

A REVIEW OF PSYCHOSOCIAL STRESS AND CHRONIC DISEASE FOR 4TH WORLD INDIGENOUS PEOPLES AND AFRICAN AMERICANS

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Public health literature indicates that psychosocial stress is an important contributor to chronic disease development. However, there is scant research on the health effects of stress for minority groups, who suffer from a high burden of chronic disease. This paper provides a review of studies that examine the relationship between psychosocial stress and chronic disease for 4th world indigenous groups and African Americans.

A total of 50 associational and 15 intervention studies fit the inclusion criteria for this review. A range of chronic diseases, as well as harmful health behaviors, were associated with psychosocial stress for indigenous peoples and African Americans, with much stronger findings for mental rather than physical health outcomes. Several stress moderating factors were also identified and a small body of intervention research suggests that transcendental meditation and group-oriented stress management may be effective in reducing psychosocial stress and its effects for African Americans and 4th world indigenous groups respectively. (*Ethn Dis.* 2006;16:295–308)

Key Words: African Americans, Chronic Diseases, Indigenous Populations, Review, Stress

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INTRODUCTION

There is increasing evidence highlighting the importance of the social determinants of health.^{1–5} Within the field of public health, two broad categories of social determinants can be defined. The first are structural/material determinants: accessibility of health-related infrastructure (water supply and quality, sewerage systems, roads, health services); level of income; level of education; and level of employment.⁶ The second category can be described as psychosocial factors such as social status, stress, self esteem, degree of social support, and social exclusion.⁶

The significance of psychosocial factors was illustrated by the Whitehall studies conducted among civil servants in the United Kingdom.^{7,8} These studies demonstrated that the lower the relative income or social status, the higher the likelihood of disease.^{7,8} This trend, described as the social gradient of health, is not a new concept and had previously been attributed primarily to material determinants of health. The Whitehall studies, however, demonstrate that psychosocial factors also have a large impact on health.^{2,6,8–10}

Emerging international literature indicates that psychosocial stress, as one of these factors, is an independent contributor to chronic diseases.^{11–15} In addition to identifying causes and responses to stress, current literature also highlights the importance of coping mechanisms for dealing with stress and its impacts.¹⁶ Coping mechanisms range from personal attributes (such as high self-esteem and positiveness) to the availability of community or social networks.¹⁷ Research has also found

that interventions for individuals and communities are effective in promoting health and reducing chronic diseases.¹⁸

Other research indicates that minority groups are exposed to greater levels of stress due to racism and other forms of discrimination.^{19–22} Furthermore, minority groups suffer a particularly high burden of chronic disease morbidity and mortality compared to the dominant members of their respective societies.²³

Despite this burden of psychosocial factors, there is no summary available of the evidence relating psychosocial stress to chronic disease for indigenous peoples and African Americans or of the interventions which have been found to be effective in reducing psychosocial stress or its ill-effects for minority groups. This paper seeks to address this dearth of information through answering two research questions: 1) what evidence is there linking psychosocial stress to the development of chronic disease or the complication of its management for indigenous peoples and African Americans; 2) in these populations, what interventions have been tested and proven successful in reducing psychosocial stress and/or its detrimental health effects?

METHODS

A review was conducted by searching available electronic databases using PubMed, Ovid, and the World Wide Web. The key words and Boolean operators used in searching these databases were based on a recent review of stress and coronary heart disease²⁴ and Medline MeSH terms. Psychosocial

stress (hereafter 'stress') was defined broadly as psychological or social phenomena that tax an organism in such a way that physical, psychological, or social change results. The key exclusion resulting from this definition was of studies relating only to physical or physiological stress such as those in the field of sports science. Chronic disease was defined as non-acute illnesses and conditions, including mental illness, drug and alcohol misuse, and chronic infectious diseases. Studies that examined stress as an outcome of chronic disease were not included in this review. Indigenous peoples were defined for the purposes of this review as those populations living in a 'fourth world context' – situations in which a minority indigenous population exists in a nation wherein institutionalized power and privilege are held by a colonizing, subordinating majority.^{25,26} African Americans were included in the review as this population experiences similar social contexts within a first world nation and because considerable research has been conducted in relation to this group.

A sequential process of examining article titles followed by abstracts and then full text was conducted whereby articles were excluded if: they were not available in English; the study population was not indigenous or African-American; or the study did not include stress as an exposure and health as an outcome. This review includes published and unpublished items produced until July 31, 2004. In total, approximately 5000 journal articles, monographs, and conference abstracts were located and examined. Communication with relevant experts in the field and manual searching of bibliographies were also undertaken as part of this review.

RESULTS

Associational Studies

A number of associational studies have examined the effects of various

forms of stress on the development of chronic disease among indigenous peoples and African Americans. This review identified 50 such studies which met the inclusion criteria as described above. Of these, 13 were conducted with indigenous populations and the remaining 37 with African Americans. Twelve studies were qualitative in nature with the others being quantitative cross-sectional studies ($n=31$) and cohort studies ($n=7$).

Fifteen studies involved women only (10 cross-sectional, three cohort and two qualitative), five studies (four cross-sectional and one qualitative) involved men only and four studies (two cross-sectional and two cohort) related to adolescents only. Ten studies specifically considered the effect of stress on the management of chronic conditions such as HIV/AIDS,^{27–32} hypertension,^{33,34} sickle cell disease,³⁵ mental illness,³⁶ and myocardial infarction.³⁷ Summary details of associational studies included in this review are shown in Table 1.

