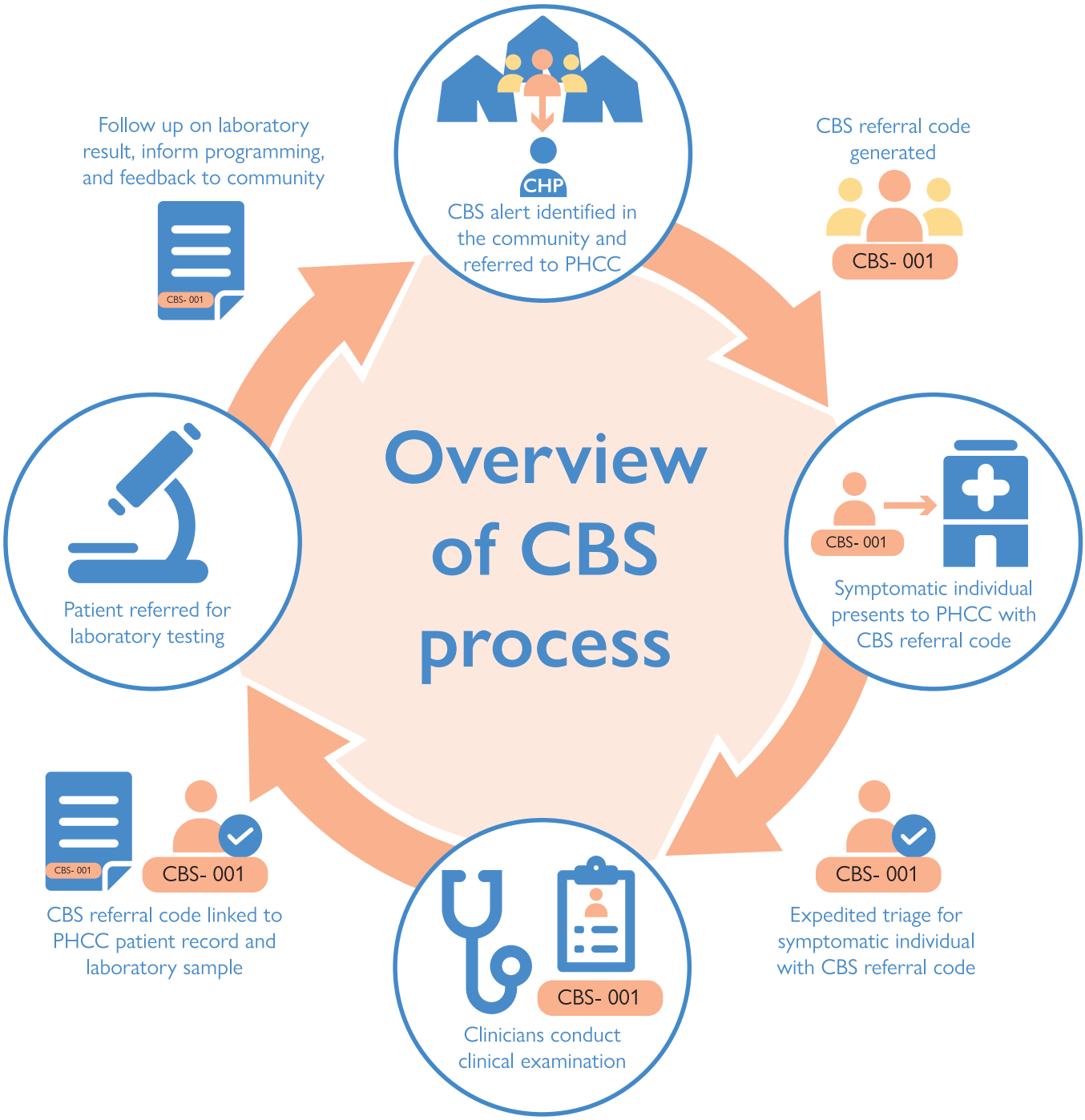
Data collection forms were developed using KoboToolbox [14], with specific forms developed for each component of CBS. Referral algorithms for COVID-19 symptoms of concern that constituted a community alert were built into in the active case finding and EBS forms, where Kobo automatically provided referral instructions when symptomatic individuals needed to be referred for clinical evaluation. The Kobo tool was updated periodically to reflect changes to the community alert definition and resulting referral algorithm. The referral codes allowed CBS data to be linked with clinical evaluation outcomes from the health facility records.

