

# Containing measles in conflict-driven humanitarian settings

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## MEASLES: A WELL-STUDIED DISEASE, YET A LONG WAY TO GO

The fragile capacity of health systems to respond to measles in humanitarian settings is likely to break down completely, should the current COVID-19 pandemic ravage these populations.<sup>1</sup> Conflict-driven humanitarian settings (hereafter humanitarian settings), characterised by armed conflict, insecurity, and mass displacements, are particularly vulnerable to the detriments of competing epidemics where a low capacity to carry out basic health system functions, such as vaccination programmes, facilitates the occurrence of disease outbreaks.<sup>2</sup> Supply chains become sporadic, cold chains lose viability, beneficiaries avoid unsafe trips to health centres, and human resources are dissipated, creating ever-larger pools of unvaccinated children and jeopardising herd immunity. Delays in case detection due to disrupted healthcare or lack of laboratory capacity, exacerbated by the dynamic nature of conflicts, lead to late epidemic response and control. With over 135 million people living in areas of conflict,<sup>3</sup> epidemics in humanitarian settings are a pressing global health concern: 14 million out of the 20 million (70%) unvaccinated children in 2018 are zero dose children, and an estimated 5.6 million are in conflict-affected settings.

Measles is a highly contagious and potentially deadly disease that can spread among malnourished and vitamin A deficient populations in humanitarian settings.<sup>4</sup> Globally, measles cases have appreciably increased in the last years, especially in conflict-affected countries (table 1 and box 1). For example, the Democratic Republic of Congo is estimated to have had nearly 350 000 suspected cases of measles and over 6500 fatalities between January 2019 and March 2020.<sup>1</sup>

Measles must not become collateral damage to our efforts to contain COVID-19, and the urgent need for vaccination must

## Summary box

- ▶ The persistence of measles incidence and outbreaks in humanitarian settings is troubling and needs urgent attention.
- ▶ There is now a pressing need to develop, test and implement innovative approaches to vaccinate populations affected by humanitarian emergencies in light of the new and heightened threats posed by COVID-19.
- ▶ Humanitarian interventions must keep a balance between Supplementary Immunization Activities and Routine Vaccination Programs, as well as between host and displaced communities.
- ▶ Building strong partnerships, including with warring parties and the local communities, will support the delivery of broader primary healthcare services including immunisation in humanitarian settings.

be addressed despite the pandemic. Measles virus pathology and related medical technologies are well established and understood by the public health and scientific communities. The persistence of cases and increasing outbreaks in humanitarian settings is in part due to underutilisation of this knowledge. In addition to logistics and vaccine dose availability in health facilities—often the main preoccupation in humanitarian settings—weaknesses in vaccination planning within the health system are overlooked in the haste. For instance, as COVID-19 continues to spread globally, nearly 180 million children may miss out on receiving measles-containing vaccine (MCV). Measles immunisation campaigns in 29 countries have already been delayed; more will be postponed.<sup>5</sup> Interruption of immunisation services poses a major risk for secondary outbreaks of vaccine preventable diseases leading to a measles epidemic in few months time that will kill more children than COVID-19. As the pandemic lingers, the WHO is now urging countries to carefully resume vaccination while contending with SARS-CoV-2.

**Table 1** Number of measles cases and measles-containing vaccine first-dose (MCV1) coverage (%) in top 10 countries affected by conflicts, 2014–2018 (source: WHO)

Country	2014		2015		2016		2017		2018	
	Cases (n)	MCV (%)	Cases (n)	MCV (%)	Cases (n)	MCV (%)	Cases (n)	MCV (%)	Cases (n)	MCV (%)
Afghanistan	492	60	1154	63	638	64	1511	64	2012	64
Bangladesh	289	94	240	97	972	97	4001	97	2263	97
Central African Republic	210	49	150	49	367	49	801	49	224	49
Democratic Republic of the Congo	33 711	77	5020	79	5092	77	45 107	80	69 693	80
Iraq	1317	68	1433	71	37	80	41	85	489	83
Pakistan	1370	71	386	75	2703	75	9175	76	33 007	76
Somalia	10 229	46	7497	46	26	46	23 039	46	9126	46
South Sudan	441	55	878	53	898	51	487	51	263	51
Syrian Arab Republic	594	54	45	53	66	62	737	67	329	63
Yemen	815	67	468	67	143	70	433	65	10 640	64