The most commonly used measures in these 50 studies were stressful life events/traumas,^{28,30,36,38–45,47,48,56} financial/economic stress,^{33,38,44,46–50,66} and perceived stress.^{34,40,51–54} Half of these studies also adjusted for one or more confounders in their analysis. The most common confounding factors adjusted for in these studies were age,^{36,38,41,43,48,49,52,54,56,57,59,68,70,73,74,77} education,^{32,36,38,41,43,54,56,57,59,74} sex,^{34,45,55,56,57} Body Mass Index (BMI),^{34,52,54,74,77} gender,^{38,52,68,74} and income.^{38,41,57,59} Adjusting for these confounders was common in both cross-sectional and cohort studies but did not occur in qualitative studies. A number of cross-sectional studies used convenience^{29,40,41,52,54,57,59,62,73} or non-random samples^{27,28,32,35,36,39,68} and several cohort studies also used non-random sampling techniques^{30,42,43} with all qualitative studies using convenience samples.

Across this range of research a number of poor health outcomes were found to

be positively associated with increased stress exposure as variously measured. Mental health outcomes associated with stress were psychological distress,^{41,44,46} depression,^{29,32,35,38,45,55,56} reduced psychological well-being^{46,54} and psychological functioning,⁴⁷ poor mental health,^{54,57,58} increased anxiety,^{32,35,42,59} suicidal ideation^{39,60} and suicidal outcomes.^{39,61}

Physical health outcomes associated with stress were elevated blood pressure,^{33,34,40,52,77} hypertension,⁵² self-reported illness,⁶² impaired immune function,³⁰ diabetes,^{63–67} hyperglycemia,⁶³ heart disease,^{37,66} pre-term birth,⁴² reduced physical well-being,⁵⁴ increased heart rate⁷⁷ and increased carotid artery intima-media thickness.⁵⁰ In addition, health damaging behaviors such as drug misuse³⁹ and cigarette smoking⁶⁸ were also found to be associated with stress exposure.

However there were also a number of studies which did not find a statistically significant association with stress exposure. Psychological distress,⁴⁴ blood pressure,^{34,40,49,51,52,69–72} hypertension,^{52,73} insulin resistance,⁷⁴ blood glucose,⁶⁹ life satisfaction,⁵⁷ physical well-being,⁵⁷ general well-being,³⁶ depression,^{38,59} anxiety,⁵⁹ self-reported illness,⁶² atherosclerotic plaque,⁵⁰ natural killer cell cytotoxicity,²⁷ and birth weight⁴³ were measured in studies but found to have a null association with stress exposure. Only one study found an association between stress and improved health with posttraumatic stress disorder symptoms related to higher CD4 count in HIV positive African Americans.²⁸

Interestingly, there was also a marked difference in associations between stress and increased systolic vs. diastolic blood pressure with 11 out of 17 associations (65%) being positive, rather than null, for the former and only five out of 14 (34%) being positive rather than null for the latter. In the 50 studies overall, there were 25 positive associations and five null associations between a stress

Table 1. Associational studies of psychosocial stress and chronic disease in indigenous and African-American populations

Study Population	Exposure Measure	Outcome Measure	Findings
Cross-sectional studies			
Nationally representative sample of 549 African Americans aged 18–54 in the US National Comorbidity Survey, 82.4% RR ⁴⁴	0-item traumatic events 2-item financial strain	4-item PD ^{a,e} 4-item PD ^{a,e}	PA* No A
Random sample of 126 non-obese normotensive or mildly hypertensive African Americans (97 male and 29 female) in Pennsylvania, NRRG ³⁴	14-item PSS	Resting SBP ^{a,al,bmi,s} Resting DBP ^{a,al,bmi,s} Daytime ambulatory SBP ^{a,al,bmi,s} Daytime ambulatory DBP ^{a,al,bmi,s}	PA* PA† PA* No A
SRS of 285 African-Americans aged 17 and over in a southern U.S. city (101 male and 184 female), NRRG ⁴⁸	8-item measure of economic stress	Depression sub-scale of the Hopkins Symptom Checklist ^{a,m,ses}	PA* (men, women & total sample)
Stratified random sample of 1,784 African Americans aged 25–50 years in Pitt County, North Carolina, 80% RR ⁵¹	8-item adaptation of PSS	SBP DBP	PA* (women), No A (men) PA* (women), No A (men)
Random sample of 296 African Americans aged 20 years older who were both born and currently living in the U.S. Virgin Islands (97 men and 199 women), 77.2% RR ⁷⁴	Psychosocial stress as measured by sub-scales of the Roger's Life Attitude Inventory	Insulin resistance as measured by fasting serum insulin using the homeostasis model assessment method ^{a,bmi,ed,f,g,w}	No A
Convenience sample of 356 African Americans aged 21 years and over in Atlanta, Georgia (196 men and 160 women) ⁵²	Perceived stress from race-based discrimination at work (RBDW) from non-African Americans (inter-RBDW) and from other African Americans (intra-RBDW)	Self-reported physician diagnosed hypertension ^{a,bmi,c,g} SBP ^{a,bmi,c,g} DBP ^{a,bmi,c,g}	Perceived stress by: Intra Inter-RBDW No A PA* PA* PA* No A No A
Multistage area probability sample of 1139 African American adults as part of the Detroit Area Study, 70% RR ⁴⁶	1-item work problems 2-item financial problems 4-item family problems	6-item PD index 2-item psychological well-being	PA* (all three measures) PA* (financial, family stress)
Representation sample of 1803 young adults (<23 years) in South Florida (25% African Americans), 70.1% RR ⁴⁵	33-item lifetime exposure to adversity including major/traumatic life events	Depressive disorder (DSM-IV) ^{et,s,t,ses} Anxiety disorder (DSM-IV) ^{et,s,t,ses}	PA* (African Americans) PA* (African Americans)
Convenience sample of 127 African Americans aged 55 to 93 years (87 women and 26 men, 14 missing sex) in the U.S. ⁵⁷	46-item IRRS with four subscales: Individual, Institutional, Collective and Cultural	5-item Satisfaction with Life Scale ^{a,ed,i,s} MCS of the Short Form-36 ^{a,ed,i,s} PCS of the Short Form-36 ^{a,ed,i,s}	No A NA* (institutional subscale) No A
Area probability sample of 897 caregivers (93% women) of African American children (10–11 years old) in Iowa and Georgia, 61–68% RR ⁴⁷	29-item negative life events, chronic financial stressors and job stress	Psychological functioning measured by the 5-item distress-depression and 3-item distress-anxiety subscales of the Mini-Mood and Anxiety Symptom Questionnaire	NA*
All census tracts in Detroit using a random sample (stratified by sex, race, stress and area) of 487 married African Americans aged 25 to 60 years who had relatives in the area, 94% RR ⁴⁹	Stress as measured by economic deprivation, residential/ family instability, crime & density	SBP ^{a,h,o,p,rr,se,ti} DBP ^{a,h,o,p,rr,se,ti}	PA* (men), No A (women) PA* (men), No A (women)
Nonrandom network sample of 105 African American girls aged between 11 and 19 years in the U.S. who were not pregnant, NRRG ⁶⁸	26-item Daily Hassles for Adolescents Inventory including extent of hassle for each item	Ever smoked	PA*

