obesities would be a relevant first step towards a much needed paradigm shift.

J-PD is the Scientific Director of the International Chair on Cardiometabolic Risk supported by the Fondation de l'Université Laval and is the co-chair holder of the Chaire de recherche en santé durable funded by Fonds de recherche du Québec—Santé. Research from J-PD is currently supported by the Canadian Institutes of Health Research (foundation grant FDN-167278). J-PD reports receiving consulting fees from Inversago and honoraria from Rockpointe for participation as a speaker at a Novo Nordisk sponsored symposium held at American Heart Association's annual meeting 2022.

Jean-Pierre Després
jean-pierre.despres.ciussscn@ssss.gouv.qc.ca

VITAM—Centre de recherche en santé durable, Centre intégré universitaire de santé et services sociaux de la Capitale-Nationale, Québec City G1J 2G1, QC, Canada; Department of Kinesiology, Faculty of Medicine, Université Laval, Québec City, QC, Canada; Centre de recherche de l'Institut universitaire de cardiologie et de pneumologie de Québec, Université Laval, Québec City, QC, Canada

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The PEN-Plus Partnership: addressing severe chronic non-communicable diseases among the poorest billion

Published **Online** May 3, 2023
https://doi.org/10.1016/S2213-8587(23)00118-3

For more on the **NCDI Poverty Network** see https://www.ncdipoverty.org/

The number of people living in extreme material poverty (around 1 billion) has remained remarkably persistent over the past two centuries.[1] During the period of the Millennium Development Goals (2000–15), world leaders were focused on improving the lives of this population and treating infectious diseases associated with poverty was seen as one of the most effective ways to promote health and economic progress. Unfortunately, non-infectious diseases , even severe ones, were left out of calls for global solidarity and development financing.

Between 2015 and 2020, the *Lancet* Commission on reframing non-communicable diseases and injuries (NCDIs) for the poorest billion attempted to remedy this injustice by addressing the intersection of extreme poverty and non-infectious conditions.[2] The Commission found that around half of the burden of NCDIs among the world's poorest people was in children and young adults. Because of the diversity of causes, relatively little of this burden was preventable by addressing behavioural risk factors, but much of the burden could be avoided through treatment. The Commission concluded that integrated teams using shared infrastructure (often led by mid-level providers) could deliver these treatments even in highly constrained health systems.

In 2020, the NCDI Poverty Network was established to implement the Commission's recommendations to broaden the non-communicable disease (NCD) agenda in the interest of equity. The network now includes 22 lower-income countries with national NCDI poverty commissions (figure).

National NCDI poverty commissions have generally prioritised interventions to address severe chronic NCDs such as type 1 diabetes, rheumatic and congenital heart disease, and sickle cell disease. These four conditions alone are responsible for around 150 000 avoidable deaths per year among the world's poorest people, largely occurring among children and young adults. Additionally, most of the medications needed to manage these conditions (such as insulin, penicillin, furosemide, angiotensin-converting enzyme inhibitors, β blockers, warfarin, and hydroxyurea) are low-cost, generically produced, and have been used for decades.

Care for severe chronic NCDs in lower-income countries is generally restricted to tertiary-care facilities in large urban centres with specialist physicians. The medications used to treat these conditions have

