

88% for the conventional group). Atraumatic needles can be up to approximately three times more expensive than conventional needles.<sup>3,10,11</sup> However, Nath and colleagues found that compared with patients in the conventional needle group, patients in the atraumatic needle group had a lower prevalence of headache and fewer patients needed to return to hospital or required epidural blood patches, which could result in lower direct and indirect costs for society.<sup>12</sup> With a number needed to treat to prevent harm of five, changing to atraumatic needles would have major benefits.

Lumbar puncture is an extremely common procedure, thus more research is needed. The study by Nath and coworkers highlights differences in the interpretation and management of patients with complications after lumbar puncture. The proportion of patients with postdural puncture headache, nerve root irritation, and who required treatment with epidural blood patches varied substantially between studies included in the meta-analysis. Studies should define postdural puncture symptoms, using patient-reported outcome measurements, and establish when and how to treat these patients to further reduce the effect of lumbar puncture complications.

The most important step is easy to achieve: clinicians should start using atraumatic needles for lumbar punctures. Nath and colleagues have armed us with the evidence to phase out conventional needles and reduce harm to our patients. We need to change practice.

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## Addressing social determinants to end tuberculosis



Leave no one behind. This is the overarching pledge of the Sustainable Development Goals; a pledge that is far from being realised. In 2016, more than 4 million people with tuberculosis were estimated to be undiagnosed or their care and treatment were unknown.<sup>1</sup> In the same year, nearly a fifth of the people who were diagnosed and known to be treated for tuberculosis had adverse outcomes, including 1.3 million deaths.<sup>1</sup> One reason that millions of people affected by tuberculosis are left behind is an absence of coordinated, international action to combat poverty and inequality.

Despite renewed interest in addressing the social determinants of tuberculosis, there remains a stark

global disparity in disease burden and access to care.<sup>2</sup> Low-income and middle-income countries (LMICs) bear the highest tuberculosis burden<sup>1</sup> and people with tuberculosis are often vulnerable and impoverished.<sup>3</sup> Conversely, in high-income countries, improvements in living conditions, increased social expenditure per person, and strategies to address the social determinants of health have been associated with decreased tuberculosis prevalence.<sup>4–6</sup> WHO's 2015 End TB Strategy acknowledges the need to reduce inequalities in tuberculosis prevention and care, including through provision of social protection and poverty alleviation for households affected by tuberculosis.<sup>7</sup>

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For the past two decades, we, the Innovation for Health and Development (IFHAD) team, have been working with impoverished periurban shantytown communities of Callao, Peru, to generate evidence on the feasibility, acceptability, and impact of socioeconomic support for people affected by tuberculosis. Our cohort study of households affected by tuberculosis defined a threshold above which costs of accessing “free” tuberculosis care became catastrophic, predicting loss to follow-up, treatment failure, treatment non-completion, tuberculosis recurrence, and death.<sup>3</sup> This threshold was endorsed in the End TB Strategy, which mandated that “zero TB-affected families should face catastrophic costs by 2025”.<sup>7</sup> However, little rigorous evidence is available to guide cost mitigation strategies for tuberculosis-affected households.

The Innovative Socioeconomic Interventions Against Tuberculosis (ISIAT) project addressed this knowledge gap by offering a panel of diverse psychosocial and economic support to enhance access to tuberculosis care and increase prevention and cure.<sup>8</sup> Education, community mobilisation, psychological and social support were integrated with poverty-reduction interventions, including food and cash transfers, linkage to universal health coverage, microcredit, microenterprise, and vocational training. Implementation increased successful tuberculosis treatment completion by patients with tuberculosis and preventive therapy completion by their household contacts.<sup>8</sup>

The most acceptable, feasible components of ISIAT were then combined into a standardised intervention that consisted of integrated social support (household visits and “TB Clubs” involving peer-led mutual support groups) and economic support (conditional cash transfers), evaluated in the Household-Randomised Evaluation of a Socioeconomic Intervention to Prevent Tuberculosis (HRESIPT).<sup>9</sup> HRESIPT showed that patients offered the intervention were more likely to achieve treatment success,<sup>9</sup> their contacts more likely to initiate preventive therapy,<sup>10</sup> and the household less likely to incur catastrophic costs.<sup>11</sup> The intervention was simplified further, including relaxation of cash transfer conditionality, a stronger focus on participant empowerment, and consolidation of a civil society of “tuberculosis survivors” who provide improved peer support to affected households. The impact and cost-effectiveness on long-term cure, tuberculosis case-finding, and risk-targeted tuberculosis prevention<sup>12</sup> are being assessed in the Community Randomized Evaluation of a Socioeconomic Intervention to Prevent Tuberculosis (CRESIPT) trial. CRESIPT’s results will be instructive, but in the meantime important questions remain largely unaddressed.

First, while socioeconomic support for tuberculosis-affected households has had positive impacts on cure and prevention in a few settings,<sup>13-15</sup> including Peru,<sup>8-11,16,17</sup> its wider transferability is unknown. Socioeconomic interventions are likely to benefit from adaptation to, and evaluation in, settings with diverse patient demographics (eg, rates of poverty, substance use, HIV, and tuberculosis drug resistance), health and social care systems, and infrastructure.

