COVID-19 control in low-income settings and displaced populations: what can realistically be done?

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Background

While modelling predictions[1] suggest that uncontrolled or even partially mitigated COVID-19 epidemics in high-income countries could lead to substantial excess mortality, the virus' impact on people living in low-income settings or affected by humanitarian crises could potentially be even more severe. Three mechanisms could determine this: (i) higher transmissibility due to larger household sizes[2], intense social mixing[3] between the young and elderly[4], overcrowding in urban slums and displaced people's camps, inadequate water and sanitation, and specific cultural and faith practices such as mass prayer gatherings, large weddings and funerals during which super-spreading events might propagate transmission disproportionately[5]; (ii) higher infection-to-case ratios and progression to severe disease due to the virus' interaction with highly prevalent co-morbidities, including non-communicable diseases (NCDs; prevalence of hypertension and diabetes is often higher in low- than high-income settings, with a far lower treatment coverage[6]), undernutrition, tuberculosis[7] and HIV; and (iii) higher case-fatality due to a dire lack of intensive care capacity, especially outside large cities. Moreover, extreme pressure on curative health services could result in indirect impacts resulting from disrupted care for health problems other than COVID-19.[8] While these risk factors could be counterbalanced by younger age distributions and hot temperatures, on balance we believe that, given current evidence and plausible reasoning, drastic action is required immediately to protect the world's most fragile populations from this unfolding threat.

Containment may buy some time – at best

Over the last week, low-income and crisis-affected countries are following a global pattern of attempting to interrupt further importation of COVID-19 from abroad through border closures, while also implementing various social distancing and quarantine measures. Examples from China, South Korea and Singapore[9] suggest that this approach may enable containment at least for some time; it is, however, very resource-intensive, entailing widespread testing and meticulous contact tracing.[10] It is doubtful that these measures are replicable in low-income and crisis settings, where inadequate surveillance and less-than-sufficient testing may initially obfuscate the true extent of locally driven transmission. Moreover, extreme population-wide social distancing and travel restrictions, if sustained over a long period, could be very harmful for fragile, export-dependent economies and stretch livelihoods beyond people's coping ability, in turn dis-incentivising adherence to control measures. In short, a draconian containment strategy may be useful for a limited time to allow countries to better prepare, but risks failing beyond a horizon of weeks.

What can realistically be done?

Of the three mechanisms we describe above, two (higher infection severity and case-fatality) appear less tractable for the time being. Some interventions could help and should be pursued quickly (e.g. maintaining NCD, TB and HIV case detection and treatment coverage; intermittent presumptive treatment to reduce other co-morbidities; freeing up health care capacity by postponing non-essential services). However, there appears to be little realistic prospect of scaling up intensive care to the levels required; isolation of cases in dedicated, but not high-intensity wards might offer neither clinical benefit nor meaningful transmission reductions, as most transmission would still be attributable[11] to low-risk infections[12] and the proportion of the infectiousness period spent pre-admission[1314], e.g. among household members. Moreover, without sufficient training and infection control supplies, such facilities would pose a major threat to the health of clinicians, already a very scarce resource in most low-income and crisis settings.

By contrast, the mechanism of higher transmissibility appears more amenable to economically and socially feasible interventions, even in the most resource-constrained settings. Here too, however, a range of possible strategies may be considered. Even as containment measures are pursued, governments in resource constrained settings are already promoting population-wide social distancing measures. Realistically, to achieve sufficient impact these would require most non-essential workers to work from home or not at all, a strategy ill-suited to the economies and remote-working capability of low-income settings. Moreover, this must be sustained over a long period, until a vaccine, treatment or both are available at scale. We thus suggest that, where dispersive strategies targeting the general population are difficult to implement and/or cannot be sustained, leading to ongoing transmission among low-risk populations[15,16], it will be more impactful and efficient to focus resources on protecting those most vulnerable.

Shielding high-risk populations: general principles

In Ebola epidemics, isolating the ill into a contaminated 'red zone' is mainly needed to protect the healthy. In COVID-19, this paradigm is upturned: from the perspective of at-risk groups, the red zone is everywhere, unless they can be shielded from transmission and cared for when isolating. While stressing that no single approach is likely to fit all low-income or crisis settings, we outline below a set of principles that, implemented together, could support the general aim of protecting those most vulnerable from infection by helping them to live safely, dignifiedly and separately from their families and neighbours for potentially an extended period of time, until COVID can be controlled or vaccine and treatment options become available.

Who should be shielded?

Information so far suggests a rapid increase in COVID risk with age with a particularly high risk among people aged above 70 years and/or living with NCDs and other immuno-suppressing conditions[17,18]. In the absence of evidence to the contrary we suggest that in low-income or crisis-affected populations the high-risk definition could be extended to those aged 60 years or above (a more meaningful proxy of old age in countries that have not completed the epidemiologic and demographic transition). It should also consider those living with TB or HIV, and malnourished adults. TB patients, however, would likely need dedicated isolation arrangements in order to avoid close-quarters TB transmission.

How should effective shielding be achieved?

