Neurodegenerative Diseases and Socioeconomic Disparities: Analyzing Healthcare Access, Disease Outcomes, and Regulatory Measures

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This paper reviews the current research on neurodegenerative diseases and explores how socioeconomic disparities influence the recognition and management of these conditions. Using data on healthcare access, disease outcomes, environmental factors, and economic influences, the paper advocates for policy reforms to enhance healthcare access and equity for underserved populations in light of rising life expectancies. The paper emphasizes the challenges faced by individuals of lower socioeconomic status (SES) towards timely diagnoses and/or treatments for neurodegenerative diseases, highlighting the broader goal of addressing healthcare disparities.

Keywords

Neurodegenerative Disease (NDDs) • Neuroinflammation • Socioeconomic Status (SES) • Parkinson's Disease (PD) • Multiple Sclerosis (MS)

Background

Neurodegenerative diseases (NDDs) are defined as disorders that lead to the progressive degeneration of central nervous system cells, resulting in a diminished ability to engage in activities of daily living (ADLs) (National Cancer Institute, n.d.). The term 'degenerative' distinguishes these diseases from others, as they are chronic and progressive, with few effective treatments available (National Cancer Institute, n.d.). Furthermore, the US population of those over 65 years old is projected to increase from 48 million to 88 million by 2050 (National Institutes of Health, n.d.). Current treatments for NDDs are focused on symptom management, requiring a long-term doctor-patient relationship. For instance, in 2017, approximately one million individuals were diagnosed with Parkinson's Disease,

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resulting in a personal economic burden estimated at around $52 billion across the United States (Yang et al., 2020). Fortunately, most of the individuals in that study were eligible for Medicare, reducing their economic burden (Gao & Hong, 2008). Medicare eligibility is typically determined by factors such as being 65 or older, having worked in Medicare-covered employment for at least 10 years, and maintaining U.S. citizenship or legal residency for at least five years (California Health Advocates, n.d.). However, for those who fall outside of these criteria, such as individuals in the uninsured population—access to necessary healthcare, including treatments for neurodegenerative diseases, becomes a significant challenge. The uninsured population consists of individuals who lack health insurance, a characteristic often tied to socioeconomic status (SES) (United States Census Bureau, n.d.). Socioeconomic statistical data suggest that the prognosis for uninsured patients with NDDs is unfavorable, likely due to delayed healthcare access associated with lower socioeconomic status (Yang et al., 2020). Due to the projected increase in the U.S. 65-or-older population and economic burdens regarding NDDs, NDDs in the uninsured population could become a leading killer (Seifi et al., 2021). Ensuring that healthcare access via low/no cost healthcare clinics is expanded to provide basic plus advanced treatment, maintaining disease prognosis and medication accessibility, and controlling environmental factors could increase the life expectancy for the millions of uninsured.

Healthcare Access: Low/No Cost Healthcare Facilities

Healthcare access in the U.S. shouldn't be one-sided, where those with expendable income or adequate insurance receive the treatment they need, while those without these resources miss out on the care they deserve. SES is a way to describe an individual based on their job, income, or education (National Cancer Institution, n.d.). Unfortunately, lower SES tends to factor from discrimination and length of schooling (National Academies of Sciences, Engineering, and Medicine, 2017). Fortunately, data from around 775 low/no cost health care clinics show that 5.8 million patients benefit from their basic services (Thompson, 2023). These healthcare clinics offer essential services such as lab work, physical check-ups, and prescriptions, similar to those available at primary care facilities, often at no or very low cost to patients. What if these clinics gained the capability to offer more specialized services like Magnetic Resonance Imaging (MRI), Electroencephalograms (EEG), or even a team of neurologists to help these patients understand what they might be dealing with? The Medical University of South Carolina wanted to tackle this problem by establishing the Dream Center Neurology Clinic which has provided free routine neurologic care to over 250 patients since its inauguration (Taylor et al., 2015). Services offered by this type of clinic should be expanded to include current low/no-cost healthcare facilities. This is because approximately 1 in 3 people suffer from a neurological disorder (World Health Organization, n.d.), and uninsured or underprivileged individuals are not exempt from these conditions. With this in mind, a key question that arises is funding, which would require increased federal or state funding towards these low/no cost clinics since the benefits from them are extremely valuable. Increasing funding should increase access to healthcare for a wider variety of individuals since neurological treatment tends to be extensive and expensive (Callaghan et al., 2019).