See page 301 for definition of abbreviations.

Table 1. Continued

Study Population	Exposure Measure	Outcome Measure	Findings
Nonrandom clinical roster sample of 109 African American adults with sickle cell disease in the U.S., 94.7% RR ³⁵	Daily stress measured by the 17-item Hassles Scale	Depression (SC-90) ^{a,com,g,pa,scd,ses} Anxiety (SC-90) ^{a,com,g,pa,scd,ses} Global Severity Index (SC-90) ^{a,com,g,pa,scd,ses}	PA* PA* PA*
Nonrandom clinical sample of 110 HIV adults from a Midwestern city (49 African American), NRRRC ³⁸	PTSD measured by the 15-item Impact of Event Scale	Self-reported physician determined CD4 count	PA*
Random sample of 287 Native American adults (96 men and 191 women) in the upper Midwest, 85% RR ⁶⁹	6-item financial strain scale 12-item negative life events scale	Depression (CES-D) ^{a,al,ch,d,ed,g,ho,pi,pt,ss} Depression (CES-D) ^{a,al,ch,d,ed,g,ho,pi,pt,ss}	No A PA*
SRS of 93 Mississippi Choctaw aged 21 years or older (43 men and 50 women), 67% RR ³⁹	10-item psychological stress scale combining mood, acute/chronic stress	Blood glucose ^{di,hy,me} SBP ^{di,hy,me} DBP ^{di,hy,me}	No A No A No A
Nonrandom sample of 124 American Indian and Alaskan Native adolescents with a depressive disorder, aged 14 to 18 years in Alaskan boarding schools (60 male and 64 female), NRRRC ⁶²	Life events: family/ parental conflicts, marital/ pregnancy fears, interpersonal conflicts, loss of culture supports/ academic demands, social rejections & close death	Suicide ideation Suicide attempt Drug misuse	PA* PA* PA*
Cross-sectional Studies: Women			
Convenience sample of 50 low-income African American women in the U.S. ⁵⁴	126-item SRRS in last 12 months for: Self, significant other, Community stress (social problems, violence, & fear in their community)	Illness measured using self-report checklist of disease ^{ba,dd,di,ddi,du,th}	PA* (self), PA* (significant other), No A (community stress)
Convenience sample of 128 urban African American women enrolled in a church-based physical activity randomized trial from Baltimore, Maryland ⁵⁴	PSS	Physical health status (SF-36) ^{a,e,bmi} Mental health status (SF-36) ^{a,e,bmi} Well-being measured by Cantril's Ladder of Life ^{a,e,bmi}	No A NA* NA*
Convenience sample of 90 African American women employed in a health care facility in the U.S. ⁷³	The Personal Strain Inventory (four 10-item scales: vocational, interpersonal, psychological & physical strain)	Hypertensive status ^{a,py,whr}	No A
Nonrandom clinical sample of 55 African American women with severe and persistent mental illness aged 18 to 68 years in Pennsylvania who were mental health service outpatients, 78.6% RR ³⁶	Violence and trauma measured by the 49-item self-report Posttraumatic Diagnostic Scale	Well-being (SF-36) ^{a,e,m} No. of psychiatric disorders ^{a,e,m}	No A PAT
Convenience sample of 94 pregnant African American women from the Pittsburgh area without hypertension, diabetes or previous adverse pregnancy outcomes ⁴⁰	Life Events Scale PSS Life Events Inventory	SBP SBP SBP	No A PA* No A
Convenience sample of 79 African American mothers of adolescents attending high school ⁴¹	Stressful life events measured by the 35-item Psychiatric Epidemiology Research Interview Life Events Scale	Psychological distress (20-item CES-D) ^{a,e,i,fs} Self-esteem (Rosenberg Self-Esteem Scale) ^{a,e,i,fs}	PA* NA*
Representative sample of 334 pre-menopausal women (225 non-Hispanic Caucasians and 109 African Americans) aged 42-52 years from the Pittsburgh area, RR: 88.6% (African Americans), 84.9% (Caucasians) ⁵⁰	Life events Ongoing stressors Economic hardship	Carotid artery intima-media thickness measured by ultrasound ^{HDL-C,SBP,whr} Artherosclerotic Plaque ^{HDL-C,SBP,whr}	PA* (composite stress score) PAT (life events), PAT (ongoing stressors) PAT (economic hardships) No A

See page 301 for definition of abbreviations.