Table 1 suggests three options for housing high-risk community members into transmission-shielded arrangements, with their likely applicability to different settings. Under options 1 and 2, it may be assumed that healthier members of the high-risk group are able to care (e.g. bathe, feed) for those with disabilities; including low-risk carers (particularly those previously infected and thus probably immune) could also be an option. While an extreme option of resettling large numbers (e.g. many hundreds) of high-risk people in dedicated buildings or neighbourhoods might also be conceivable, we have discounted it due to likely high cost and the risk of large-scale harm if transmission is seeded within such a concentrated 'green zone'.

Table 1. Options for housing high-risk persons into designated 'green zones'.

Option	Description	Applicability	Notes
1. Household-level shielding	Each household demarcates a room or shelter for high-risk members. If necessary, a carer from the household is isolated with them.	Settings with multi-shelter compounds or multi-room houses.	Likely preferable to families with space available but also more likely to be 'leaky' if isolation is not strictly enforced.
2. Street- or extended family-level shielding	Neighbouring households (e.g. 5-10) or members of an extended family within a defined geographic locale (neighbourhood, district) voluntarily 'house-swap' and group their high-risk members into dedicated houses / shelters.	All, but especially urban settings.	Infection control and social distancing measures would also have to be strictly observed within each green zone.
3. Neighbourhood- or sector-level isolation	Sections of the settlement are put aside for groups of high-risk people (e.g. 50-100).	Displaced persons' / refugee camps, where humanitarian actors can provide supportive services and smaller scale isolation is not possible.	Ideally located at the periphery of camps to facilitate such measures. Infection control and social distancing measures would also have to be strictly observed within each green zone.

Infection control

Stringent but realistic infection control measures should accompany any of the options, as should some social distancing within the green zone, especially under option 3. To facilitate acceptability, the green zone's boundaries should probably remain virtual, but a single physical entry point, featuring handwashing facilities, should be established: food and other provisions should only be exchanged through this point. A meeting area where visitors can interact with loved ones at a safe distance or mobile, outpatient care can be provided could also be set up. Where resources allow, measures for transmission control within the green zone, including immediate isolation and testing of residents with symptoms consistent with COVID-19, should be added.

Social acceptability and supportive services

It is essential that such strategies are acceptable and well communicated to communities, and not perceived as an oppressive measure: indeed, their economic benefit rests on authorities or humanitarian coordination mechanisms relying on communities to rapidly and spontaneously self-organise along a set of epidemiologically sound principles. To this end, existing networks of community health workers, including Red Cross and Red Crescent volunteers, could be mobilised to set up local social care committees tasked with disseminating culturally appropriate information on behaviour change, facilitating a decision on which 'green zone' arrangement works best for the community, out of a discrete set of options; and coordinating provision of food and supplies to high-risk residents. Local and international development and humanitarian actors, whose support accounts for a substantial (or, in the case of most camps, total) share of public service delivery, could contribute meaningfully by supplying infection control supplies (e.g. soap and water), supporting livelihoods, enabling local care committees and providing or strengthening mobile, dedicated medical treatment.

When to start isolating? When to stand down?

Because of its short serial interval[19] and relatively high transmissibility, an uncontrolled COVID-19 epidemic would likely peak very rapidly[20] (e.g. within a few months of first importation). While control measures currently being rolled out might slow this progression, the weakness of surveillance systems and inevitable implementation delays suggests a pragmatic need to roll out the proposed approach now.

However, isolating at-risk people would be hard to maintain, and as such the strategy should be discontinued as soon as safe to do so. In the absence of widespread testing, serological surveys are key to provide robust information on the evolution of the epidemic; if these cannot be done with sufficient geographic resolution, some form of syndromic surveillance, with simple stand-down thresholds (e.g. a period with no suspected cases of COVID-19 within a given radius) could instead be adopted: this remains to be explored, as any syndromic approach is complicated by the high background of other respiratory infections. Alternatively, a cruder decision rule taken at whatever geographic level robust surveillance data are available may need to be applied.

Conclusion

While the targeted approach we have outlined may only be one of several possible, we believe that it may offer a realistic solution for allocating scarce resources to maximise impact in settings where scaling up treatment significantly is unlikely to be an option. Detailed guidelines on the different elements of the approach need to be developed. Other feasible, high-yield interventions should be undertaken simultaneously, e.g. staying home if sick, limiting public transport use, reducing super-spreading events at funerals or other mass gatherings, promoting hand-washing, soap distribution and/or at least maintaining treatment coverage for risk-factor co-morbidities. Clearly, any shielding strategy would need to be predicated on sound, locally informed behavioural science and monitored for effectiveness, e.g. by measuring transmission or mortality within isolation 'green zones' and evaluating its potential under realistic modelling assumptions.

Whenever vaccines or improved therapeutics for COVID-19 become available, these must be allocated equitably to low-income and crisis-affected populations. Until then, it is imperative that low-resource countries and humanitarian responses plan and roll out evidence-based, long-term strategies to mitigate their COVID-19 epidemics, starting now. Approaches such as containment of importation are likely to have exhausted their potential in the immediate future; not all interventions are of equal value, and the opportunity costs of emphasising one over the other should be considered. The price of inaction may be high. Sub-optimal, inefficient control interventions could however be just as costly.

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