BMJ Global Health

The problem of 'trickle-down science' from the Global North to the Global South

Daniel D Reidpath,[1,2] Pascale Allotey[3]

To cite: Reidpath DD, Allotey P. The problem of 'trickle-down science' from the Global North to the Global South. *BMJ Global Health* 2019;**4**:e001719. doi:10.1136/bmjgh-2019-001719

Handling editor Seye Abimbola

Received 30 May 2019
Revised 2 July 2019
Accepted 5 July 2019

[1]Jeffrey Cheah School of Medicine and Health Sciences, Monash University Malaysia, Bandar Sunway, Malaysia
[2]South-East Asia Community Observatory (SEACO), Monash University Malaysia, Bandar Sunway, Malaysia
[3]International Institute for Global Health (UNU-IIGH), United Nations University, Cheras, Malaysia

Correspondence to
Professor Pascale Allotey;
pascale.allotey@unu.edu

Trickle-down economics holds that the way to lift the poor out of poverty is to support wealth creation in those who are already rich.[1] The underlying assumption is that as the wealth of the rich grows, they will purchase more goods and services, creating opportunities for the less well-off to benefit. The theory is in direct contrast to one that actively redistributes wealth. The analogy in science is that the way to improve science in the less developed parts of the world (the Global South) is to concentrate the intellectual gravitas, the resources and the opportunities into the Global North. The concentration will produce the best science which will trickle methods, theories, and insights down to the Global South.

Ten years ago, Nigel Crisp observed, with respect to the healthcare workforce that 'the global health system is characterised by an import–export business in which rich countries export the ideology of Western scientific medicine and aid predicated on this ideology to poor countries. In return, the poor countries export a portion of their preciously limited pool of trained health workers back to the rich countries'.[2]

A similar situation holds in scientific research. Many of the very brightest minds from the Global South go to institutions of higher learning in the Global North.[3] They either go as graduate students or they go as fully fledged researchers. They are attracted by better pay, resources, engagement and prestige. There are then three broad outcomes. If the move is a permanent one (which is the case 70% of the time)[3] many of the researchers turn their focus away from the concerns of the Global South towards the research priorities of the Global North. This is where the funding is. Others will remain in the Global North but try to keep their focus on the issues of the Global South. Their impact is often limited, but not for a lack of good intentions. The challenge for the second group is that career progression in the Global North relies on building resumés that are competitive in that context. A competitive resume means:

- Pursuing a research agenda relevant to the Global North.
- Ensuring that the critical mass and intellectual gravitas of the science remains with them in their Global North institution.
- Attracting research funding to their Global North institution, which may be partially redistributed to scientific *service* units in the Global South.
- Attracting graduate students from the Global South under the rubric of 'capacity building' and, thus, perpetuating the cycle.

The third outcome is the return of the researcher to the Global South, often with significant frustrations due to the lack of an enabling environment in which their newly acquired skills can be applied.

The Global South makes up the majority of the world's population and carries the majority

Summary box

- Countries in the Global South continue to struggle to train and retain good researchers and practitioners to address local, regional and global health challenges. As a result, there is an ongoing reliance on the Global North for solutions to local problems and an inability to develop alternative approaches to problem solving that take local (non-northern) contexts into account.
- Current paradigms of scientific advancement provide no long-term models to challenge the status quo or privilege knowledge that is generated primarily in the Global South. This has major impacts on access to funding which perpetuates the problem.
- There needs to be a concerted and demonstrable shift to value and promote the development of research and scientific traditions that are borne out of the reality of local contexts that complement knowledge and evidence generated in the Global North.

of the world's burden of disease, the world's poor, the socially disadvantaged and poorly educated. The countries of the Global South are the least able to cope with the world as it is, or to prepare for the world that is to come: climate change; food scarcity and water shortages; energy demands; environmental degradation; urbanisation and demographic shifts due to ageing, fertility and (forced) migration; emerging infectious diseases and the increasing prevalence of chronic diseases. For most of the countries in the Global South, the challenge is compounded by weak or poorly distributed infrastructure. 'Trickle-down science' is therefore set to fail the Global South because it is: (1) often not fit for purpose; (2) designed to accrue the greatest intellectual benefit to the North and (3) supportive of subaltern science in the Global South (see Chersich *et al*[4]). Consider three examples that we have witnessed.