Table 1. Continued

Study Population	Exposure Measure	Outcome Measure	Findings
Convenience sample of 373 women with HIV/AIDS in New York City (44% African American) ²⁹	Stress measured by frequency of physical and sexual abuse	Depression (20-item CES-D)	PA*
Nonrandom clinical sample of 100 women with HIV/AIDS receiving medical care in Louisiana (84% African American), 80% RR ³²	43-item SRRS	Depression (20-item CES-D) ^{ds,e,thiv} Anxiety measured by the State-Trait Anxiety Inventory ^{ds,e,thiv}	PA* PA*
Nonrandom clinical sample of 36 HIV+ African American women in Miami, NRRG ²⁷	10-item version of the Life Experiences Survey measuring stress over past 12 months	Natural killer cell cytotoxicity ^{ar,cs,hp,pe,sm}	No A
Cross-sectional Studies: Men			
Random sample of 90 African-American homeless men from a church soup-kitchen in the U.S., NRRG ⁷⁵	20 item hassles/stressors in the week before the survey	CES-D (week prior to the survey)	PA*
Ecological study of all 45–54 year-old men residing in 86 counties in North Carolina ⁷⁸	Stress measured by a composite of children not living at home with both parents, divorce, delinquency, correction school admissions, incarceration and murder rates	Hypertension, heart disease and stroke related mortality rates	PA* (non-Whites in the difference between mortality rates for high and low stress groups)
Area probability sample of 112 African American male workers aged 17–60 years in rural North Carolina, 91% RR ⁷⁰	1-item job security	SBP ^{a,bmi,s,ti} DBP ^{a,bmi,s,ti}	NA* No A
	1-item race as a hindrance to job success	SBP ^{a,bmi,s,ti} DBP ^{a,bmi,s,ti}	PA† PA†
	1-item unfair wages	SBP ^{a,bmi,s,ti} DBP ^{a,bmi,s,ti}	No A No A
Convenience sample of 126 African American men, 56 from a residential substance abuse treatment program (clinical sub-sample) and 70 undergraduate college students (non-clinical sub-sample) ⁵⁹	22-item Index of Race-Related Stress using the overall Global Racism scale	21-item Beck Depression Inventory II ^{a,e,i}	No A (both sub-sample)
		21-item Beck Anxiety Inventory ^{a,e,i}	PA* (clinical sub-sample) No A (non-clinical sample)
Cohort Studies			
3-year study involving a random sample of 204 African American adults (88 men and 116 women) aged 20–33 years in the Coronary Artery Risk Development in Young Adults Study, 79% follow-up ⁷⁷	Stress reactivity using a video game and mirror star-tracing task	SBP ^{a,al,bmi,fh,ph,SBP,sm} DBP ^{a,al,bmi,fh,ph,SBP,sm} Ambulatory heart rate ^{a,al,bmi,fh,ph,SBP,sm}	PA* (men and women) PA* (women, No A (men)) PA*
6-year study using an area probability sample of 1,060 African Americans aged 65 years and over in 5 counties in North Carolina (321 men, 739 women), 47.4% follow-up ⁵⁶	4-item life events: death of spouse/child/friend or other family member and serious illness/injury of close friend/family member	Depressive symptoms (CES-D) ^{a,ed,fs,s}	PA*
4-year study using a non-random clinical sample of 1,962 pregnant women without multiple gestation (36% African American) in North Carolina aged over 16 years who spoke English, 83% follow-up ⁴²	39-item Life Experiences Survey weighted by perception of life impact Pregnancy-related anxiety	Preterm birth (<37 weeks) ^{al,arh,mp,sm}	No A (all life events), PA* (life events with negative impact)
			PA*

See page 301 for definition of abbreviations.

Table 1. Continued

Study Population	Exposure Measure	Outcome Measure	Findings
Nonrandom clinical sample of 1,150 pregnant women over 17 years of age from six ethnic groups in New York and Chicago (30% African American) followed from 16–28 weeks gestation till birth, no follow-up rate given. ⁴³	Material hardships in food, housing, medical care and from lack of money	Mean birth weight	No A
	Negative stressful life events (loss of a loved one, legal problems etc.)	Mean birth weight ^{a,ed,et,m,po,tm}	No A
1-year study of a nonrandom clinical sample of 67 HIV+ African American women aged 18–45 years in New Orleans, no follow-up rate given ³⁰	Traumatic life events measured by the 22-item Life Stressor Checklist	Lower CD4 to CD8 ratio ^{bt}	PA*
	PTSD (DSM-IV [†]) 22-item Impact of Events Scale (Revised)	Lower CD4 to CD8 ratio	PA*
5-year study involving a census of 555 African American students in ninth-grade (at baseline) in a school district in Michigan (301 females and 254 males), 81% follow-up rate ⁵³	12-item version of the PSS	PD measured by 6-item depression and 6-item anxiety subscale of the Brief Symptom Inventory	PA*
2-year study of an area probability sample of 279 African American high school seniors in the Boston area (132 male and 147 female), 72% follow-up rate ⁵⁵	1-item conflict with parents	Depressed mood ^{dr,fa,ls,ped,s} (12-item version of the CES-D)	PA*
	1-item conflict with peers	Depressed mood ^{dr,fa,ls,ped,s}	PA*
Qualitative Studies			
Convenience sample of four case histories of Native Americans ⁶³	Stress caused by socio-cultural change	Self-reported diabetes Self-reported hyperglycemia	Positive associations between abrupt lifestyle changes/extreme stress and the two outcome factors
Convenience sample of 12 Inuit men aged 15 to 30 years in the Arctic ⁶¹	Various coping styles and forms of stress including the stress of definition, isolation, transition, timing and consolidation	General Health status	The experience of stress was found to be a risk factor for increased contact with the health care system and suicidal outcomes
Convenience sample of 34 Anishnaabe (Ojibway), 26 women and 8 men with a mean age of 49 years, from a community vnear Manitoba ⁶⁴	Open-ended interviews	Explanations for the cause of diabetes	Worry and stress were mentioned by several individuals and there was an overall consensus that worrying too much could raise one's sugar level
Convenience sample of 28 Anishnaabe (Ojibway) in Canada ⁶⁵	Open-ended interviews	Explanations for the cause of diabetes	Stress was noted as a cause of diabetes by 14/28 people
Convenience sample of 314 African American women with diagnosed hypertension in south Louisiana ³³	Worry and stress	Self-reported high blood pressure	Participants noted that just 'making ends meet' financially caused their elevated blood pressure
Convenience sample of 18 African American women aged 31–49 years with HIV/AIDS in New Jersey ³¹	Open-ended interviews	Major concerns or problems with experience of living with HIV/AIDS	Family was identified as a source of stress in relation to communication, family availability, endurance, resources, and over-estimation of their ability to cope by family members
Convenience sample of 14 Aboriginal adults (11 with type 2 diabetes) aged 31–63 in a remote Aboriginal community in Australia (3 men and 11 women) ⁶⁷	Group discussions, semi-structured interviews and informal conversations	Explanations for the cause of diabetes	Many participants, particularly middle-aged women, considered worry about family & social problems to be the primary cause of their diabetes
Convenience sample of 14 Indigenous adults from an urban and three rural areas in Australia who had suffered a myocardial infarction (10 men and 4 women) ³⁷	Open-ended unstructured interviews	Personal beliefs about the causes of heart attacks and heart disease in general	Many participants said that a stressful lifestyle was the main cause of their heart attacks

