

crippling, strategies and design novel structures that leverage the power of polymathy. By allowing polymathic thinking to flourish, society will be in a much better position to reach the innovation required to tackle our most pressing challenges. The choice is ours to make.

I declare no competing interests.

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## A unified approach to loneliness

Globally, there are growing concerns about rates and consequences of loneliness, especially among older adults. In response, 2018 saw the launch of a UK loneliness strategy and the first minister for loneliness in the world appointed. In the USA, the National Academies of Sciences, Engineering, and Medicine set up a special committee to examine the problem.<sup>1</sup> Demographic shifts suggest that the numbers experiencing loneliness are likely to increase.

However, it is important to recognise that most older adults are not chronically lonely and loneliness is also experienced by other age groups, especially young adults. Large gaps remain in our understanding of loneliness, rates and drivers of loneliness in different populations, its

effect on health and wellbeing, and evidence on effective interventions. We believe loneliness can be defined as a subjective negative experience that results from inadequate meaningful connections, but neither definitions nor assessments of loneliness have achieved wide-scale consensus. The variety of scales and single-item measures of loneliness used to date should be standardised to advance knowledge with an agreed common set of valid measures.

Currently, there is inadequate causal evidence of the consequences of loneliness but associations with poor health and wellbeing have been established. The evidence shows associations with depression, anxiety, non-communicable diseases, poor health behaviours, stress, sleep, cognition, and premature mortality (with the evidence especially strong for depression).<sup>2</sup> However, further work is required to establish causality between loneliness and specific health outcomes, and vice versa, as well as to investigate social consequences that remain unclear.

Structural and cultural changes (eg, technology and social media use) and societal forces (eg, perceptions and expectations around ageing and ageism) and their effect on loneliness also need to be better understood. The evidence base for loneliness interventions is characterised by poorly constructed trials with small samples, a lack of theoretical frameworks, undefined target groups, heterogeneous measures of loneliness, and short follow-up periods. Within this context the charity, voluntary or community sectors, and government are delivering programmes, often with inadequate empirical evidence.

Key therapeutic elements of interventions must be identified, as well as their optimal intensity, frequency, and duration. Although inevitably more complex to implement and evaluate, evidence indicates that interventions

must be tailored and matched to specific root causes of loneliness. This Correspondence is based on discussions from a meeting in Belfast, held in December, 2018, of international researchers that led to the establishment of an International Loneliness and Social Isolation research Network (I-LINK) to drive this work. Research, policy, and practice can only benefit from a greater pooling of expertise and knowledge exchange to address this global challenge.

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