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The association between biopsychosocial factors and disability in a national health survey in South Africa

P. Naidoo, R. Sewpaul, A. Nyembezi, P. Reddy, K. Louw, R. Desai and D. J. Stein

Abstract

The association between psychosocial factors and disability is less clear. This study investigated the biological and psychosocial (employment and psychological distress) factors associated with level of disability in an adult sample in South Africa. Data were analysed from a cross-sectional survey among adults aged 18–64 (n = 4974). Multiple linear regression was used to investigate the associations of the selected variables with disability. The mean percentage score on the WHODAS scale of disability was 5.31% (95% CI: 4.74–5.88). Age (p < 0.001) and race (p = 0.0002) were significantly associated with disability, and history of stroke (β = 7.19, 95% CI: 3.19–11.20) and heart-related conditions (β = 2.08, 95% CI: [0.23–3.93]) showed positive associations. Of the psychosocial variables, psychological distress (β = 10.49 [8.63–12.35]) showed a strong positive association while employment (–1.62 [–2.36 to –0.88]) showed a negative association with disability. The association between demographic factors, medical conditions and increased disability confirms the findings in the literature. The finding that psychological distress is associated with increased disability has not been frequently reported. This study highlights specific psychosocial targets that may be usefully addressed by health policies and interventions in order to improve disability management.

Introduction

The estimated prevalence of disability in Southern Africa is 24.5%, higher than the world average of 15% (World Health Organization [WHO], 2011). The WHO (2001) defines disability as the outcome of the interaction between a person's health condition and the context in which the person lives, which occurs at the *body, person* and *societal levels*. Understanding disability within a Biopsychosocial (BPS) Model is therefore appropriate as it encapsulates the complex interaction of factors that result in varying levels of disability.

Non-communicable diseases (NCDs) which include stroke, heart disease, hypertension and diabetes are recognised as major causes of disability in low- and middle-income countries (LMICs) (Hoy et al., 2013; Nojilana et al., 2016). In South Africa (SA), a MIC, NCDs account for an estimated 16% of disability-adjusted life years (DALYs) (Norman, Matzopoulos, Groenewald, & Bradshaw, 2007). NCDs share common risk factors, such as high blood pressure, elevated blood glucose, and abnormal blood lipids (Maimela et al., 2016). A

leading cause of disability among adults is stroke (Gbiri, Olawale, & Isaac, 2015) and 80% of all stroke deaths occur in LMICs (Lekoubou, Nkoke, Dzudie, & Kengne, 2015). In SA, 75,000 strokes occur each year with a third of these fatal within the first month (Bertram, Jaswal, Van Wyk, Levitt, & Hofman, 2013). Type II diabetes also carries a high disease burden on SA with over 73,000 attributable DALYs (Bertram et al., 2013) Psychosocial factors, including psychological distress (PD) have also been associated with disability (Brenes et al., 2008; Merikangas et al., 2007; Okoro et al., 2009, 2011). Twelve-month prevalence of depression and anxiety disorders among SA adults was 4.9 and 8.1% respectively (Herman et al., 2009).

This study was located within the BPS Model of Health (Gallo & Luecken, 2008; Suls & Rothman, 2004). Based on a national adult sample, the study investigated the association of biological variables (age, sex, race, personal history of stroke and heart conditions, high blood pressure, blood glucose and cholesterol levels), psychosocial variables (employment status and psychological distress) and the outcome variable (disability).

Method
Participants and procedures
The study analysed data from the South African National Health and Nutrition Examination Survey (SANHANES), a household-based national survey (Shisana et al., 2014). Multi-stage disproportionate, stratified cluster sampling was used to select households within enumeration areas (EAs) stratified by province and locality type. All individuals within the 10,000 selected households were eligible to participate.

Data collection, in 2012, comprised interviews, physical examinations and collection of blood samples for clinical tests. The study received approval from the HSRC Research Ethics Committee (REC 6/16/11/11).

Measures
The degree of disability related difficulties in doing daily activities (outcome variable) was measured through self-report using the 12-item interviewer-administered WHO Disability Assessment Schedule (WHODAS 2.0) (WHO, 2010). WHODAS 2.0 measures health and disability at population level by assessing the level of functioning over the past month in six domains of life, namely, cognition, mobility, self-care, getting along with other people, life activities and participation in society. Respondents rate the level of difficulty they experience in doing various activities, from none to extreme or cannot do. Composite scores ranging from 0 to 48 are transformed into percentages (0–100%) (WHO, 2010). The Cronbach's alpha for WHODAS per cent score, in this study, was 0.9.

The biological variables, age group, sex, race, a personal history of stroke and heart conditions, high blood pressure, blood glucose and cholesterol levels; and the psychosocial variables, psychological distress and employment, were used as the independent variables.

Race allowed investigation of ongoing health disparities that have endured post-apartheid. Personal history of stroke and of heart disease were each based on respondents' self-report of having ever been told by a health professional that they had these conditions.

