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COMMENTARY

Testing for dementia across the world

The world's population is rapidly aging. By 2050, the number of people over age 60 will reach 2 billion, almost double of the current population in that age group (12%–22%). Moreover, persons over the age of 80 will be more than triple, increasing from 125 to 434 million. The greatest growth will occur in low- and middle-income countries (LMICs) where 80% of the world's older people live (World Health Organization, 2019).

It is anticipated that the increase in older adults population will be associated with a significant rise in the incidence and prevalence of persons living with dementia. Due to the increased morbidity and mortality for those suffering with the illness and economic burden for each country, a current World Health Organization (WHO) goal is to develop the capacity to diagnose 50% of persons with dementia in 50% of countries by 2025. This capacity is needed for early diagnosis of dementia which can lead to early interventions (World Health Organization, 2018).

There are two general testing strategies for diagnosing dementia. The first strategy entails estimating premorbid cognitive abilities and administering cognitive tests to determine if a significant decline has occurred. This approach is typically used for patients with milder cognitive deficits which require a more comprehensive evaluation to determine cognitive decline. The second strategy is to administer a cognitive screen and determine if the patient's performance falls within the dementia range. Results can be used to diagnose dementia if scores are significantly lower than the cut-off score or generate a referral for more comprehensive testing.

In the Overman *et al.* (2021) article (UNESCO Institute for Statistics, 2017), the authors perform a systematic review and critique of tests and techniques to estimate premorbid intelligence in the elderly. They found that the majority of these tests are language-based such as reading irregularly spelled words, identifying real words from pseudo words, or vocabulary tests. These types of tests are useful for estimating premorbid functioning in normal or milder levels of dementia, but can substantially underestimate premorbid functioning for patients with moderate or more severe forms of dementia due to a significant decline in performance. Most of these tests also lacked data on psychometric properties. Additional challenges with these language-based tests include inappropriateness for illiterate patients, which number about 750 million worldwide (Apolinario, 2013), and patients with language deficits such as aphasics. Currently, language-based tests are only available in a few languages, typically in countries with strong economies.

The authors also report the potential strength of demographic equations formulas which demonstrated stability with increasing severity of dementia. However, this statement was based only on one study which was conducted in the USA. They also found that nonverbal measures are a poor estimate of premorbid abilities as these tests often assess for fluid intelligence that is typically impaired early in the dementia process. Although not reviewed in the analysis, the authors discourage informant-based approaches due to potential inaccuracies of responses provided by informants (World Population Review, n.d). Given the weaknesses of each strategy, the authors proposed that clinicians use a combination of word recognition and demographic equations for estimating premorbid abilities.

This article highlights the logistical difficulties in meeting WHO goals for dementia assessment.

There is a paucity of measures that estimate premorbid abilities and the psychometric properties of several of these measures have not been established. The most common type of measure is language-based which are only available in a few languages, primarily from countries with strong economies, and are not appropriate for illiterates and aphasics. Moreover, there are significant challenges in utilizing these types of language-based tests in LMIC where the vast majority of the world's older people live. First, there are large numbers of illiterate and low educated persons in LMIC (Graetz and Woyczynski, 2020; Ardila, 2010). Thus, reading-based tests would likely be a poor indicator of cognitive abilities as illiterate persons are able to function well in their own environment, and cognitive tests often correlate poorly with these abilities (Jorm, 2004). Second, language tests would not only have to be translated but also correlated with other cognitive measures to establish construct validity as a predictor of premorbid intellectual functioning. Most LMICs not only do not have existing validated measures of intellectual functioning, but they also do not have the resources for test development.

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These tests are generally population-based and require large sample sizes, thus are expensive to develop. Finally, language tests would have to be developed for a country's specific language or languages and normed on each population.

It is likely that there is no one test strategy that can accommodate WHO's worldwide dementia diagnoses goals. Test strategies will have to be determined by country as well as diagnostic setting, such as memory clinics versus general practitioner offices. More comprehensive testing can be conducted in university settings of higher resource countries, where cognitive screens would be more practical for physician offices.

For LMIC, a more practical strategy would be to use a combination of informant-based tools to determine a decline in functioning and cognitive screens validated with samples with low education levels or who are illiterate. One such informant-based tool is the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) which assesses for cognitive decline by comparing premorbid functional abilities with current functioning (Morrell *et al.*, 2019). In this strategy, estimates of premorbid abilities are functional and individualized; thus, test scores with this measure do not require studies to correlate it with measures of cognitive functioning that are population-based to determine a baseline. Another advantage is IQCODE estimates of premorbid functioning should not be impacted by a decline in cognitive abilities associated with dementia. Conversely, a disadvantage is that informant reports can be negatively impacted by caregiver burden or depressive symptoms in the patient (Overman *et al.*, 2021).

The IQCODE has been translated and studied in over 30 languages and Cochrane literature reviews, which include multicultural studies, reported adequate discriminatory properties for identifying dementia in the community (pooled sensitivity .80, specificity .84) (Quinn *et al.*, 2014), and hospital settings (pooled sensitivity .91, specificity .66) (Harrison *et al.*, 2015), and predicting the onset of dementia in 6–12 months (pooled sensitivities .75–.87, specificities .46–.87) (Harrison *et al.*, 2016). Despite its potential usefulness, review authors caution that the IQCODE is a screen and by itself would result in a relatively large numbers of inaccurate diagnoses.

To enhance diagnostic accuracy, it is recommended that functional assessment data be combined with a cognitive screen validated on low education and illiterate populations such as the Cross-Cultural Dementia Screen (Goudsmit *et al.*, 2017) or Rowland Universal Dementia Assessment Scale (RUDAS) (Nielsen and Jørgensen, 2020). This dual assessment strategy has demonstrated promise in studies using the IQCODE and RUDAS which has been found to be very effective in discriminating persons with dementia versus those with normal cognition in migrant (AUC .91) and Arabic (AUC .97) samples with low education levels and illiteracy (Goudsmit *et al.*, 2020; Nielsen *et al.*, 2016).

Despite the promising potential for this two-pronged strategy, challenges also exist for implementation. Similar to language-based premorbid estimates, these measures still have to be translated, adapted and normed for specific populations (Magklara *et al.*, 2019). For example, functional items would have to be culturally consistent with activities in everyday life. Hence, IQCODE item such as "remembering his/her address and telephone phone," or "following a story in a book or on TV" may not be appropriate for everyone in a given country and would have to be modified or eliminated and replaced with items that are consistent with everyday functioning. In addition, gender roles may differ significantly in cultures, and test items would have to address potential differences. However, it should be an easier process as it reduces the step of correlating the premorbid estimate measure with a validated measure of cognitive abilities based upon a populations' normal curve. In parallel, cognitive screens will also require translation and norming, however, tests such as the RUDAS which have been validated on persons who are illiterate or have low levels of education should demonstrate less bias in LMIC.

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