Each team received a smart phone for reporting. CHPs were trained on COVID-19 symptoms of concern, transmission and prevention; community alert definitions; the Kobo data collection tool; and respectful communication.

Community Referrals and Laboratory Confirmation

CHP teams carried a coupon book with pre-printed referral codes on tear-off carbon paper. When symptomatic individuals were identified during CBS activities, CHP teams provided them with a coupon and referred them for evaluation at the PHCC. The referral code listed on the coupon provided to the symptomatic individual was entered on Kobo to link the CBS data with PHCC outcomes for each referred individual.

PHCCs established COVID-19 screening and triage processes in response to the pandemic for all patients and health workers. Referrals from the CBS programme were able to bypass the screening as they were already identified as symptomatic individuals and sent straight to the isolation area for clinical evaluation. CBS referral codes for these individuals were entered into the patient logbooks at the PHCCs. Physicians conducted clinical examination and referred suspect cases for testing, also using the CBS referral code, which allowed the linkage of laboratory results with the CBS and health facility data.


Overview of CBS process
CHP
CBS alert identified in the community and referred to PHCC
CBS referral code generated
CBS- 001
Symptomatic individual presents to PHCC with CBS referral code
CBS- 001
Expedited triage for symptomatic individual with CBS referral code
CBS- 001
Clinicians conduct clinical examination
CBS- 001
CBS referral code linked to PHCC patient record and laboratory sample
CBS- 001
Patient referred for laboratory testing
Follow up on laboratory result, inform programming, and feedback to community
CBS- 001

Data analysis

Frequencies of COVID-19 alert detection were reported over time by epidemiological week and by month, stratified by camp. Among the detected alerts, the percentage of household visits that resulted in referrals to the PHCC, the percentage of the referrals that presented to the PHCC for evaluation, and the percentage of referred individuals who tested positive for COVID-19 were calculated. The overall positive predictive value (PPV) for the COVID-19 alert definition was calculated by comparing the number of individuals referred to the PHCC for evaluation to the number of CBS-referred individuals that met the suspect case definition after clinical evaluation (for example, those that clinicians subsequently referred for COVID-19 testing). Obstacles to COVID-19 vaccination and strategies for increasing vaccination were reported as frequencies. General acceptability was measured by the number of households that verbally consented to participate in the CBS pilot programme compared to the total number of households visited and by the number of respondents who reported they were comfortable asking IOM field teams questions about COVID-19 topics. Statistical analyses were performed in Stata and R Studio.

Key Findings

Summary of community-based surveillance activities

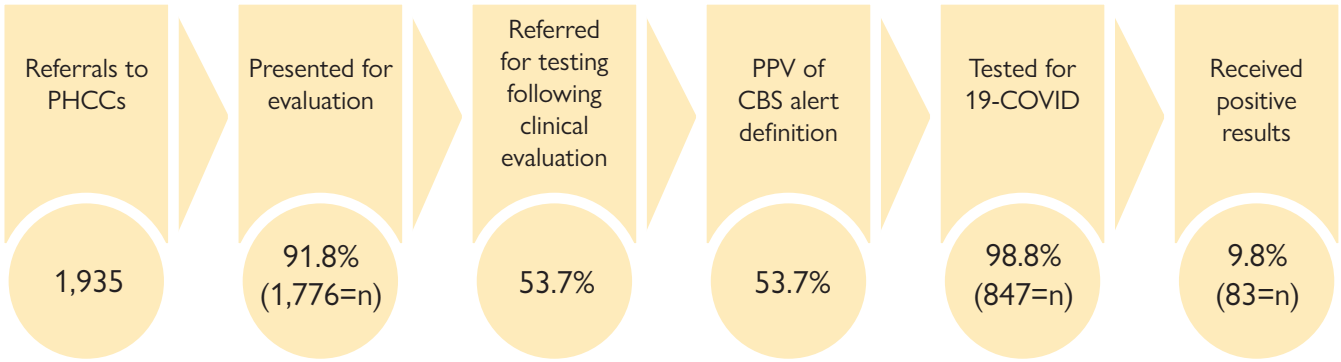
From May 2021 through June 2022, 7,757 households were visited at least once and 99.6 per cent (n=7,728) consented to participate. Over 100,000 data collection forms were submittd with 99 per cent of forms submitted from active case finding activities. Following community mapping activities, individuals at risk of severe COVID-19 (such as those with chronic health conditions, pregnant women, or those older than 60 years) were identified in 40 per cent of households visited.

