

COMMENT

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CHEMISTRY Happy 200th to hydrogen peroxide, industrial workhorse **p.181**

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A Rohingya refugee from Myanmar in a Bangladeshi camp in 2017.

Grand challenges for humanitarian aid

Fund and study these priorities for natural and social sciences to meet a gaping need, urge **Abdallah S. Daar, Trillium Chang, Angela Salomon and Peter A. Singer**.

The gap between the magnitude of humanitarian need and the global capacity to respond is massive and growing. Here we describe an attempt to map ways in which that gap might be closed (see ‘Top 10 Humanitarian Grand Challenges’).

Humanitarian crises directly affect more than 140 million people in 37 countries, according to the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA). More than 65 million of these people have been forcibly displaced from their homes — the

highest level since the Second World War. Nearly 60% are currently in Africa and the Middle East, including in Turkey, Lebanon, Uganda and Ethiopia¹. The rest include refugees, asylum seekers, people displaced internally, those not yet seeking asylum and many more.

Much of this humanitarian need derives from violent conflicts and civil wars that target civilians and their support systems, including shelters and hospitals. Much also follows natural disasters such as earthquakes, hurricanes, floods and drought. With climate change, it is highly likely that

some of these disasters will get worse and more frequent¹.

All of these people need aid, and the funds available are increasingly inadequate¹. Just one-third of the US\$25.4 billion required for humanitarian aid for 2018 will be covered. In other words, the current humanitarian system is buckling. It desperately needs much more programme funding to close the gap. At the same time, it needs more funding for innovative solutions: uses of technology, products and processes from other sectors; new forms of partnership; and drawing on the ideas and coping capacities of ▶

Top 10 Humanitarian Grand Challenges

RANK	PRIORITY IDENTIFIED	RESEARCH QUESTIONS
1 (147 cumulative score)	<h2>Strengthen economies</h2> <p>Restore functioning markets and the economic stability of affected communities by:</p> <ul style="list-style-type: none"> Scaling up cash-based assistance (rather than in-kind commodities) Improving access to financial services Increasing autonomous choice over spending Expanding social safety-net programmes, such as provision of health care, shelter and transport Engaging cross-border refugees, particularly women, who are displaced to countries where they are forbidden to work outside camps* 	<ul style="list-style-type: none"> How can assistance be maximally scaled in humanitarian crises settings? What are the obstacles to achieving this and how can they be overcome? What potential financial services, formal and informal, are available to refugees and affected communities? How can safe and affordable access be improved? What are the economic advantages and disadvantages of allowing aid beneficiaries to receive cash and/or control their own spending, rather than receiving aid through material goods or medical supplies? What are the most effective ways to distribute cash digitally without compromising user data privacy (for example, via blockchain)? What are more affordable/effective ways for diaspora and others to send money to crisis-affected persons?
2 (141)	<h2>Reduce inequality</h2> <p>Strengthen resilience in communities at risk of humanitarian crises by:</p> <ul style="list-style-type: none"> Reducing inequality and poverty Promoting gender equality Improving education* 	<ul style="list-style-type: none"> How can communities vulnerable to humanitarian crises be identified proactively? What are effective ways to raise public awareness about potential disasters in communities not previously affected? How can a population be engaged in procuring and storing vital goods such as food, clothing, medical supplies, power generation and rescue equipment? How can these vital goods be most efficiently deployed? How do social determinants (such as poverty, gender inequality, low education; and ethnic, tribal and religious or other differences) perpetuate or aggravate humanitarian emergencies? How can maternal and child education and health services be more effective, and how can uptake be increased?
3 (138.5)	<h2>Improve metrics</h2> <p>Measure effectiveness of humanitarian aid by moving away from metrics that measure 'cost-per-beneficiary' to those that measure how the needs are met of:</p> <ul style="list-style-type: none"> the most vulnerable the most systematically excluded the hardest-to-reach communities 	<ul style="list-style-type: none"> What are the most logical indicators for measuring lives saved and improved in humanitarian crises? This may include existing indicators, such as those in the Paris Declaration on Aid Effectiveness, if appropriate to the context. How can technological innovations, such as cloud computing and mobile devices, automate and improve the efficiency of measuring aid effectiveness over time? Can 'big data' resources such as messaging apps, user-generated maps, GPS, mobile-phone tracking, commercial transactions or electronic medical records be used to identify impacted populations, their needs and gaps in support? Do current monitoring and evaluation systems compromise the safety of affected people or place heavy burdens on responders? What are ways to overcome this while still meeting donor needs?
4 (128)	<h2>Address funding</h2> <ul style="list-style-type: none"> Shift from short-term emergency funding toward longer-term humanitarian financing Ensure accountable, impactful investments that include incentives or subsidies for host governments to contribute alongside foreign assistance* 	<ul style="list-style-type: none"> How can states, humanitarian aid agencies, donors and others be effectively engaged in an effort to shift to sustainable funding? How effective are impact bonds in financing initiatives in humanitarian settings (recent onset or protracted)? What are other potentially transformative strategies to achieve multi-year funding for protracted crises? How can 'risk insurance', based on agreed-upon triggers, mitigate humanitarian disasters?
5 (121)	<h2>Protect identity</h2> <p>Provide affected persons with an official private, secure digital identity that reduces the risk of creating stateless persons.</p> <p>This might:</p> <ul style="list-style-type: none"> Incorporate a universal health card Safely and privately store, transport, validate authenticity of, and disseminate personal documents (such as bank cards, land deeds, birth certificates, school diplomas and medical records)* 	<ul style="list-style-type: none"> How effective have previous efforts been to establish Universal Health Cards, Universal Health Insurance and financial-risk protection for migrants (such as those used in Thailand⁸)? How effective have previous efforts been to issue digital identity cards to hard-to-reach populations (such as India's Aadhaar⁹ system)? What are the advantages, disadvantages and long-term impacts of providing digital identities by countries of origin or by hosting governments? What are the ethical, legal and social issues that may arise in developing and disseminating such digital identities? What is the feasibility and impact of using highly secure, efficient technologies to store records in humanitarian settings? What are the potential drawbacks or consequences?