Respondents were classified as follows: (1) of having high blood pressure (HBP) if at least one of the following conditions were met: measured systolic blood pressure (SBP)>=140 mm Hg, diastolic blood pressure (DBP) ≥ 90 mm Hg or they reported currently taking medication for blood pressure; (2) of having high blood glucose levels if either their measured blood glucose level (HbA1C) was ≥ 6.5% or they reported currently taking medication for blood sugar; and (3) of having high cholesterol if either their serum total cholesterol exceeded 5 mmol/L or they reported having ever had their blood cholesterol checked and being told by a health professional that it was high.

PD was measured by the Kessler 10 (Kessler et al., 2002), a 10-item scale where scores exceeding 19 indicate a level of PD. The K10 has been validated for use in the SA context (Andersen et al., 2011). The Cronbach's alpha of the K10 in this study was 0.9.

Data analysis
Data were weighted to account for unequal sampling probabilities and to benchmark to 2012 mid-year population estimates. Adults aged 18–64 years who completed the questionnaire and clinical examinations were included in the analysis. Data were analysed using Stata 13.0 (Stata Corporation, College Station, USA). The mean percentage for level of disability measured by the WHODAS was presented for each category of the independent variables, with one-way ANOVA to determine significant differences between groups. A significance level of 0.05 was used. Simple and multiple linear regressions investigated the association of the independent variables with the WHODAS percentage score. Variables found to be significant in the bivariate models were used in the multiple regression, controlling for age, sex, race and employment status.

Results
Of the 4974 respondents (Table 1), 65.5% were female, and 69.9% were black African, 23.3% Coloured, 2.1% White and 4.7% Indian.

Overall 7.7% of respondents had a personal history of heart-related conditions; 2.1% ever had a stroke; 29.8% had HBP; 6.7% had high blood glucose levels, 25.4% had high cholesterol and 18.4% were psychologically distressed.

The mean WHODAS per cent score was 5.31% (Table 2) and 61.1% of adults scored 0%. Mean WHODAS per cent score increased with age group, varied significantly by sex and race, and was significantly higher among adults with a personal history of stroke, of heart related conditions, those with HBP, high blood glucose, high cholesterol, who were unemployed and who were psychologically distressed, than those who did not have each of these conditions or risk factors.

3

When controlling for sex, age, race and employment status, HBP, high blood glucose and high cholesterol showed weak associations with WHODAS per cent score ($p > 0.05$) and were hence excluded from the multiple regression model. Multiple linear regression (Table 3) showed that White ($\beta = -2.43$, 95% CI: -4.05 to -0.82) and Coloured ($\beta = -1.44$ [-2.15 to -0.72]) adults had significantly lower WHODAS per cent scores than African adults.

Table 1. Characteristics of the sample[a].

	%	Count
Total	100.0	4974
Age		
18–24	22.9	1140
25–34	21.7	1077
35–44	19.3	960
45–54	19.9	991
55–64	16.2	806
Sex		
Female	65.5	3260
Male	34.5	1714
Race		
African	69.9	3463
White	2.1	103
Coloured	23.3	1157
Indian	4.7	234
Employment status		
Unemployed	67.2	2941
Employed	32.8	1433

[a]Table presents unweighted percentages and counts.

Table 2. Mean WHODAS percentage score by biological and psychosocial factors.

	WHODAS percentage score			
	Mean (%)	SE	p-Value (one-way ANOVA)	n
Total	5.31	0.29		4974
Age				
18–24	3.99	0.5	<0.001	1140
25–34	3.55	0.35		1077
35–44	4.91	0.54		960
45–54	7.05	0.52		991
55–64	9.54	0.74		806
Sex				
Female	5.79	0.32	0.003	3260
Male	4.58	0.39		1714
Race				
African	5.75	0.35	0.0085	3463
White	2.94	0.90		103
Coloured	3.06	0.33		1157
Indian	3.93	0.71		234
Employment Status				
Unemployed	6.08	0.34	<0.001	2941
Employed	3.80	0.40		1433
Personal history of stroke				
No	5.07	0.28	<0.001	4825
Yes	16.71	2.19		123
Personal history of heart conditions				
No	4.78	0.27	<0.001	4505
Yes	11.05	0.99		378
High blood pressure				
No	4.83	0.35	0.001	3062
Yes	6.48	0.43		1567
High blood glucose				
No	5.12	0.30	<0.001	4540
Yes	7.90	0.74		434
High cholesterol				
No	4.55	0.30	0.006	2720
Yes	6.15	0.54		1056
Psychological distress				
Low/no distress	3.16	0.20	<0.001	4038
Distressed	14.83	0.93		936

4

Table 3. Association of biological and psychosocial factors with WHODAS percentage score.

