Multimorbidity in a Mexican Community: Secondary Analysis of Chronic Illness and Depression Outcomes

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Abstract

The aims of this article are: 1) to examine the associations between health provider-diagnosed depression and multimorbidity, the condition of suffering from more than two chronic illnesses; 2) to assess the unique contribution of chronic illness in the prediction of depression; and 3) to suggest practice changes that would address risk of depression among individuals with chronic illnesses. Data collected in a cross-sectional community health study among adult Mexicans ($n=$ 274) living in a low income neighborhood (*colonia*) in Ciudad Juárez, Chihuahua, Mexico, were examined. We tested the hypotheses that individuals who reported suffering chronic illnesses would also report higher rates of depression than healthy individuals; and having that two or more chronic illnesses further increased the risk of depression.

Resumen

Los datos de un estudio transversal en salud de la comunidad de bajos ingresos (colonia) en Ciudad Juárez, Chihuahua, México ($n=274$) fueron examinados para investigar las asociaciones entre las enfermedades crónicas y la depresión. Hemos probado la hipótesis de que las personas que manifestaron padecer de enfermedades crónicas también tienen valores más altas de depresión que las personas sanas; y que dos o más enfermedades crónicas aumentan aún más el riesgo de sufrir depresión. El análisis indicó que enfermedades crónicas "multimorbid" predice significativamente la depresión en nuestra muestra. Sobre la base de las pruebas, se ha encontrado que tener una enfermedad crónica es un factor de riesgo para resultados negativos en salud mental, y recomendar cambios en las prácticas que incluyen detección e intervención de la depresión entre los pacientes con enfermedades crónicas.

Keywords: Hispanics, chronic illness, depression, multimorbidity, evidence-based practice

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Introduction

Multimorbidity is a term used to describe the presence of two or more chronic illnesses in a single individual. The aims of this article are: 1) to examinemultimorbid associations between health provider-diagnosed depression and chronic illness, specifically in depressed patients who also have two or more chronic illnesses; 2) to assess the unique contribution of chronic illness in the prediction of depression; and 3) to suggest practice changes that would address risk of depression among individuals with multiple chronic illnesses. A secondary data analysis was conducted using data from a cross-sectional, binational health study, conducted jointly by the University of Texas at El Paso (UTEP) and the Universidad Autonóma de Ciudad Juárez (UACJ). Data were collected between 2006 and 2008, in a border community in northern Mexico, adjacent to El Paso, Texas. Study activities took place in a low income neighborhood (*colonia*) of Ciudad Juárez, Colonia Felipe Angeles, located within sight of the University of Texas at El Paso, and part of a larger binational metropolitan region. The *colonia*, a resource-poor, semi-suburban neighborhood of Ciudad Juárez, shares many of the health outcomes prevalent in predominantly Hispanic El Paso County. Data were also collected in San Elizario, Texas, a low income *colonia* on the US side of the border, discussed elsewhere(Anders et al., 2008) .

Background and Literature Review

Recent research underlines the importance of considering multimorbidity, including mental and behavioral health, as part of a complete picture of patient care. The complexity of multimorbidity demands systemic practice change in terms of assessing patients (Bayliss et al., 2012). Assessment of patient-centered outcomes should include patient self-report as well as disease-specific measures, to capture biopsychosocial outcomes and etiologies that may be overlooked in disease-centered evaluations. This is of particular importance when assessing mental and behavioral health comorbidities. Current healthcare practice incompletely addresses the issue of multimorbidity, reflecting a "carve-out" practice approach. The term "carve-out" as used by Johnson et al (2012) signifies the custom in contemporary healthcare practice in which highly specialized providers treat a single health condition, resulting in patients/clients accumulating several providers, none of whom treat the whole person. The practice risks overlooking treatment implications of multiple illnesses and inadequately addresses multimorbid physical and behavioral health (Johnson et al., 2012). The elderly are at particular risk. A system-wide practice change is called for as healthcare providers are given guidelines to treat specific diseases or related disease clusters, but not for multiple conditions (Hughes, McMurdo, & Guthrie, 2013). The cumulative impact of treatment for multiple conditions is rarely considered. The current status of practice may thus be characterized by the inadequate coordination of care (Katon et al., 2010).

There is also a significant gap in knowledge about patients who suffer from multimorbidities, particularly aging adults, including how to assess and treat multiple chronic illnesses. For example, of randomized controlled trials published in prominent academic journals, 81% excluded older patients, who are more likely to suffer from multiple illnesses. Patients with multimorbidities are also usually excluded(Hughes et al., 2013). Although problems related to multimorbidity are particularly critical among older patients, multimorbid conditions begin at middle age or earlier. Current practice often results in polypharmacy, in which patients can rapidly accumulate prescriptions that may not be coordinated by providers in terms of drug interaction or duplication(Hughes et al., 2013).