RANK	PRIORITY IDENTIFIED	RESEARCH QUESTIONS
6	<p>Expedite aid</p> <p>Remove all barriers to immediate aid following emergencies or after predetermined 'triggers' in slow-onset emergencies, such as restrictions on humanitarian organizations. This prevents the need to wait until public consciousness is raised and pressure applied to donor governments.</p>	<ul style="list-style-type: none"> • What are the most effective international mechanisms and auspices under which to engage governments to develop partnerships for immediate disaster/emergency relief? • How feasible and effective are crowdfunding platforms to speed the availability of money in crisis situations? • How can mechanisms for regional neutral bodies to intervene rapidly in the case of disasters be better coordinated? • How can the voices of those affected by crises be amplified most effectively?
(119)		
7	<p>Save more lives</p> <p>Improve access to life-saving assistance for people living in areas that are highly insecure and largely inaccessible to international and national aid organizations.</p>	<ul style="list-style-type: none"> • What methods promote and ensure compliance (of non-governmental organizations, governments) with international humanitarian law? How can such laws be strengthened? • How can the private sector improve the delivery of aid and increase the speed, effectiveness and cost-efficiency of delivering or manufacturing commodities (such as by 3D printing) in hard-to-reach places? • How can crisis-affected people be supported or empowered to create their own local solutions — such as by locally manufacturing and reusing items? • In what ways can military know-how and capabilities, including transport and logistics, be used ethically in disaster responses? What are potential political obstacles, and how can they be overcome?
(117)		
8	<p>Support mental health</p> <p>Offer emergency psychosocial support at scale.</p>	<ul style="list-style-type: none"> • How effective are culturally sensitive and locally applicable emergency intervention programmes based on the World Health Organization's Mental Health Gap Action Programme for mental health and psychosocial support? Where are there gaps and how can they be filled? • What are the most effective ways for health-care providers to advocate for the incorporation of established ethical principles and more counselling into emergency mental-health intervention programmes? • What are the population metrics and outcome indicators for mental-health policy and programme surveillance? • Can artificial intelligence (such as chatbots or apps) deliver mental-health and psychosocial support, in a culturally sensitive and effective manner?
(116)		
9	<p>Democratize data access</p> <p>Increase (digital) connectivity of affected persons to democratize access to information and opportunities, including market prices, wage information, weather, jobs, banking, insurance and microfinance*.</p>	<ul style="list-style-type: none"> • What culturally specific and community-based strategies will efficiently and effectively integrate crisis-affected people with worldwide data sources? • How can mobile-network operators become valuable contributors to preparedness before, and responses after, humanitarian disasters? • How effective are existing innovative ways to share data in humanitarian settings, such as mesh networks, bluetooth technology, microwave technology and peer-to-peer networks? What other novel strategies exist?
(113)		
10	<p>Boost direct communication</p> <p>Facilitate direct two-way communications between affected persons and humanitarian agencies, for the sharing of needs, developments, plans and actions.</p>	<ul style="list-style-type: none"> • What are examples of low-cost satellite or other technologies that can facilitate logistics and cut response time in crisis settings, and how effective are they? • How can non-governmental organizations, governments and other actors gain feedback from affected persons to improve humanitarian responses? How effective are online surveys, feedback apps and chatbots? What other novel solutions exist?
(110.5)		

*Challenge reformatted and/or slightly reworded from the original submission to increase clarity and coherence.