Households visited and consented to participate **99.6% (n=7,728)**

Active case finding activities **99%**

Households with chronic health conditions, pregnant women, or those older than 60 years **40%**

The highest monthly totals of door-to-door CBS activities occurred in August and September 2021 and January and March 2022, in response to the increase in cases seen in national trends [15]. Symptoms of concern prompted 1,935 referrals to PHCCs, of which 91.8 per cent(n=1,776) presented for evaluation and 53.7 per cent were referred for testing following clinical evaluation, meaning the overall PPV of CBS alert definition was 53.7 per cent. Of those referred for testing after clinical evaluation, 98.8 per cent (n=847) were tested for COVID-19, 9.8 per cent (n=83) of whom received positive results. Most CBS referrals presented at the PHCC on either the same day or the next day. August and September 2021 had the highest percentage of positivity, which aligned with national trends.



Additionally, CBS teams conducted vaccine hesitancy knowledge, attitudes and practices (KAP) surveys during December 2021 and January 2022 to support vaccination campaigns within the camps, and 5,247 heads of households agreed to participate. Fear of side effects was the primary obstacle to vaccination against COVID-19, while speaking with a trusted medical expert remains the most common strategy for increasing comfort around the COVID-19 vaccine across all four locations.

Discussion

Programme successes

Community-based surveillance initiatives can provide valuable information that can strengthen the early warning function of national surveillance systems [16-20]. Though the Programme was new for the communities where CBS was implemented, there was a high degree of acceptability when assessed by participation and referral rates. Further highlighting the acceptability and community trust was how the CHP teams were successfully utilized for vaccination - campaign awareness activities in the camps where CBS activities were implemented, and, in one governorate (Dohuk), in nearby camps as well. Additionally, CHP teams successfully engaged in response to additional outbreaks of leishmaniasis and scabies that occurred during the COVID-19 response.

The CBS programme was also successful in terms of overall functionality. The programme was continuously developed and refined using an iterative process that resulted in an agile system design. Community alert definitions, data collection tools and refresher training materials were adapted in real time as the pandemic progressed and evolved; this also enabled the incorporation of feedback from the field teams on improving data collection. Additionally, the CBS programme was successful in designing and implementing data collection and management systems to link data collected across three different systems: in the community, at the PHCCs, and through laboratory test data. Furthermore the trends in the number of symptomatic individuals identified during CBS activities and per cent positivity of those referred for evaluation and eventual testing aligned with national trends [15].

Challenges and limitations

One of the main challenges encountered during this pilot programme was the laboratory capacity required for testing for COVID-19. Symptomatic individuals had difficulty in obtaining Polymerase chain reaction (PCR) tests. When tests were conducted, the lag time between sample collection and available results varied by governorate and timepoint during the pandemic. This lag time was at times as long as two weeks, which meant that contact tracing was often not feasible – by the time test results were available, the recommended 14-day quarantine period was over. That said, CHP teams still visited households of individuals who tested positive for COVID-19 to check if any additional family members were symptomatic for referral to the PHCC for evaluation. The difficulty in obtaining PCR tests and getting timely test results were known among camp residents, which may have affected the number of referred individuals.

There were also general programme design and implementation challenges encountered. Designing and implementing CBS for COVID-19 was identified as a priority soon after the pandemic began; however, it took time to understand the existing health and disease surveillance systems, map available resources, build the data collection tools and training curriculum, and ultimately hire qualified personnel. Field team turnover was another challenge. Community residents were hired, trained and paid to work as CHPs, which meant that whenever one of the field team members resigned, additional individuals needed to be recruited, hired and trained. However, due to the time invested in developing the training materials and hiring qualified field-level supervisors, new hires were efficiently and effectively trained to maintain CBS activities.

Data entry errors also posed challenges; however, the iterative process allowed for revisions to the data collection tool in response to CHP team feedback and in response to changing case definitions during the pandemic. Entered data was also routinely reviewed by IOM MHD's information management team, and the field-level supervisors were responsible for reviewing and correcting any identified errors in the data collected and entered by their teams.

