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Projecting Parkinson's disease burden

More advanced methods may enable better modelling

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Parkinson's disease is a considerable health problem owing to its high and rising global prevalence, its progressively degenerative nature, and its wide range of symptoms. In 2019 more than 8.5 million people worldwide were living with Parkinson's disease, a number that has more than doubled in the past 25 years.[1] Parkinson's disease has a severe impact on individuals and their families, including social consequences and economic costs.[2] Tackling this complex disease requires a multifactorial approach including increased awareness, improved diagnostics, better treatments, and ongoing research to find a cure.

Projecting the future number of people with Parkinson's disease is important for several reasons. Accurate projections enable appropriate allocation of healthcare resources and a better understanding of demand for specialists, drug treatments, rehabilitation, and long term care, preventing shortages that could lead to delayed diagnoses, inadequate treatment choices, and diminished health related quality of life for patients. Projections also inform targeted interventions, early diagnosis efforts, and public health prevention and management strategies. Understanding the growing prevalence of Parkinson's disease underscores the need for continued research into its causes, treatments, and potential cures, guiding funding towards the most promising areas. Projected increases in Parkinson's disease prevalence provide quantifiable data to support advocacy efforts, securing greater attention and resources for research, care, and support services including better funding.[3] By understanding the future burden of Parkinson's disease, we can better prepare to meet the challenges ahead and improve outcomes for people affected by this debilitating disease.

The modelling study of Su and colleagues (doi:10.1136/bmj-2024-080952) projects a substantial increase in Parkinson's disease cases globally by 2050, reaching 25 million individuals, a doubling from 2021.[4] Population ageing was identified as the primary driver, followed by population growth. The overall prevalence is predicted to increase by 76%, and age standardised prevalence will also rise by 55%. The study reports that the largest increases will occur in East Asia and among the oldest age group (≥80 years). It also highlights differences by Socio-demographic Index, a composite measure of development based on income per capita, educational attainment, and fertility rates. The Socio-demographic Index is widely used in global health research to assess how social and economic factors influence disease burden.[5] The study also estimates the impact of lifestyle factors on future Parkinson's disease prevalence by using population attributable fractions.[4] It suggests that increasing physical activity could reduce the number of cases, whereas smoking cessation may lead to a rise in prevalence. The study concludes that Parkinson's disease will pose a greater public health challenge by 2050, emphasising the need for increased research, informed policies, and resource allocation.

Given the resource and policy implications, modelling of future disease burden must mirror what might happen in reality as closely as possible. Researchers need to consider several methodological factors when projecting future case numbers of chronic conditions that may allow for more accurate estimates. Some researchers are now moving beyond simple extrapolation of prevalence to use the more robust illness-death model.[6] Prevalence extrapolation is limited because it assumes that current prevalence patterns will remain unchanged. It ignores key factors such as changes in disease incidence (new cases) and mortality rates among individuals with and without Parkinson's disease. As prevalence results from a complex interplay between incidence and mortality, failing to account for these dynamics can lead to misleading projections.[7]

By contrast, the illness-death model provides a more accurate representation of disease dynamics by incorporating transitions between different health states. Specifically, it models movement from a healthy state to Parkinson's disease, from a healthy state to death (without developing Parkinson's disease), and from Parkinson's disease to death. By explicitly accounting for these transitions, projections based on the illness-death model are more realistic and better suited for long term healthcare planning. The advantage of this approach has been shown in a recent study comparing different projection methods for another age related chronic disease.[8] The study found that prevalence extrapolation substantially underestimates future case numbers, failing to capture the increasing incidence and evolving mortality trends. Given that Su and colleagues used prevalence extrapolation in their Parkinson's disease projections, their estimates are likely to be similarly underestimated.

The estimates of population attributable fraction rely on strong causal assumptions, implying that modification of risk factors directly translates to proportional changes in disease burden. However, such estimates often oversimplify complex disease processes, ignoring factors such as incomplete risk factor elimination, latency periods, and real world feasibility of interventions.[9] Although population impact fractions attempt to overcome this by modelling partial exposure reductions, they still assume that intervention effects mirror observational associations, which may not hold as a result of confounding, reverse causation, or effect heterogeneity.[10] More robust causal modelling is needed to produce realistic and actionable projections.

Although the projections by Su and colleagues highlight an urgent public health challenge,[4] more methodologically advanced approaches that integrate incidence and mortality dynamics—such as the illness-death model—allow for better forecasting and ensure that healthcare systems, policy makers, and researchers are equipped with reliable data for long term planning. As Parkinson's disease cases are expected to rise sharply, adopting rigorous modelling techniques is essential to guide resource allocation, inform policy decisions, and advance research efforts. Future projections should prioritise methods that capture the true complexity of chronic disease progression, ultimately leading to more effective interventions and improved patient outcomes.

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