See page 301 for definition of abbreviations.

Table 1. Continued

Study Population	Exposure Measure	Outcome Measure	Findings
Convenience sample of Aboriginal Community Elders and Victorian Aboriginal Health Service in Melbourne ⁶⁶	29 months of participant observation, 38 in-depth interviews, 2 focus groups, 2 small group discussions Pilot questionnaire with 31 Aboriginal respondents (18 with diabetes and 13 age and sex matched controls without diabetes)	Financial/material and emotional worries associated with diabetes prevalence Worries included physical distance, separation, conflict, illness and death in families, young people and elders, role fulfillment and social support in the community.	No. of worries 0 1-4 5+ Cases 28% 33% 39% Cont. 15% 38% 46% Diabetes in the family Yes 29% 29% 43% No 10% 60% 30%
Convenience sample of an urban Indigenous community in Australia ⁷⁶	Participant observation with a focus on dietary factors	General health status	High levels of stress were evident in the community and were thought to be a more important factor than diet in the health status of the community
Convenience sample of 88 low SES Aboriginal heads of households in Adelaide (72 women and 16 men) ⁶⁰	Stress	Suicide ideation Suicide attempt	PA* PA*
Nonrandom clinical sample of patients presenting at an Aboriginal Medical Service, NRRG ⁵⁸	Current stressful life events	Mental health	NA*

* $P < .05$ (two-tailed), † $P < .10$ (two-tailed). **CES-D**: Center for Epidemiological Studies-Depression, **DBP**: Diastolic blood pressure, **DSM-IV**: Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition, **HDL-C**: High density lipoprotein-C, **IRRS**: Index of Race-Related Stress, **MCS**: Mental component scale, **NRRG**: No Response Rate Given, **No A**: No association, **PA**: Positive association, **PCS**: Physical component scale, **PD**: Psychological distress, **PSS**: Perceived Stress Scale, **PTSD**: Posttraumatic stress disorder, **RR**: Response rate, **SBP**: Systolic blood pressure, **SC-90**: Symptom Checklist-90 (revised), **SF-36**: Short Form-36, **SRS**: Simple random sample, **SRRS**: Social Readjustment Rating Scale. Lettered superscripts indicate statistical adjustment for those variables that either appear elsewhere in the table as shown above or as listed below. **a**: age, **al**: alcohol consumption, **ar**: antiretroviral use, **arh**: adverse reproductive history, **ba**: basis of prognosis, **bmi**: Body Mass Index, **bt**: baseline t-cell populations, **c**: coping ability, **ch**: childhood events and behaviors, **com**: complications, **cs**: No. of current sex partners, **d**: discrimination, **dd**: degree of disability, **ddi**: degree of discomfort, **di**: diabetic status, **du**: duration, **dr**: dropout status, **ds**: disease severity, **e**: extroversion, **ed**: education, **et**: ethnicity, **f**: family history of diabetes, **fa**: family's standard of living, **fh**: family history of hypertension, **fs**: family structure, **fu**: functional status, **g**: gender, **h**: hours since last meal, **ho**: household income per capita, **hp**: presence of human papillomavirus, **hy**: hypertensive status, **i**: income, **ls**: living situation, **m**: marital status, **me**: medicative status, **mp**: medical problems, **n**: neuroticism, **o**: overweight, **p**: ponderal index, **pa**: pain frequency, **pe**: pessimistic attitude, **ped**: parents education, **ph**: physical activity, **pi**: parenting influences, **po**: poverty level, **pt**: participation in traditional activities, **py**: pack-years of smoking, **rr**: rated tension at reading, **s**: sex, **se**: season, **scd**: Sickle Cell Disease type, **ses**: socio-economic status, **sm**: smoking, **ss**: social support, **t**: time of event, **ti**: time of interview, **th**: threat to life, **thiv**: time since HIV diagnosis, **tm**: type of medical insurance, **w**: waist circumference, **wa**: warmth and support, **whr**: waist/hip ratio

exposure and a mental health outcome while for physical health outcomes and stress exposure there were 18 positive associations and 18 null associations.