Second, current global policies focus on providing tuberculosis-affected households with economic support to prevent catastrophic costs associated with treatment, travel to receive care, and time off work. Indeed, economic incentives and enablers for tuberculosis have a long history. However, it is striking that in ISIAT, HRESIPT, and CRESIPT, participants consistently valued social support more highly than economic support.<sup>16,17</sup> This is important because social support is, generally, much less expensive than economic support but can be more labour intensive. Social or psychosocial support might have a similar impact on tuberculosis prevention and outcome measures to economic or combined support.<sup>15</sup> Unlike economic support, which has its own target in



Mariana Pizarro/Reuters

Callao, Peru

the End TB Strategy in the form of the catastrophic costs, social support does not have a global indicator and is in danger of being overlooked. Furthermore, there has, to our knowledge, been no robust trial to evaluate social versus economic versus socioeconomic support versus existing standard of care for tuberculosis-affected households. The results from Peru highlight the potential value of engaging tuberculosis-affected households and civil society to establish what type of socioeconomic support communities would find valuable, acceptable, locally appropriate, and sustainable.

Third, cost-opportunity and cost-effectiveness of socioeconomic support for tuberculosis-affected households are likely to depend on targeted strategies that focus on specific tuberculosis-affected beneficiaries, but relevant analyses are lacking. There is an evidence gap about the optimal allocation of already scarce resources. For example, it is unknown whether a fairly expensive, labour-intensive intervention for high-risk groups (eg, people who are homeless, incarcerated, living in extreme poverty, or have multidrug-resistant tuberculosis) would be more cost-effective and impactful on rates of tuberculosis treatment success in national tuberculosis programmes than a cheaper, simpler intervention that supported all tuberculosis-affected households.

Fourth, it is not known how a disease-orientated approach that provides tuberculosis-specific support focused on tuberculosis-affected households, as in ISIAT, HRESIPT and CRESIPT, might enhance and be complemented by tuberculosis-sensitive approaches. Tuberculosis-specific approaches focus on supporting households after diagnosis and throughout treatment, and their success is measured by short-term, predominantly tuberculosis-related indicators. Tuberculosis-sensitive approaches involve strengthening national social protection strategies and adapting them to be more inclusive to people at risk of tuberculosis infection and disease, such as Brazil's Bolsa Família social welfare programme, which has been associated with improved tuberculosis treatment outcomes and reduced incidence.<sup>18,19</sup> Although initially expensive,<sup>20</sup> tuberculosis-sensitive interventions could lead to improved long-term population outcomes in health (including tuberculosis), food security, and poverty alleviation. Thus, a combination of tuberculosis-sensitive and tuberculosis-specific support is likely to be the most impactful

approach to comprehensively address the social determinants of tuberculosis.

Finally, consideration should be given to how socioeconomic support would be funded (eg, governmental, charitable, crowd-sourcing), by whom it will be delivered (eg, national tuberculosis programmes, the third sector, civil society), how it might be improved by streamlined service delivery (eg, ambulatory care, decentralisation, out-of-hours services), and the timeframes, indicators, and outcome measures used to judge its success (eg, tuberculosis-related, broader health outcomes, psychosocial and economic impact).

Socioeconomic interventions for tuberculosis can be achievable and impactful<sup>8,9</sup> but require local adaptation tailored to meet the needs of diverse populations and underserved groups. To end tuberculosis, medicines must be integrated with socioeconomic interventions that fight poverty.

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## The Lancet Commission on tuberculosis: building a tuberculosis-free world

The Sustainable Development Goals have prioritised ending the epidemic of tuberculosis by 2030. We are therefore at a critical juncture in implementing efforts to control and eliminate tuberculosis. Current efforts have averted 56 million deaths since 2000.<sup>1</sup> We also have better diagnostic tools and the promise of a few new, potent agents in the pipeline.<sup>2</sup> Yet tuberculosis remains the leading source of infectious disease deaths globally, responsible for 1.7 million deaths in 2016.<sup>1</sup> The UN's High-Level Meeting on Tuberculosis, due to take place in New York, USA, later in 2018, represents a unique opportunity to secure a commitment from heads of state and governments for a coordinated global response to end the epidemic. The *Lancet* Commission on tuberculosis aims to identify decisive global and country-specific actions necessary to ensure the success of that response. These recommendations will address the following priorities.

First and foremost, the global community needs to pivot to bold new strategies to address the tremendous burden of disease. We are not starting from scratch when it comes to the prevention and treatment of tuberculosis.<sup>3</sup> Although new tools and innovations are urgently needed,

we must not lose sight of what we already know works. Increasing access to molecular diagnostics for all patients and tuberculosis preventive therapy for those at highest risk for tuberculosis disease need to be prioritised. However, we can no longer rely on one-size-fits-all approaches to ending tuberculosis; current efforts are missing millions of people with tuberculosis every year. This Commission will explore how countries can improve outcomes and optimise use of available resources by realigning them to ensure that all tuberculosis care is people-centred and by prioritising interventions that increase efficiencies in the delivery of tuberculosis services. Without urgent action, drug-resistant tuberculosis will be the single largest cause of mortality from antimicrobial resistance (AMR) by 2050, responsible for a quarter of the projected 10 million annual AMR-related deaths.<sup>4</sup> Therefore, this Commission will highlight how scaling up evidence-based strategies to address drug-resistant tuberculosis must be a high priority if we are serious about addressing this global health security threat.

Second, creating an enabling environment is essential to successfully ending tuberculosis. In most high-burden countries, tuberculosis efforts are undermined by social,