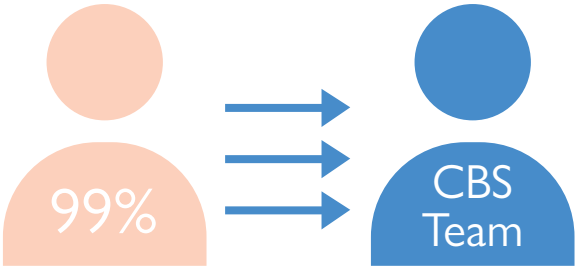
Lessons learned: was it worth it?

Balancing the sensitivity and specificity of a CBS system with practical and sustainable programme design is important. If a CBS system is too specific, important alerts may go undetected, allowing potential outbreaks to proliferate in the community for longer periods of time. Conversely, if too sensitive, a high percentage of false positives results in an increased burden on the health facility from too many referrals. This can increase the programme requirements, making CBS too resource-intensive to be sustainable [6]. CBS is often designed for a specific purpose; therefore, ideal sensitivity or specificity thresholds are not clearly defined. Furthermore, without the ability to determine false negatives (such as how many cases may have been missed) or true negatives, because population-level testing was not available for individuals who were not referred, it was not possible to calculate the overall sensitivity and specificity of this pilot programme. Recommended performance indicators for monitoring and evaluating CBS systems include community feedback, number of alerts, number of outbreaks, per cent of alerts responded to within 24 hours, number of trained team members, reporting rate and impact (often measured through decreasing case numbers or related morbidity or mortality outcomes) [6].

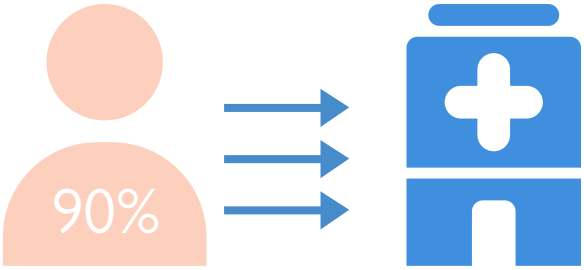
This CBS pilot was conducted from May 2021 through June 2022, before the end of the COVID-19 pandemic. Due to the difficulty in getting laboratory tests, it is difficult to measure programme success against impact if looking only at case numbers or morbidity or mortality outcomes. That said, trends in the number of symptomatic individuals identified during CBS activities and per cent positivity of those referred for evaluation and eventual testing aligned with national trends. The PPV of the CBS alert definition was 53.7 per cent, comparable with assessed COVID-19 suspect case definitions in recently published literature [21,22]. Moreover, in addition to COVID-19, the CBS field teams were also able to respond to increasing cases of leishmaniasis and scabies, both with health education materials and referring affected individuals for clinical evaluation and treatment.

One outcome of interest for this pilot was how this programme was viewed by the communities where it was implemented. Over 99 per cent of the households visited by the CBS teams consented to participate in the household interviews. Furthermore,over 90 per cent of individuals who were referred for clinical evaluation did present to the PHCCs.

Percentage of households visited by CBS teams who consented to participate



Percentage of symptomatic individuals referred for clinical evaluation who presented to PHCC



Additionally, the CHP teams were able to participate in COVID-19 vaccination campaigns within the camps to help increase vaccination turnout and to learn more about resident perceptions reasons for getting or avoiding the COVID-19 vaccines. During these campaigns, residents were asked if they felt comfortable discussing these topics with the IOM CHP field teams – of which 99 per cent responded favourably. Further inquiry to understand the acceptability and community perspectives of the CBS programme are underway through third-party phone interviews and future focus group discussions.

Looking ahead

Community-based surveillance has been used extensively in parts of the world to enhance the detection of priority diseases. In June of 2018, the World Health Organization convened a global technical meeting focused on defining community-based surveillance and charting a way forward [3]. One of the recommendations from this meeting was to bring together all existing CBS guidance and tools into one global CBS guidelines document and to then fill remaining gaps in guidance – including guidance on designing and implementing CBS for hard-to-reach populations and communities lacking social cohesion [3].

The lessons learned from this pilot of implementing CBS activities in IDP camps in Iraq can contribute to filling that gap. In this pilot, CBS teams were utilized for increased syndromic surveillance and health promotion activities in response to the COVID-19 pandemic and in response to leishmaniasis and scabies cases identified during CBS activities, demonstrating the potential to apply the CBS framework to additional diseases within the Iraq context. Following the successful pilot, in March 2023 the CBS programme expanded to include seven additional diseases (acute watery diarrhoea, acute flaccid paralysis, Crimean-Congo hemorrhagic fever, leishmaniasis, measles, scabies and animal bites/rabies), and two new locations (Khanke and Darkar camps in Dohuk). Within the first few weeks of this expansion, the CBS programme detected an outbreak of scabies in Khanke and CHP teams were able to respond promptly by identifying additional cases, referring them for clinical evaluation and treatment, and to provide awareness on preventive measures.