A number of factors were found to moderate the effects of stress. These factors were social support,^{44,48} personal control,⁴⁴ hardiness,⁶² racism,⁴⁷ religiosity,⁴⁶ substance misuse,⁵⁹ and various coping strategies.^{48,75} Active problem-focused responses to stress,^{40,48,75} social support,^{48,51} hardiness,⁶² and religiosity⁴⁶ were found to buffer the ill-effects of stress on health while factors found to exacerbate these ill-effects were neuroticism,⁴⁴ racism,⁴⁷ and substance misuse.⁵⁹

The associational studies were also considered by study type and study population. The seven cohort studies found that blood pressure,⁷⁷ heart

rate,⁷⁷ depression,^{55,56} psychological distress,⁵³ immune function,³⁰ and pre-term birth⁴² are associated with stress. The health outcomes associated with stress in the twelve qualitative studies were general health status,⁷⁶ poor mental health,⁵⁸ suicidal ideation,⁶⁰ suicidal outcomes,^{39,61} elevated blood pressure,^{33,40} diabetes,⁶³⁻⁶⁷ hyperglycemia,⁶³ and heart disease.^{37,66}

The 13 studies of indigenous groups in Australia, Canada, and the United States found that health outcomes associated with stress were general health status,⁷⁶ poor mental health,⁵⁸ depression,³⁸ suicidal ideation,³⁹ suicidal outcomes,^{39,60,61} diabetes,⁶³⁻⁶⁷ hyperglycemia,⁶³ heart disease,³⁷ and drug misuse.³⁹ Findings from the four studies of adolescents indicate that depression,⁵⁵ cigarette smoking,⁶⁸ sui-

cidal ideation,³⁹ and suicidal outcomes^{39,60} are associated with stress and the ten studies which examined the effects of stress on the management of chronic diseases suggest that elevated blood pressure,^{33,34,40,52} impaired immune function,³⁰ depression,^{29,32,35} and anxiety³⁵ are associated with stress.

The 15 studies involving only women found that health outcomes associated with stress were depression,^{29,32} psychological distress,⁵⁹ anxiety,^{50,60} reduced self-esteem⁵⁹ and well-being,⁷² poor mental health,^{41,46,54} elevated blood pressure,^{33,40,52} self-reported illness,⁶² immune function,³⁰ pre-term birth,⁴² and increased carotid artery intima-media thickness.⁵⁰ In one of these studies, hardiness⁶² was also found to buffer the ill-effects of stress on

health. Finally, the five studies involving men only found that stress is associated with increased depression,⁷⁵ anxiety,⁵⁹ suicidal outcomes,⁶¹ mortality,⁷⁸ elevated blood pressure⁷⁰ with substance misuse acting as a stress exacerbator.⁵⁹

Intervention Studies

This review identified a total of 15 studies which examined the treatment and/or management of stress in indigenous or African-American populations. Of these, six were randomized controlled trials,^{71,72,79-83} one was a retrospective cohort study⁸⁴ and the remaining eight were demonstration studies of programs or activities, without control groups, that ranged over periods from a day to almost a year.⁸⁵⁻⁹² Of these interventions, 11 involved African Americans, four Indigenous Australians and one, Native Americans. Summary details of intervention studies included in this review are shown in Table 2.

The types of interventions trialed were transcendental meditation (TM),^{72,79-84} progressive muscle relaxation (PMR),^{71,72,81,82,84} yoga and aerobics,⁸⁷ biofeedback relaxation,⁸⁸ focused support groups,⁸⁵ empowerment programs,^{86,89} psychoeducational group experiences⁹⁰ and stress reduction/management workshops.^{91,92}

Six randomized controlled trials involving African Americans used TM as the intervention, with PMR also used as a secondary intervention arm in several trials. These studies were conducted with both hypertensive and normotensive African Americans. Compared to the control group, those who undertook the TM intervention had decreased carotid intima-media thickness,⁷⁹ systolic blood pressure,^{72,81,83} and diastolic blood pressure,^{72,81} heart rate and cardiac output,⁸³ anxiety,^{80,82} depression,⁸⁰ neuroticism,⁸² and sleep dysfunction,⁸⁰ as well as increased energy,⁸⁰ general mental health,⁸² and health locus of control.⁸⁰ However, a few

TM and PMR interventions failed to produce changes in health outcomes with one study finding no significant change in heart rate for the TM group⁸¹ and another finding no change in vocational strain⁷¹ for the PMR group. In general, TM was more effective than PMR in an eight year follow-up of 530 African-American participants which found a 63% reduction in all-cause mortality and a 82% reduction in heart disease mortality in the intervention group compared to the control groups.⁸⁴

The single study that used a yoga and aerobics intervention did not produce any change in blood pressure⁸⁷ while the two studies which utilized biofeedback relaxation had mixed results, showing improvement in diastolic blood pressure and forehead muscle tension but not in systolic blood pressure or finger temperature.^{88,89}

The focused support group (FSG) model aims to: 1) build and enhance group bonding and group cohesion in a short period of time; 2) present participants with a model of facilitation that they can easily execute; and 3) change patterns of coping through increased awareness of behaviors.⁸⁵ The FSG model also seeks to buffer the effects of stress through the provision of positive support networks and by increasing knowledge of gender and ethnic discrimination as a significant source of stress.⁸⁵ The study considered in this review of the FSG model found that, according to participant self-reports, the intervention reduced stress and increased personal and professional support networks for the 65 African-American women participants.⁸⁵

An empowerment program conducted with Indigenous Australians was, according to the post-intervention evaluation, effective in enhancing participants' awareness, resilience, and problem solving ability.⁸⁶ This program was based on the principles of psychosynthesis, analytical skills, mastery train-

ing, transformation, and meditation and has since been delivered in a number of Indigenous communities in Australia.⁸⁶ Another study, underway in north Queensland since 2001, supports earlier findings that an empowerment program is able to equip Indigenous Australians with greater analytical and problem-solving skills, provide space for self-reflection and growth, encourage confidence, improve communication skills, promote empathy and an ability to help others, and create an improved understanding of root causes of problems.⁹³ A similar program conducted in the United States used a psychoeducational group experience based on notions of group sharing and support which incorporated Native American cultural traditions. Self-report data after this intervention suggests that it was effective in promoting positive and reducing negative emotions.⁹⁰