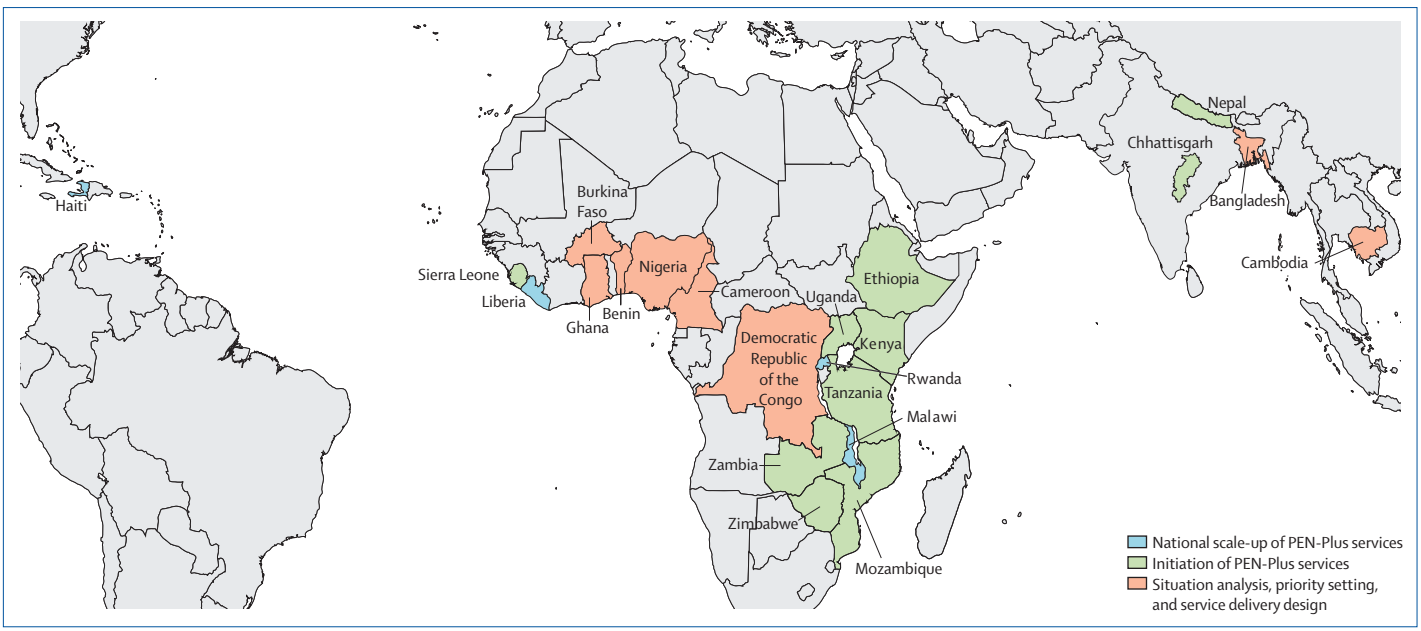

Figure: **NCDI Poverty Network and PEN-Plus participation, April 2023**
NCDI=non-communicable diseases and injuries. PEN=package of essential non-communicable diseases interventions.

narrow therapeutic windows and might be considered dangerous to prescribe by generalist providers. Public health systems with few health-care workers have found it difficult to justify disease-specific clinics for relatively uncommon conditions. As a result, most of the population, which is living in rural or impoverished regions, goes undiagnosed and untreated.

A plan to increase access to care for NCDs had, however, been introduced by WHO in 2010. This plan was the WHO Package of Essential NCD Interventions (WHO PEN), which supported integrated case management for common conditions such as hypertension, asthma, and type 2 diabetes at primary health centres. By 2020, WHO PEN had been introduced in more than 30 countries, but gaps remained in integrated care for severe chronic NCDs.[3] For example, WHO PEN did not address management of insulin, heart failure medications, or hydroxyurea.

Beginning in the late 2000s, several rural district hospitals in Rwanda developed a strategy to decentralise care for these severe chronic NCDs. These hospitals trained nurses to provide outpatient services such as focused point-of-care echocardiography, medication management, and psychosocial support using shared space and data systems.[4] Subsequently, these same hospitals became teaching facilities that enabled the scale-up of these integrated services for severe chronic NCDs to all 42 first-level hospitals in the country.[5] Drawing on this experience, similar programmes were begun in Malawi, Haiti, and Liberia. And in 2018, WHO's Regional Office for Africa began to recognise this approach as the Package of Essential NCD Interventions-Plus (PEN-Plus).[6]

PEN-Plus was designed to strengthen outpatient care for severe chronic NCDs at intermediate-level facilities such as district hospitals. These facilities and their associated health centres are the backbone of primary health-care systems in many lower-income countries. PEN-Plus takes an equity-driven approach by first addressing severe conditions among the rural and urban poor. At the same time, PEN-Plus builds capacity to train, mentor, and supervise health workers at lower-level facilities, strengthening WHO PEN and chronic care decentralisation and integration for common NCDs.