We find that fixing holes in health systems in these contexts may be equally important as lapses in vaccine coverage or availability and, indeed, may have more sustainable and lasting effects. We identify four parameters that could enhance health system resilience and optimise the effectiveness of measles prevention and control in humanitarian settings.

#### SUPPLEMENTARY IMMUNIZATION ACTIVITIES: A DOUBLE-EDGED SWORD

To eliminate measles in developing countries, the WHO recommends >95% coverage of two MCV doses, with first and second doses administered at 9 and between 15 and 18 months of age, respectively.<sup>6</sup> Measles can be accompanied by diarrhoea and pneumonia which also contribute to childhood mortality in humanitarian settings.<sup>6,7</sup> Therefore, WHO/UNICEF prioritise Supplementary Immunization Activities (SIA) for measles by expanding the target age group from 6 months to 14

years as an immediate preventive response to build-up immunity after sharp declines in vaccination coverage and/or as a response to nascent outbreaks in humanitarian settings.<sup>8</sup> As observed recently in Yemen, a series of targeted SIAs enhanced by Periodic Intensification of Routine Immunization activities have prevented a precipitous decline in vaccination coverage, especially in high-risk areas.<sup>9</sup> Despite advantages, SIAs often become a substitute rather than a complement to routine immunisation—the stolid approach that must be foundational for measles elimination. The labour-intensive nature of SIAs and their capacity to monopolise resources can lead to lapses in routine vaccination, following the completion of the campaign.<sup>10</sup> In addition, as vaccine efficacy drops for children vaccinated at <9 months due to possible interference with maternal antibodies,<sup>11</sup> children vaccinated before their optimal age still require two routine doses,<sup>4,6</sup> presenting a serious challenge among transient populations. In addition, a shorter time interval between MCV1 and MCV2 could substantially reduce attrition<sup>6</sup>; we urgently need further research into the long-term protective effects of administering MCV2 as early as 28 days after MCV1 (the minimum interval between two live vaccines), rather than the prescribed 15–18 months of age. Moreover, efforts should be made to evaluate and minimise the impact of SIAs on routine health services, including vaccination programmes.

#### Box 1 Measles cases and measles-containing vaccine first-dose (MCV1) coverage in countries experiencing humanitarian crises

- ▶ Of the 10 countries in table 1, only one —Bangladesh—reports MCV1 coverage commensurate with the WHO threshold of 90% coverage.
- ▶ The high number of measles cases reported from 2014 to 2018 underscores the importance of redoubling immunisation programming. Further, countries experiencing conflict and protracted humanitarian crises have mass displacement and high birth rates, raising concerns about unvaccinated birth cohorts giving rise to even higher case counts.
- ▶ Countries with exceptionally low coverage such as the Central African Republic, Somalia and South Sudan garner particular concern and different strategies.
- ▶ Dedicated efforts to increase coverage are necessary to prevent vast increases in measles burden.

#### VACCINATION COVERAGE: ARE WE MEASURING RIGHT?

Reliable MCV coverage measures in the target population need accurate denominators—a central preoccupation in epidemiology; a challenge in humanitarian settings.<sup>12</sup>

A common source of routine vaccine coverage is population-based sample surveys, which frequently prove difficult, politically controversial and bias prone in humanitarian settings. They are vulnerable to incorrect sampling frames, and government authorities often inflate official population estimates to avoid

acknowledging population loss, or they purposefully exclude certain groups, for example, by ethnicity or religion. Surveys may also exclude communities sympathetic to opposition forces or where the state may have been responsible for many deaths.