Two stress reduction/management workshops have also been conducted in Australia with Indigenous people using techniques such as identifying signs of stress and strategies to promote well-being, stress management techniques, balancing stress, problem-solving skills, simple relaxation techniques, and dealing with anger.^{91,92} The only one of these studies which was quantitatively evaluated showed a reduction in both the incidence and complications of diabetes.⁹²

DISCUSSION

Within the 50 associational studies examined in this review there was a diversity of stress measures utilized. Of these, stressful life events were the most common approach, used in eleven studies. The literature has noted that stress measures have tended to under-sample the experiences of women, minorities, and the poor especially in the case of life events measures.⁹⁴ In addition, many of the exposure measures used were not psychometrically

Table 2. Studies of psychosocial stress interventions in indigenous and African-American populations

Study	Trialed Intervention	Outcome Measure	Findings
6–9 month single-blind randomized controlled trial (RCT) of 60 hypertensive African Americans (19 men and 41 women) aged over 20 years ⁷⁹	T, N=31 (9 men, 22 women) HE, N=29 (10 men, 19 women) Both groups instructed by African American practitioners	Blood pressure Carotid intima-media thickness	NA* (T & HE) NA* (T only) Adjusted for antihypertensive medication and smoking status
1 year RCT (blinding status unspecified) of African Americans with hypertension ⁸⁰	T HE	Left ventricular mass Anxiety Depression Sleep dysfunction Energy Health locus of control	NA* (T & HE) NA* (T only) NA* (T only) NA* (T only) PA* (T only) PA* (T only)
3 month single-blind RCT of 127 hypertensive African Americans aged 55 to 85 years in a primary care health centre (half of the participants were taking antihypertensive medications) ^{72,81}	T P C (lifestyle modification (nutrition and physical activity))	SBP DBP Heart rate Adjusted for baseline BP and age.	NA* (T) NA† (P) NA* (T & P) No A T was about twice as effective as P overall. Associations hold for those with high & low stress levels
1 year RCT (blinding status unspecified) of 83 African American college students in the U.S. (39 male and 44 female) ⁸²	T P C (Cognitive-behavioral strategies)	General mental health Anxiety Neuroticism	PA* (T & P) NA* (T & P) NA* (T only)
8-week non-blinded RCT of 43 African American women employed in a health service in the southeastern U.S. ⁷¹	P, N=22 C (30 minutes of relaxation, n=21)	Physical strain Interpersonal strain Psychological strain Vocational strain Blood pressure	NA* (P only) NA* (P only) NA* (P & R) No A (P & R) No A (P & R)
2 month RCT (blinding status unspecified) of 34 African Americans and 1 Caucasian American aged 15–18 years with resting SBP between the 85 th and 95 th percentile for their age and gender ⁸³	T, N=17 (8 female, 9 male) C (Health education), N=18 (8 female, 10 male) All reported associations in comparison to control group	Resting SBP in response to (i) simulated car driving stressor; (ii) interpersonal social stressor: SBP Heart rate Cardiac output	NA* (i) NA* (ii) NA* NA* No A NA* No A
Eight year follow-up of a total of 530 African Americans ⁸⁴	T P	All-cause mortality Heart disease mortality	63% reduction 82% reduction
5-week trial with 65 African American working women ⁸⁵	Lifestyle modification program Focused Support Group Model with the goals of building and enhancing group bonding and cohesion, changing patterns of coping and maladaptive response strategies in the resulting situations through increased awareness of behaviors	Feelings of stress Personal support networks Professional support networks	T group compared to P+L groups Reduction for 40% of participants Increase for 82% of participants Increase for 60% of participants
88 low-income elderly African-Americans ⁸⁷	10-week health promotion program including yoga and aerobics	Blood pressure	No A
22 African-American hypertensive patients ⁸⁸	Biofeedback relaxation	Blood pressure	No A
Unspecified number of African American hypertensives ⁸⁹	Biofeedback relaxation	DBP SBP Forehead muscle tension Finger temperature	NA No A NA No A

See page 304 for definition of abbreviations.

Table 2. Continued

Study	Trialed Intervention	Outcome Measure	Findings
A trial of a historical trauma intervention with 54 Lakota Native Americans (32 female and 12 male) in the U.S. ⁹⁰	Brief 1 day intensive psycho-educational group experience integrated with Lakota culture and ceremonies	Pride Joy Sadness Grief Anger Hopelessness Helplessness Shame Guilt	Before 51.5% 45.5% 66.7% 54.5% 69.7% 45.5% 54.5% 60.6% 60.6% After 81.8% 75.8% 18.2% 27.3% 18.2% 0.0% 0.0% 6.1% 6.1%
Aboriginal women aged 40–60 years in Victoria, Australia participating in a workshop called 'Finding a balance: the next step' held in May 2000 ⁹¹	Included identifying signs of stress and strategies to promote well-being and discussions in small groups. A feminist approach and community development framework was utilized	Evaluation of the program	Women were extremely enthusiastic and appreciative of being able to explore these issues in a secure place
Three to four day diabetes camps, available to both Aboriginal people with diabetes and family members in New South Wales, Australia ⁹²	Stress management techniques	Diabetes incidence Hospital admissions for diabetics	Decrease in incidence among non-diabetic family members 15% reduction in the number of Aboriginal diabetics being admitted to hospital
Empowerment program structured into four stages running for 10 weeks each with 12–31 participants and Aboriginal facilitators (more than 80% of participants were Aboriginal Australians) ⁸⁶	Based on the principles of psychosynthesis, analytical skills, mastery training, transformation and meditation. Participants gained a formal qualification in counselling upon completion.	Participant observation and narrative interviews	Participants reported enhanced awareness, resilience and problem solving ability

* $P < .05$ (two-tailed), † $P < .10$ (two-tailed),

C: Control group, DBP: Diastolic blood pressure, HE: Health education, NA: Negative Association, No A: No Association, P: Progressive muscle relaxation, PA: Positive Association, RCT: Randomized Controlled Trial, SBP: Systolic blood pressure, T: Transcendental Meditation.

validated. The Perceived Stress Scale was the most commonly used psychometrically validated scale in these studies.^{34,40,51,53,54} In general, however, more work is needed to standardize stress exposures in the study of chronic disease development to allow greater comparability across studies.