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Glossary

Active case finding	The process of actively searching for symptomatic cases of an infectious disease using a specified case definition; conducted through household visits and interviews with head of household.
Community alert definition	Description of key symptoms of the disease(s) of interest that are easily understood. Diseases are generally identified by one or two key symptoms seen in an infected person. These symptoms can easily be established by non-health trained volunteers, or self-reported by suspected cases.
Community event-based surveillance	The capture and analysis of any information from outside the health facilities about health-related events which could represent a threat to human health; captures unstructured information that might otherwise escape a national surveillance system.
Community-based health surveillance	The process(s) by which one or more specific disease(s) of interest are looked for in the community with a focus on epidemic-prone diseases; can be used to monitor the first few cases of a disease in situations where the alert indicates a potential outbreak. This functions in the same manner as an event-based mechanism, such as CEBS, but differs in that it is more disease specific. Alternatively, can be used during a declared outbreak to monitor outbreak trend.
Community-based surveillance	The systematic detection and reporting of events of public health significance within a community, by community members.
Community-based surveillance (CBS) Health Promoter	Resident of IDP camp recruited and trained to conduct community-based surveillance activities.
Contact	Individuals who shared living space with COVID19- cases identified within IDP camps.
Contact tracing	The process of identifying, assessing, and managing people who have been exposed to someone who has been infected with the disease of interest (e.g., COVID19-).
Early Warning, Alert and Response Network	Network of health partners that collect and report surveillance data on selected epidemic-prone diseases, as part of establishing an early warning system for disease outbreaks in humanitarian situations.
Event-based surveillance	The organized collection, monitoring, assessment and interpretation of mainly unstructured, ad hoc information regarding health events or risks, which may represent an acute risk to human health.
Internally displaced person	Person(s) who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized border.
International Health Regulations (2005)	A legally binding agreement of 196 countries to build the capability to detect and report potential public health emergencies worldwide. IHR require that all countries have the ability to detect, assess, report, and respond to public health events.
International Organization for Migration	United Nations agency in the field of migration that works closely with governmental, intergovernmental, and non-governmental partners to ensure the orderly and humane management of migration to promote international cooperation on migration issues, to assist in the search for practical solutions to migration problems and to provide humanitarian assistance to migrants in need, including refugees and internally displaced people.
Joint External Evaluation	A Joint External Evaluation (JEE) is a voluntary, collaborative, multisectoral process to assess country capacities to prevent, detect and rapidly respond to public health risks whether occurring naturally or due to deliberate or accidental events. The JEE helps countries identify the most critical gaps within their human and animal health systems in order to prioritize opportunities for enhanced preparedness and response.

Knowledge, Attitude, and Practices Survey	Knowledge, attitude, behavior, and practice surveys widely accepted for the investigation of health-related behaviors and health-seeking practices, as they provide valuable information for resource allocation in, planning of, and implementation of public health programs.
KoboToolbox	An integrated set of tools for building forms and collecting interview responses; built for easy and reliable use in difficult field settings, such as humanitarian emergencies or post-conflict environments.
Migration Health Division	Division within IOM that delivers and promotes comprehensive, preventive, and curative health programmes which are beneficial, accessible, and equitable for migrants and mobile populations and contributes towards the physical, mental and social well-being of migrants, enabling them and host communities to achieve social and economic development.
Misinformation tracking	The monitoring of disease-specific misinformation that is moving through a community. Identification of misinformation can feed into both the event-based surveillance and active case finding components of CBS.
Negative predictive value	The proportion of reported healthy people (or those without the outcome of interest) that are truly healthy or truly do not have the outcome of interest.
Polymerase chain reaction	Laboratory test for the presence of viral genetic material or its fragments as it breaks down; is the most reliable and accurate test for detecting active COVID19- infection.
Positive predictive value	The proportion of reported or identified cases that truly are cases.
Sensitivity	The proportion of all cases notified to the system (ascertainment proportion); the ability of surveillance to detect the health problem that it is intended to detect.
Specificity	The proportion of cases without disease correctly identified by the system.

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