Anecdote 1: A meeting was held in Malaysia to explore potential research collaborations between Malaysian scientists and scientists at centres of research excellence in Europe. The discussion turned to the development of methods for determining the cause of death in settings where, for cultural reasons, autopsies are rarely performed. A Northern researcher, a pathologist, dismissed that line of inquiry because in the absence of cadaveric samples, there was no interesting science to be done. There was no science worth pursuing if it did not advance the trajectory of technological and intellectual developments occurring in the Global North. As a consequence of this kind of engagement, research conducted in low-income and middle-income countries (LMICs) is often poorly aligned with the needs of the Global South.[5]

Anecdote 2: An Indonesian scientist with a PhD in molecular genetics from an Ivy League university returned as a postdoctoral fellow to a university in Indonesia. Untrained to conduct science suitable to her setting, she becomes an outpost scientist for colleagues in the USA who want biosamples from Indonesia. She is able to contribute to the US scientific discussion but unable to initiate or develop the science herself. The problem is further illustrated in the distribution of authorship between Global North researchers and Global South researchers conducting research in Global South.[6]

Anecdote 3: In 2015, an article appeared in an international peer-reviewed journal on the Malaysian acute stroke registry.[7] We wrote a letter with a doctoral student to the Global North editor identifying significant scientific problems with the paper.[8] The rejection letter from the Editor said inter alia,

> I do not want disucssion [sic] about the quality of stroke registry in your country. No readers in this journal other than your country are interested [sic] in such discussion (Personal Email Communication, 2015).

The implication is that the quality of the science from the Global South is irrelevant because no one in the Global North cares about science in the Global South—and unstated, you should be grateful we publish 'your science' at all. Extending this point, a recent review of papers reporting research trials from LMICs showed an overall increase in the number of papers published from 1990 to 2013.[6] Papers with a first author from a LMIC increased 2.8 times over the period. Papers with a first author from high-income countries increased 11.8 times over the same period.

We note that the direction of scientific developments is not always unidirectional. The International Rice Research Institute (IRRI), headquartered in the Philippines is credited with the development of the semidwarf rice varieties that saved South Asia from famine in the late 1960s.[9] The impact was so significant that in 2005 it was estimated that 60% of the area under rice cultivation was using varieties originating in the work of IRRI.[10] The work was part of a global collaboration situated in the Global South.

The International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b), provides the second example. In 1968, researchers at icddr,b showed the effectiveness of a low technology, oral rehydration solution of glucose and electrolytes in the management of diarrhoea.[11] This early work lead to the global standard management of fluid replacement in diarrhoea and the prevention of 54 million deaths.[12] The icddr,b has also been a major contributor to research on Cholera and again has arisen out of genuine global collaboration.

Trickle-down science as a strategy for the advancement of knowledge for today's problems and the challenges of the future is a serious issue for the Global South and has failed to redistribute expertise. The lack of concern about the global distribution of scientific capacity was apparent in a recent Elsevier and Ipsos MORI paper on research futures which does not even identify an intellectual presence in the Global South in its 10-year projection.[13] Instead, a scenario is posited of the Eastern ascendance of science, led by China, and predicated on the cloning of the top Western institutions and the attraction of scientists from Europe and North America to China.

Reinforcing the disparity, the WHO sources its expertise disproportionately from a handful of institutions in the Global North. In its actions, the agency that is responsible for providing global leadership in health demonstrates the need for scientific training in the Global North to provide the answers for the Global South. This is of course a gross generalisation because various sections of the WHO have gone through extraordinary lengths to engage with the Global South and ensure that countries increasingly have a pivotal role in the implementation of their own health policy and strategies. The Wellcome Trust has also actively explored models of more direct engagement with research institution located in the Global South. The point, however, is correct in its generality, and the general case could be levelled at many multilateral agencies, funders and governments in the Global North who (potentially unwittingly) use international aid as a device to maintain their domination of science. Ndlovu-Gatsheni described the situation

in terms of an 'asymmetrical global power structure that prevents the possibilities of meaningful development in the Global South'.[14]

The Global South desperately needs good, well-funded science; it is facing an existential crisis in the demand and supply side of that science. There is an opportunity to engage more effectively with the growing, if disempowered, talent in the Global South to support the building of enabling environments to raise the leadership, quality and volume of home grown, contextually driven and sustainable solutions. There are some very preliminary models to support this,[3] and waiting for trickle-down science to work will only exacerbate the crisis.

Acknowledgements The authors would like to thank Vivian Lin, Gabriel Leung, Emma Rhule, Michelle Remme, Sabina Rashid, Abdul Ghaffar, Lola Adedokun, Barbara McPake and participants of the LEAP Forum and roundtable discussion on global health and global health think tanks at UNU-IIGH-12 April 2019.

Contributors PA and DDR conceived the idea, wrote and edited subsequent drafts and approved the final submission. DDR wrote the first draft.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No additional data are available.

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