Evidence from the field also suggests that families are often unable to present vaccination cards since they may have limited concern for safeguarding them through times of distress and frequent moves. For cards to be a reliable measure of coverage, surveys must be conducted very shortly after a campaign, as longer intervals may substantially reduce a population's ability to produce vaccination cards.<sup>13</sup> Given these constraints, the number of vaccine doses delivered is a common proxy measure of vaccination coverage in humanitarian settings. However, this is far from satisfactory and can actually be misleading. Using these data can give a false sense of the actual coverage levels and may explain the increasing numbers of repeated measles outbreaks around the world despite high coverage estimates. Immunosurveys would be the best option to measure a population's level of immune protection, but such measures are admittedly impractical in humanitarian settings. Instead, we must explore innovative methods to better estimate true levels of vaccine coverage.

Humanitarian agencies commonly undertake thousands of small-scale health surveys in humanitarian settings and have good potential to collect such data. Increasingly, these data are made public for widespread usage. Satellite data producers already provide accurate and up to date population estimates in precisely defined zones to serve as denominators and could be further engaged.<sup>14</sup> However, challenges to track sudden, large population movements following conflict remain and, even if denominators and sampling frames are improved, surveys are still limited by access and lack of proof of vaccination. Long-term, flexible funding mechanisms must be established to effectively advance research and overcome these methodological challenges. However, flexibility must neither compromise the maintenance of high ethical standards nor should it compromise the strengthening of local research capacities in the short term, for example, through remote learning.<sup>15</sup>

#### DISPLACED VERSUS HOST COMMUNITIES: A BALANCING ACT

In 2019, almost 71 million people were displaced in the world. Of these, more than 60% were internally displaced.<sup>16</sup> Typically, these displaced eke out a living among equally impoverished host communities whose health needs are often as great and remain unaddressed. Leaving local communities aside is an indisputably dangerous oversight, especially for vaccination coverage. Usually, immunity profiles of neither the host nor the displaced groups are known as serosurveys cannot realistically be undertaken. Both tend to be equally impoverished and, in some occasions, the hosts may receive fewer health services than the camped refugee communities.

The reality is that despite differing international civil status (refugees and residents) the risk of outbreaks is deeply interconnected and hence must be examined together. These considerations highlight the morality of inequitable aid for equally needy communities, although tensions between host and displaced communities are increasingly recognised by operators on the front line. The current COVID-19 pandemic and associated impact on healthcare services may further heighten such tensions. In 2017, over a million Rohingya refugees moved into Chittagong, one of the poorest states of Bangladesh, inhabited by about 300 000 people in small villages. By December 2018, Bangladesh authorities and humanitarian actors increased vaccination coverage in the Rohingya refugee camps up to 89%,<sup>17</sup> possibly higher than in the host population. By this time, not only did tensions heighten between the refugees (the 'haves') and the host populations (the 'have-nots') but measles cases have been observed in both population groups, creating an epidemic powder keg for this highly transmissible disease.<sup>18</sup>

The realisation of universal healthcare for migrants and refugees requires evidence-based, inclusive policies that balance the costs and benefits of 'health for all' in a public health and development perspective.<sup>19</sup>

At present, there is a need for new governance structures and new global compact for healthcare in conflict settings, that are beyond the present capacities of global agencies. Lancet Commission recommendations articulate the crucial role of law in achieving global health with justice, through legal instruments, legal capacities and institutional reforms, as well as a firm commitment to the rule of law.<sup>20</sup>