In August, 2022, the 47 countries of WHO's African Region approved a resolution and strategy to achieve high-levels of PEN-Plus coverage by 2030.[7] 3 weeks later, a global PEN-Plus Partnership was launched as an initiative of the NCDI Poverty Network. This global partnership includes leading organisations focused on childhood heart disease, diabetes, and sickle cell disease working together with WHO and UNICEF to dramatically increase the number of the poorest

children and young adults on high-quality treatment for these three conditions and other severe chronic NCDs by the end of the decade. With major support from the Leona M and Harry B Helmsley Charitable Trust, PEN-Plus programmes were initiated in ten new countries—Sierra Leone, Tanzania, Uganda, Ethiopia, Kenya, Mozambique, Zambia, Zimbabwe, Nepal, and India (Chhattisgarh State)—in 2022. Additionally, WHO is developing an implementation framework to expand PEN-Plus initiation to 22 more countries.

Major challenges for the PEN-Plus Partnership include training health-care providers, alignment of disease-specific initiatives, and fundraising at both global and national levels.

Training of PEN-Plus providers is challenging because it requires at least 3 months of precepted clinical practice and thus cannot be scaled as quickly as didactic teaching. E-learning modules are being developed to allow complementary independent study. PEN-Plus initiation plans depend, however, on the effort of specialists such as family medicine physicians, internists, paediatricians, endocrinologists, haematologists, and cardiologists to support the development of mid-level provider master trainers. These mid-level master trainers can subsequently train other mid-level providers to enable PEN-Plus expansion in their region. In addition to training, specialists remain important for referral services, ongoing mentorship, quality assurance, quality improvement, and continuous professional education. PEN-Plus strategies must therefore support expansion of the specialist workforce and prepare specialists to embrace a public health function beyond tertiary centres.

Several disease-specific initiatives are already working to expand care for severe chronic NCDs. However, these initiatives have revealed that it is challenging to decentralise services within public facilities in highly constrained health systems without an integrated approach. To promote a coordinated response, the PEN-Plus Partnership has organised global working groups and supported the development of government-led national PEN-Plus operational plans. WHO is also working to encourage donors to align their efforts around this integrated strategy to embed care for severe chronic NCDs within public health systems.

PEN-Plus programmes in several low-income countries have demonstrated the feasibility of decentralising integrated care for severe chronic NCDs. Now is the time to expand these efforts. A lack of resources remains the major challenge for an equitable response to the intersection of extreme poverty and severe chronic NCDs. As demonstrated by The Lancet *NCDI Poverty Commission*, the poorest countries—many of which are victims of historical injustice—cannot afford essential health services on their own. Some lower-middle income countries could do more to include management of severe chronic NCDs in national health benefit packages. But global solidarity is still urgently needed from philanthropy, the private sector, governments, and the community.

By aligning the passion of people affected directly by conditions such type 1 diabetes, congenital and rheumatic heart disease, and sickle cell disease, the PEN-Plus Partnership hopes to mobilise the external resources needed to end one of the great and enduring tragedies in the world today.

We declare no competing interests. The PEN-Plus Partnership is supported by grants from the Leona M and Harry B Helmsley Charitable Trust and the JDRF.

Gene Bukhman, Ana Mocumbi, Emily Wroe, Neil Gupta, Luwei Pearson, Raoul Bermejo, Jean Marie Dangou, Matshidiso Moeti

gbukhman@bwh.harvard.edu

Center for Integration Science in Global Health Equity, Brigham and Women's Hospital, Boston, MA 02115, USA (GB, EW, NG); Program in Global Noncommunicable Disease and Social Change, Harvard Medical School, Boston, MA, USA (GB, EW, NG); NCD Synergies Project, Partners In Health, Boston, MA, USA (GB, EW, NG); NCDI Poverty Network, Boston, MA, USA (GB, EW, NG); NCDI Poverty Network, Maputo, Mozambique (AM); Universidade Eduardo Mondlane, Maputo, Mozambique (AM); Instituto Nacional de Saúde, Marracuene, Mozambique (AM); United Nations Children's Fund, New York, NY, USA (LP, RB); WHO Regional Office for Africa, Brazzaville, Congo (JMD, MM)

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