Another limitation of this body of work is that the majority of associational studies (31 in total), including several cohort studies^{30,42,43} and all qualitative studies, used either convenience^{29,40,41,52,54,57,59,62,73} or non-random sampling approaches.^{27,28,30,32,35,36,39,42,43,68} However, an examination of studies using random/representative sampling against those using convenience/non-random sampling indicates that these two sub-sets are comparable in terms of stress exposure measurement, confounder adjustment, and associated health outcomes.

Although there are only seven cohort studies included in this review, it is worth noting that the findings from this sub-set are comparable to that of the review as a whole in terms of stress exposure measurement, sampling methods, and adjustment for confounders. Both physical (four studies) and mental (three studies) health outcomes were examined in these seven studies and all three null associations related to physical health outcomes. There were also similar findings for African Americans and indigenous groups, with a range of both physical and mental health outcomes associated with stress exposure for both these groups and more null associations for physical rather than mental health outcomes. However, a majority of studies involving indigenous groups were qualitative in nature (10 out of 13) and hence stress exposure

measurement, sampling methods, and confounder adjustment for studies involving indigenous groups are skewed strongly toward the characteristics of this particular study type.

The studies in this review, as a whole, adjusted for a range of well-known demographic and anthropometric confounders. However, many studies did not take account of possible confounders at all or did so insufficiently; although in some cases, this was because stress was not considered as the primary exposure of interest and was itself adjusted for in other examined relationships. More importantly, only one study adjusted for factors that were identified in this body of literature as moderators of the relationship between stress and chronic disease.³⁸

The ways in which these factors can affect the relationship between stress

and health are complex. For example, the active coping style of 'John Henryism' is one of the few stress-related constructs hypothesized to apply particularly to minority groups. It is used to describe the tendency to work extremely hard to disprove the stereotype of laziness and inability.⁷⁰ A number of studies have shown that African Americans with high levels of 'John Henryism' are at increased risk from the detrimental effects of stress on their health, especially high blood pressure.^{48,70,95-98} This relationship appears to be strongest for African Americans of low socioeconomic position (SEP).⁹⁶ However, in one study the relationship only held for low SEP African-American women and high SEP men but not vice versa.⁹⁶ Other studies failed to find an association with blood pressure⁹⁸ in one case and in another, found an association between John Henryism and reduced stress for African-American women.⁶² Clearly, further research on stress moderators is needed as is the measurement and analysis of those moderating factors that have already been identified.

Turning to the second research question considered in this review, there is evidence that two intervention techniques are effective in ameliorating stress and its effects – Transcendental Meditation and group-oriented stress management. Unfortunately this evidence is limited by the fact that only two of the RCTs of TM in this review used blinding;^{72,79,81} other studies were either non-blinded⁷¹ or did not state their blinding status. Also the interventions involving group-oriented stress management were demonstration studies with only limited follow-up and long-term evaluation. However, TM has been investigated in several quantitative meta-analyses of first-world populations, with evidence of its effectiveness in reducing physiological arousal, anxiety, smoking, alcohol and drug misuse, and improving psychological health.⁸¹ In a meta-analysis of 146 studies, anxiety measures decreased more in the

groups that practiced TM compared to those using other forms of meditation or relaxation and individuals who practiced TM also showed decreases in illicit drug use, depression as well as increased self-actualization and positive health habits.⁸⁰

This review also has a number of limitations, which need to be noted. By focusing on published articles, it is likely that this review has overstated the strength of the evidence due to publication bias. Also, given the difficulties in weighting evidence across such studies with such heterogeneity in exposure and outcome measures as well as study populations, it was not possible to perform a meta-analysis with the studies identified in this review. For similar reasons, it was not thought that an in-depth examination of the methodological strengths and weaknesses of the studies in this review would be appropriate.

In conclusion, the contribution of stress to chronic mental health for minority groups appears to be significant. Further research in this area is warranted, especially for indigenous populations about whom less is known in comparison to African Americans. Given that chronic disease susceptibility starts early in life,⁹⁹ more research should also be undertaken with children and adolescents, as well as on stress buffers and exacerbators. Future longitudinal studies in this field should help elucidate the causal pathways between stress, coping strategies and a range of chronic diseases for these minority groups. Given the differential strength of association between stress and mental vs. physical health it will also be important to study the mechanisms by which stress affects health. It is hoped that future public health interventions can build on the body of research identified in this review and that, along with efforts to alleviate social disadvantage as the primary cause of stress for minority groups, this research will help reduce the excessive burden of mortality

and morbidity that minority populations in the developed world continue to suffer.

ACKNOWLEDGMENTS

Many thanks to Prof Joan Cuningham for her support and contribution to this project. I am also grateful to Prof Ian Anderson, A/Prof Mark Daniel, Drs Tracy Westerman, Tarun Weeramanthri, and Jeannie Devitt, Ms Cheryl Furner and members of the Menzies School of Health Research Writing Workshop group for commenting on drafts of this work. This research was partially funded by the Cooperative Research Centre for Aboriginal Health and by a scholarship (#193321) and capacity-building grant (#236235) from the Australian National Health and Medical Research Council.

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REVIEW - Paradies

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Design and concept of study: Paradies

Acquisition of data: Paradies

Data analysis and interpretation: Paradies

Manuscript draft: Paradies

Statistical expertise: Paradies

Acquisition of funding: Paradies

Administrative, technical, or material assistance: Paradies

Supervision: Paradies