#### NON-STATE ACTORS FOR BETTER VACCINATION COVERAGE: GOVERNMENTS ARE NOT THE ONLY PARTNERS

Reducing the threat of measles in conflicts requires negotiated access to target communities. This process involves all parties, including the unpopular military and non-state warring groups. Evidence from 16 conflict-affected countries suggest that many national governments fail to meet basic health needs, including essential immunisation of conflict-affected populations who reside within their own borders.<sup>21</sup> Governments are either unwilling to provide health services for refugees or withhold provisions due to conflict with sections of their own populations, challenging health service access to all children. In many regions, non-state warring actors (opposition militias, de facto government, or armed civil groups) control large territories and either block any services from reaching them or provide healthcare to the population in their jurisdiction. Most state supported service providers in humanitarian settings are increasingly recognising the indispensable role these partners play on the ground. This was the case of vaccination campaigns in Nigeria and Somalia, where effective cooperation with warring parties allowed health teams to cross green lines

and vaccinate children against polio.<sup>22</sup> Whether or not the humanitarian actors providing health services are in agreement with players such as private companies, rebel groups, religious associations, they should consult them, as far as practicable, in planning vaccination campaigns. Nevertheless, relying on third parties to vaccinate children must be a temporary solution and only when the state is too fragile to keep up with its own responsibilities.

After having negotiated with ‘warring parties’, the next link is local workers who will take this forward. The humanitarian community should prioritise projects with sound exit strategies that contribute to building state capacity. Active conflict unquestionably creates extremely challenging work conditions for health professionals travelling from outside the region. One approach to circumvent this challenge would be to systematically engage and train village-level health workers to provide essential services, including vaccination, to their communities. This is a solution that can be put into place rapidly because training packages for such a workforce are available and readily deployable at short notice.<sup>23 24</sup> Promising long-term, strategic concepts like ‘Health as a Bridge for Peace’, previously promoted by WHO and since relegated to the bottom drawer, should be revived as an effective tool for ensuring sustained vaccination coverage and essential services in humanitarian settings.

## FINAL CONSIDERATIONS

Immunisation outcomes in humanitarian settings are suboptimal despite technological solutions such as effective vaccines, as the size and transiency of the population are serious pushbacks. The current pandemic has further endangered vaccination campaigns, increasing concerns of re-emergence of measles globally and underscoring the importance of not losing sight of the collateral dangers of vaccine-preventable diseases in the age of COVID-19.

It is essential to build strong partnerships, including with the local communities, that can support the delivery of primary healthcare services including immunisation in humanitarian settings. This will require negotiating access with warring factions to enable integrated delivery of essential services amidst insecurity, addressing mistrust and rumours through risk communication, and engaging with communities. Building health and research capacity at local levels can elucidate long-standing uncertainties regarding immunity profiles, vaccination coverage and vaccine efficacy. Finally, funding policies must systematically address local inequalities with host populations as well as exit strategies in humanitarian interventions.

Global health policies and interventions have not kept up with the profound changes in humanitarian settings during past decades. We, the humanitarian community, have a collective responsibility to anticipate new challenges, understand the increasingly complex environment in which we work, and adapt our policies, guidelines and interventions accordingly.