START AT A SUMMIT

What are Global Alliance for Humanitarian Innovation and Grand Challenges Canada?

The need for innovation in the humanitarian space was recognized at the World Humanitarian Summit in Istanbul¹⁰ in May 2016. The largest ever United Nations gathering, this had 9,000 participants from at least 173 countries, including 55 heads of state and governments, hundreds of private-sector representatives, and thousands of people from civil society and non-governmental organizations, including multilateral development banks such as the World Bank.

The summit created the Global Alliance for Humanitarian Innovation with the mission of achieving higher impact and efficiency in humanitarian action¹¹. It complements several initiatives, including Global Humanitarian Lab, Global Partnerships for Humanitarian Impact and Innovation, and the Canadian Humanitarian Assistance Fund. Unfortunately, many of these

have insufficient funding to address the magnitude of the problem by creating a healthy pipeline of seed innovations; most do not have the capacity to scale them up.

Grand Challenges Canada (GCC), supported by the Government of Canada, funds technological, social and business innovations in global health. Since its founding in 2010, GCC has supported 1,000 projects in more than 80 countries (see go.nature.com/2jya0zb). The leaders of GCC have a track record of partnering to identify priorities that catalyse the creation of impactful research funding programmes at the global level. These include: the Bill & Melinda Gates Grand Challenges in Global Health programme, based on a 2003 study⁵; the Global Alliance for Chronic Diseases, based on a 2007 study⁶; and the Global Mental Health Initiative of the US National Institute for Mental Health and GCC, based on a 2011 study⁷. **A.S.D., T.C., A.S. & P.A.S.**

► crisis-affected people — in a way that is iterative and rigorously evaluated^{2,3}. A balance of the two types of funding would help the humanitarian system to become more efficient and more effective.

To this end, humanitarian agencies met with governments, private-sector representatives, philanthropists and affected persons (people who were refugees, were born in refugee camps or who worked closely with such affected people) in November 2016 in Toronto, at an event convened by Grand Challenges Canada (GCC; see ‘What are Global Alliance for Humanitarian Innovation and Grand Challenges Canada?’). Participants agreed that innovation in the humanitarian sector would be catalysed by a list of priorities, systematically identified and agreed upon. Here we set these out, and describe how they were reached.

LAYING FOUNDATIONS

Participants agreed on the definition of a grand challenge as a specific critical barrier that, if removed, would help to solve an important humanitarian problem. They agreed that humanitarian assistance is aid and action designed to save lives, alleviate suffering and maintain and protect human dignity during, and in the aftermath of, human-made crises and natural disasters, as well as aid and action to prevent such situations or prepare for them. Participants advocated the empowerment of affected communities, especially women and girls,

and the inclusion of actors beyond the usual humanitarian community — such as youth, the private sector and affected persons. Finally, participants specified that action should be governed by the four humanitarian principles — humanity, impartiality, neutrality and independence (see go.nature.com/2kb88h7).

The participants also foresaw the need to create partnerships around the identified priorities. The Toronto launch meeting culminated with a ‘dry run’ to identify a few potential grand challenges (see go.nature.com/2tjms5k). The participants asked GCC to identify grand challenges

“Identifying priorities, as in this study, is just the first step.”

in humanitarian innovation through the Delphi method⁴, a technique that builds consensus using iterative feedback from dispersed experts. The participants also agreed to serve as the nucleus of the Delphi panel. There followed a three-round Delphi study, similar to previous exercises in health and disease^{5–7}.

GCC built a panel of 68 experts in humanitarianism and innovation. Those who had taken part in the Toronto launch suggested one or two names from their networks to join (a technique called snowball sampling). Also invited were ten affected individuals who had attended the World Humanitarian Summit in Istanbul, Turkey, in May 2016 and were

recommended for the Delphi panel by an official of UNOCHA. These included, for example, the founder of the Feminist Dalit Organization, which represents the discriminated group in Nepal known as ‘untouchables’; a refugee ambassador for the Office of the United Nations High Commissioner for Refugees (UNHCR); and a nominee for the 2015 US Secretary of State’s International Women of Courage award.