Disease Outcomes: Diseases Prognosis and Medication Accessibility

Once a disease has been discovered in a person, a strict regimen consisting of medications, therapy, and/or consistent doctor visits will help dictate the course of that disease. Unfortunately, older individuals

who classify as lower SES may discover their disease in the emergency room and tend to experience a heavier disease burden (Seifi et al., 2021). This could be from the lack of pursuing preventative care or routine screenings when compared to an individual from a higher SES (McMaughan et al., 2020). In numerous lower SES aging adults, cost tends to be the primary reason for reduced access to healthcare (McMaughan et al., 2020). Furthermore, disease prognosis isn't highly maintained in lower SES individuals in underserved populations due to the high volume of patients in low/no cost clinics or financial burdens. For example, multiple sclerosis (MS), is a neurodegenerative disease in which the immune system attacks the protective covering (myelin) of neurons (Mayo Foundation for Medical Education and Research, 2022). This disease could have symptoms such as vision loss, fatigue, muscle spasms, weakness, or even paralysis if not treated. MS impacts more than 2.8 million people globally and stands as a major cause of disability among adults (Mey et al., 2023). Neurologists may utilize an MRI, lumbar puncture (to analyze atypical immune responses), or a neurological exam to diagnose patients with MS. Once a diagnosis of MS is presented, treatment consists of strong medications and/or lifestyle changes (Mayo Foundation for Medical Education and Research, 2022). These medications can cost upwards of $60,000 per year without insurance (Hartung et al., 2015). Individuals who are uninsured or have lower SES may experience MS symptoms without receiving a diagnosis or treatment plan, potentially shortening their life expectancy.

Additionally, is pursuing a diagnosis worthwhile if the treatment is unaffordable? Broadly speaking, half of medicine tends to fall toward diagnosis while the other half tends to fall toward treatment. The 2.8 million individuals affected by MS might not fully represent the extent of the disease, as many people with lower socioeconomic status may lack access to a neurologist for diagnosis or may not have the financial means to afford diagnostic testing. Overall, enhancing access to neurodegenerative medications to foster competition among pharmaceutical companies could drive down drug prices. Along with competition, expanding neurological care for individuals with lower socioeconomic status or those uninsured could significantly improve life expectancy and ensure better access to necessary treatments.

Environmental Factors: Potential Prevention Before Detection?

As research on neurodegenerative diseases advances, neuroinflammation is increasingly correlated to the eventual detection of degenerative neurological disorders (Zhang et al., 2023). Neuroinflammation can arise from brain injury, infections, toxicity, or autoimmunity. Brain injury, infections, and autoimmunity tend to be determined by lifestyle choices or genetics (McKee et al., 2016). On the other hand, toxicity from an individual's environment is a preventable cause of neuroinflammation because the air we breathe, food we eat, or water we drink can contain numerous chemicals/bacteria if poorly maintained. U.S. Census data showcases that individuals from lower SES groups often reside in clustered communities (Benson, 2023), which are frequently located in areas with higher exposure to environmental pollutants (Hajat et al., 2021). For example, chemicals like paraquat (herbicide) or manganese (trace mineral) at higher concentrations could cause neurological impairment in a developing brain (Landrigan et al., 2005). Exposure to pollutants during childhood could lead to increased inflammation potentially triggering neuroinflammatory diseases later in life (Landrigan et al., 2005).

On the other hand, another article from the U.S. Census estimates that around 3.9 million children do not have health insurance (Mykyta et al., 2023) further limiting their doctor's visits

for annual workups (lab work, physical exams, etc.). These children could have greater potential to develop neurodegenerative diseases than their fellow peers (Landrigan et al., 2005). This could be from being born into a lower socioeconomic status continuing the cycle of halting educational completion leading to income and health inequality (National Academies of Sciences, Engineering, and Medicine, 2017.). Another factor that plays into the environmental influences of neuroinflammation on neurodegeneration is ongoing research between the gut-brain axis (Ashique et al., 2024). The gut-brain axis refers to the bidirectional communication between the enteric system (gut) and central nervous system (brain and spinal cord) through signaling from various gut bacteria (Carabotti et al., 2015). This provides further evidence that the food we eat can influence our brain, as gut bacteria, which are highly sensitive to our diets, play a significant role in our overall health (Bourdea-Julien et al., 2023). Individuals of lower SES who are uninsured tend to live in impoverished communities facing food insecurity and/or food deserts (low access to healthy foods alters the gut bacteria composition (Zhang, 2022). Preventing neuroinflammation can be possible by reducing poverty, and ensuring that a healthy diet is accessible to all, regardless of socioeconomic status. Additionally, maintaining and consistently updating the Federal Drug Administration (FDA) regulations on chemicals used in food production is crucial as new discoveries emerge.

Conclusion

Ultimately, securing equitable access to healthcare is crucial for individuals to receive regular checkups and treatment for diagnosed conditions, regardless of their socioeconomic status. As life expectancy increases, neurodegeneration becomes a growing challenge (Morris, 2013). As neurodegenerative diseases represent a relatively new area of medical research, treatment costs remain high, potentially limiting access to preventive and protective care for individuals with lower socioeconomic status or without insurance. Fortunately, this doesn't have to be the case. Healthcare access via low/no cost healthcare clinics has already helped millions in the U.S. (Thompson, 2023), and expanding them to provide neurology-related treatment would only be a valuable investment. Additionally, raising public awareness about the importance of a healthy diet could play a crucial role in preventing or delaying the onset of neurodegenerative diseases. Ensuring timely prognosis and accessible medications not only benefits the uninsured but also drives competition and demand, ultimately reducing overall medication costs. This would make neurodegenerative treatments more affordable to everyone. Creating environments that nurture neurological development, irrespective of socioeconomic status, could significantly alleviate the burden of neurodegenerative diseases on the uninsured population.

Notes

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