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## REFERENCES

- 1 Roberts L. Why measles deaths are surging — and coronavirus could make it worse, 2020. Available: <https://www.nature.com/articles/d41586-020-01011-6>
- 2 Minetti A, Bopp C, Fermon F, et al. Measles outbreak response immunization is context-specific: insight from the recent experience of Médecins sans Frontières. *PLoS Med* 2013;10:e1001544.
- 3 United Nations Office for the Coordination of Humanitarian Affairs. *Global humanitarian overview 2018*, 2017.
- 4 Grais RF, Strebel P, Mala P, et al. Measles vaccination in humanitarian emergencies: a review of recent practice. *Confl Health* 2011;5:21.
- 5 The Measles & Rubella Initiative. More than 117 million children at risk of missing out on measles vaccine, as COVID-19 surges. Available: [https://www.who.int/immunization/diseases/measles/statement\\_missing\\_measles\\_vaccines\\_covid-19/en/](https://www.who.int/immunization/diseases/measles/statement_missing_measles_vaccines_covid-19/en/) [Accessed 14 Apr 2020].
- 6 World Health Organization. Measles vaccines: WHO position paper — April 2017. *Wkly Epidemiol Rec* 2017;92:205–28.
- 7 Strebel PM, Papania MJ, Fiebelkorn AP, et al. Measles vaccine. *Vaccines* 2012;6:352–87.
- 8 The United Nations Children’s Fund / World Health Organization. Joint statement on reducing measles mortality in emergencies, 2004. Available: [https://www.unicef.org/publications/files/WHO\\_UNICEF\\_Measles\\_Emergencies.pdf](https://www.unicef.org/publications/files/WHO_UNICEF_Measles_Emergencies.pdf)
- 9 Sadr-Azodi N, DeRoeck D, Senouci K. Breaking the inertia in coverage: Mainstreaming under-utilized immunization strategies in the middle East and North Africa region. *Vaccine* 2018;36:4425–32.
- 10 Chakrabarti A, Grépin KA, HELLERINGER S. The impact of supplementary immunization activities on routine vaccination coverage: an instrumental variable analysis in five low-income countries. *PLoS One* 2019;14:e0212049.
- 11 Niewiesk S. Maternal antibodies: clinical significance, mechanism of interference with immune responses, and possible vaccination strategies. *Front Immunol* 2014;5:446.
- 12 Checchi F, Gayer M, Grais R. *Public health in crisis-affected populations. A practical guide for decision-makers*, 2007.
- 13 Franke MF, Ternier R, Jerome JG, et al. Long-term effectiveness of one and two doses of a killed, bivalent, whole-cell oral cholera vaccine in Haiti: an extended case-control study. *Lancet Glob Health* 2018;6:e1028–35.
- 14 Bharti N, Djibo A, Tatem AJ, et al. Measuring populations to improve vaccination coverage. *Sci Rep* 2016;5:34541.
- 15 Woodward A, Sheahan K, Martineau T, et al. Health systems research in fragile and conflict affected states: a qualitative study of associated challenges. *Health Res Policy Syst* 2017;15:44.
- 16 UNHCR. Figures at a glance. statistical yearbooks, 2019. Available: <https://www.unhcr.org/en-us/figures-at-a-glance.html> [Accessed 19 Jun 2019].
- 17 Hossain A, Ahmed S, Shahjalal M, et al. Health risks of Rohingya children in Bangladesh: 2 years on. *Lancet* 2019;394:1413–4.

- 18 Médecins Sans Frontières. "These children shouldn't be sick" – tackling measles in Rohingya refugee camps. Available: <https://www.msf.org/msf-tackles-measles-outbreak-rohingya-refugee-camps-bangladesh> [Accessed 19 Feb 2020].
- 19 The health of migrants. Geneva: international organization for migration, 2016. Available: [www.iom.int/sites/default/files/our\\_work/ODG/GCM/IOM-Thematic-Paper-Health-of-Migrants.pdf](http://www.iom.int/sites/default/files/our_work/ODG/GCM/IOM-Thematic-Paper-Health-of-Migrants.pdf)
- 20 Gostin LO, Monahan JT, Kaldor J, *et al*. The legal determinants of health: harnessing the power of law for global health and sustainable development. *Lancet* 2019;393:1857–910.
- 21 Grundy J, Biggs B-A. The impact of conflict on immunisation coverage in 16 countries. *Int J Health Policy Manag* 2019;8:211–21.
- 22 Nnadi C, Etsano A, Uba B, *et al*. Approaches to vaccination among populations in areas of conflict. *J Infect Dis* 2017;216:S368–72.
- 23 Nzioki JM, Ouma J, Ombaka JH, *et al*. Community health worker interventions are key to optimal infant immunization coverage, evidence from a pretest-posttest experiment in Mwingi, Kenya. *Pan Afr Med J* 2017;28:21.
- 24 Gavi. New initiative to bring vaccination to over 8 million people across Africa. Available: <https://www.gavi.org/news/media-room/new-initiative-bring-vaccination-over-8-million-people-across-africa> [Accessed 15 Aug 2018].