Sixty people took part in at least one of the three rounds. The first launched in January 2017; the last closed in July 2017. All communication with panellists was through e-mail.

In the first round, each participant answered the following question: ‘What one grand challenge, if solved, would make humanitarian work more effective and efficient for the long term?’

Panellists submitted 106 answers. We lightly edited these to ensure consistency (deleting duplicates and collating analogues). This generated 83 unique statements. These we grouped into categories including: financing, economic empowerment of affected communities, gender equity/gender-based violence, digital identity, documentation/data management and tools.

In round two, panellists chose 20 challenges of these 83, and ranked them from 20 (highest priority) to 1 (lowest). Scores for each statement were then summed across all participants to identify an overall top 20.

In round three, the panellists ranked their top 10 from these 20, with 10 being the most important. Scores for each statement were then summed across all participants to identify an overall top ten list (see table, in which the rankings have been inverted so that the priority with the highest cumulative score is ranked first). In the second and third rounds, participants were encouraged to add comments or suggestions for rewording or combining statements.

Of the 60 panellists who participated in one or more rounds, 50 completed round three (83.3%). This is a high response rate for this type of large-scale international study with dispersed participants. Only four of the ten invited affected persons participated in all three rounds of the study; the others struggled to take part because they were still living and working in crisis situations (a difficulty not unique to this study). For the other participants, the distribution of organizations, geographical regions, gender and expertise was not significantly different between those who completed all three rounds and those who did not.

For the final ten Humanitarian Grand Challenges, participants were also asked to suggest potential research questions (see



People stand behind a safety cordon in San Juan Alotenango, Guatemala, after the nearby Fuego volcano erupted in June.

table). Some challenges — denoted with an asterisk (*) — were reformatted and/or slightly reworded from the original submission to increase clarity and cohesiveness. Many participants also suggested important practical steps that are more actions than research questions (see Supplementary Information).

In a conference call in September 2017, panellists discussed designing and implementing partnerships and large-scale innovation funding programmes to address the research questions.

NOW WHAT?

The ten humanitarian grand challenges identified in this study encompass many sectors. They call for a reduction of the distinction between humanitarian and development efforts. Of course, these do not cover all potential barriers or gaps in either realm. Some of these challenges are long-standing. To be addressed, they now need collaborative thinking, large-scale funding and leveraging of new technologies. Some have been tackled in ways that could do with more impact evaluation — for example, identifying the best way to deliver supplementary nutrition for poor families with young children in food crisis situations².

Identifying priorities, as in this study, is just the first step in a long-term, continuous process of trying to effect change. Ideally, most of the research questions provided here will examine how to scale up solutions in specific locations, and in ways that will inform the global humanitarian community and help it to prepare for future emergencies.

Already, this initiative has begun to make a difference. In February this year, the US Agency for International Development's Office of US Foreign Disaster Assistance (USAID OFDA), the UK Department for International Development (DFID) and Grand Challenges Canada launched a multi-million-dollar initiative to support innovations that engage the private sector and involve affected communities to provide, supply or locally generate safe water and sanitation, energy, life-saving information, or health supplies and services to help conflict-affected people. This initiative is called Creating Hope in Conflict: A Humanitarian Grand Challenge (see go.nature.com/2kscfa2).

Within 2 months, 615 proposals were received from 87 countries; approximately 300 came from low- and middle-income countries, including more than 100 from countries in active conflict. Seed grants of around US\$250,000 will be awarded to pilot projects, and grants of up to \$1 million will be awarded to a select number of 'transition-to-scale' projects. Announcements are expected in late 2018. More funding partners are likely to join soon.

Once a robust pipeline of innovations is established, the challenge will be to scale them in a sustainable manner. With sufficient funding and effective partnerships, we hope to see progress on the priorities identified here. ■

Abdallah S. Daar is professor of clinical public health, global health and surgery at

the University of Toronto, Canada; chair of the International Scientific Advisory Board of Grand Challenges Canada; and a permanent fellow of the Stellenbosch Institute for Advanced Study, South Africa. **Trillium Chang** is a master's student in public health at the University of Cambridge, UK. **Angela Salomon** is a master's student in public health at the University of Toronto. **Peter A. Singer** is chief executive of Grand Challenges Canada and professor of medicine at the University of Toronto and the University Health Network, Canada. e-mail: a.daar@utoronto.ca

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Supplementary information accompanies this article: see go.nature.com/2trwopy