	Bivariate linear regression			Multiple linear regression		
	Coeff.	95% CI (Coeff.)	p-Value	Coeff.	95% CI (Coeff.)	p-Value
Sex						
Female	Ref	–	–	Ref	–	–
Male	−1.21*	[−2.01 to −0.41]	0.003	−0.22	[−1.02 to 0.57]	0.577
Race						
African	Ref	–	–	Ref	–	–
White	−2.81*	[−4.70 to −0.91]	0.004	−2.43*	[−4.05 to −0.82]	0.003
Mixed ancestry	−2.68*	[−3.60 to −1.76]	<0.001	−1.44*	[−2.15 to −0.72]	<0.001
Indian	−1.82*	[−3.35 to −0.28]	0.020	−0.78	[−2.19 to 0.62]	0.274
Age group						
18–24	Ref	–	–	Ref	–	–
25–34	−0.44	[−1.53 to 0.64]	0.424	−0.14	[−1.24 to 0.97]	0.809
35–44	0.92	[−0.33 to 2.17]	0.150	0.6	[−0.72 to 1.93]	0.371
45–54	3.06*	[1.73 to 4.39]	<0.001	2.61*	[1.31 to 3.9]	<0.001
55–64	5.55*	[3.90 to 7.20]	<0.001	4.39*	[2.83 to 5.96]	<0.001
Employment	−2.29*	[−3.15 to −1.42]	<0.001	−1.62*	[−2.36 to −0.88]	<0.001
Ever had a stroke[a]	9.70*	[5.44 to 13.96]	<0.001	7.19*	[3.19 to 11.2]	<0.001
Personal history of heart disease/ heart related conditions[a]	4.76*	[2.99 to 6.52]	<0.001	2.08*	[0.23 to 3.93]	0.028
Raised blood pressure[a]	0.27	[−0.79 to 1.33]	0.62			
High blood sugar[a]	1.16	[−0.44 to 2.76]	0.153			
High cholesterol[a]	1.14	[−0.07 to 2.36]	0.066			
Psychological distress[a]	11.02*	[9.17 to 12.86]	<0.001	10.49*	[8.63 to 12.35]	<0.001

Note: $n = 4260$, Prob > $F = 0.00001$, $R^2 = 0.2280$.
[a]Adjusted for sex, age, race and employment.
*$p < 0.05$.

Adults aged 45–54 (β = 2.61 [1.31–3.90]) and 55–64 (β = 4.39 [2.83–5.96]) had significantly higher WHODAS per cent scores than 18–24 year olds. The biological factors, personal history of stroke (β = 7.19 [3.19–11.20]) and of heart related conditions (β = 2.08 [0.23–3.93]) were positively associated with WHODAS per cent score. In terms of the psychosocial factors, being employed was negatively associated with WHODAS score (β = −1.62 [−2.36 to −0.88]), while PD (β = 10.49 [8.63–12.35]) showed a strong positive association with WHODAS per cent score.

Discussion

The results of this study re-affirm the importance of specific biological factors (stroke, heart disease, hypertension and diabetes) and psychosocial factors (psychological distress and unemployment) in predicting disability, which was relatively low in this study (Bertram et al., 2013; Kemp, Quintana, Felmingham, Matthews, & Jelinek, 2012; Nojilana et al., 2016; Norman et al., 2007) comparative to what has been previously reported. Employed participants were shown to have lower disability scores implying that they had better cognitive, physical mobility, self-care and interpersonal relationships. A study by Jelsma and Ferguson (2004) demonstrated similar findings. The fact that black African adults were disproportionately affected by disability relative to whites and Coloureds is supported by the fact that the former faced more socio-economic disadvantage during apartheid with these disenfranchisement effects persisting, often leading to poor health outcomes (Coovadia, Jewkes, Barron, Sanders, & McIntyre, 2009; Seekings & Nattrass, 2002). Increasing disability with increasing age was unsurprising, given that the ageing process decreases

5

optimal day-to-day functioning and increases vulnerability to onset of NCDs, especially CVD, (Mayosi et al., 2009; Medhi, Hazarika, Borah, & Mahanta, 2006), which hinders functional capacity (Sander & Sander, 2014).

PD, a significant predictor of disability in this study, is often understudied. PD was found in almost one in five adults, with higher prevalence among women and black African participants. Previous studies demonstrated that SA females and black Africans are disproportionately affected by mental health conditions, including depression and anxiety (Kathree, Selohilwe, Bhana, & Petersen, 2014; Myer, Stein, Grimsrud, Seedat, & Williams, 2008). PD is not uncommon among individuals with an existing or life-long medical condition (Kagee, 2010; Peltzer, Pengpid, & Skaal, 2012) where these individuals report declines in their daily functioning ability (Brenes et al., 2008; Merikangas et al., 2007). Individuals with a current or chronic medical condition, who are female and/or black African are especially vulnerable to some degree of disability.

Not with-standing the fact that the main limitation of this study is self-report bias on selected measures and is cross-sectional preventing causal inferences, the study's primary contribution is the finding which highlights the importance of mental health factors such as the presence of psychological distress in predicting disability. Continued attention also needs to be paid to the biological characteristics of the sample such as HBP and increased cholesterol and blood glucose levels which places individuals at risk for CVD onset and in turn may lead to varying degrees of disability.

Conclusion
Health policy decision makers should take cognisance of the complex interaction of existing medical conditions such as heart disease or stroke, the psychosocial determinants of health and decreased functional capacity. Further in-depth investigation into how bio-psychosocial risk factors mitigate disability is required.

Disclosure statement
No potential conflict of interest was reported by the authors.

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