Behavioral Health: Prevalence and Unmet Need

Behavioral health accounts for a significant part of global disability burden; half of US adults will suffer a mental health issue in their lifetimes, and 27% will suffer a substance abuse problem, yet behavioral health remains underfunded and under-reimbursed. Behavioral specialists are in short supply: more than half of US counties are without practicing psychiatrists, psychologists and social workers (Butcher, 2012). In 2010, El Paso had fewer than five psychiatrists and fewer than fourteen licensed psychologists per 100,000 people,serving a population of 800,647, while the neighboring four Texas counties had no psychiatrists or psychologists at all (Texas Department of State Health Services, 2011). Ciudad Juárez has one psychiatric hospital for a population of 1.5 million(*Sistema Nacional de Información en Salud de México (SINAIS)*, 2010). The World Health Organization reports that depression accounts for 4.4% of the global disease burden (a loss of 65 million disability adjusted life years, or DALYs), a morbidity rate comparable to heart disease, diarrheal diseases, or asthma and chronic obstructive pulmonary disease combined (Chisholm, Sanderson, Ayuso-Mateos, & Saxena, 2004). The prevalence of depression among adults in the United States is approximately 9.6% (Centers for Disease Control [CDC], 2011). Persons most at risk for suffering depression are women (10.2%), Hispanics (11.7%), African Americans (12.9%), and the unemployed or uninsured.

Data from the UTEP/UACJ binational health study indicated that among residents of Colonia Felipe Angeles, rates of depression reach 27.7%; while in the comparison *colonia* on the US side (San Elizario, Texas), the prevalence of depression was25%(Anders et al., 2008).

Depression and Chronic Illness

There is considerable evidence for the positive association between depression and chronic illness and increased risk of mortality from chronic illness in the presence of comorbid depression(Bajko et al., 2012; Capuron et al., 2011; Chapman, Perry, & Strine, 2005b; Chien, Wu, Lin, Chou, & Chou, 2012b; Cutshaw, Staten, Reinschmidt, Davidson, & Roe, 2011; Eaton, 2002; Nancy Frasure-Smith & Lesperance, 2008; N. Frasure-Smith et al., 2007b; N. Frasure-Smith, Lesperance, Irwin, Talajic, & Pollock, 2009a; Gravely-Witte, De Gucht, Heiser, Grace, & Van Elderen, 2007; Green, Fox, Grandy, & Group, 2012; Hartley et al., 2012; Meng, Chen, Yang, Zheng, & Hui, 2012; Nguyen et al., 2012; Niranjan, Corujo, Ziegelstein, & Nwulia, 2012; Pereira, Cerqueira, Palha, & Sousa, 2013; Raji, Reyes-Ortiz, Kuo, Markides, & Ottenbacher, 2007; Rose, Peake, Ennis, Pereira, & Antoni, 2005; Viscogliosi et al., 2013; Whooley, 2012; Wu, Chien, Lin, Chou, & Chou, 2012). Chapman et al surveyed the literature on the associations between depression and chronic diseases, including asthma, arthritis, cancer, cardiovascular disease, diabetes, and obesity and projected that by 2020, depression would be second only to cardiovascular illnesses in the global burden of disease(Chapman, Perry & Strine, 2005).A bidirectional relationship between depression and cardiovascular disease has been observed, with mortality rates higher in depressed patients (Nemeroff & Goldschmidt-Clermont, 2012). Individuals suffering from depression are more than one and a half times more likely to develop heart disease, a risk that is more significant than the risk from passive cigarette smoke. Depressed individuals are four times more likely to suffer a myocardial infarction than healthy individuals, and depression interferes behaviorally with compliance to drug therapies and with rehabilitative and diet regimens after a cardiac event (Bautista, Vera-Cala, Colombo, & Smith, 2012). Depressed individuals are twice as likely to have a stroke within ten years (Kang et al., 2012). Having a stroke or receiving a cancer diagnosis or diagnosis of a chronic illness increases the risk for developing comorbid depression (Kang et al., 2012). Research suggests a relationship between hypertension and depression (Ginty, Carroll, Roseboom, Phillips, & de Rooij, 2013). Conversely, having achronic illness negatively affects self-perception of quality of life (Cutshaw et al., 2011).

Diabetes in particular has been positively associated with higher rates of depression in a bidirectional manner (Johnson et al., 2012; Katon et al., 2010; Rustad, Musselman, & Nemeroff, 2011). Depression is commonly comorbid with diabetes and occurs among patients with diabetes at rates that are 30-40% higher than the general population, and two to three times higher than among healthy controls (Eaton, 2002; Johnson et al., 2012). Conversely, depression is associated with a 60-65% increase in risk for diabetes, although risk factors may be related to unhealthy behavior and the use of psycho pharmaceuticals known to increase blood glucose(Chien, Wu, Lin, Chou, & Chou, 2012a). Psychosocial relationships can both mitigate or contribute to depression, exerting significant influence on outcomes among patients with diabetes, especially in terms of self-care (Arigo, Smyth, Haggerty, & Raggio, 2014; Sussman et al., 2014). Patients with comorbid depression and diabetes are at increased risk of negative health outcomes including risk factors such as poor self-care, higher rates of complications, and higher rates of morbidity (Gask, Macdonald, & Bower, 2011; Gravely-Witte et al., 2007; Katon et al., 2010). The prevalence of depression is twice as high in individuals suffering from diabetes as in healthy individuals (Anderson, Freedland, Clouse, & Lustman, 2001; Eaton, 2002). Among individuals with a "triad condition" of diabetes, hypertension and obesity, 16.5% also reported suffering from depression (Green et al., 2012).

Depression is associated with development of metabolic syndrome among women under 40, and a reciprocal relationship between obesity and depression has been observed (Capuron et al., 2011). Analysis of the immune response shows a bidirectional relationship between metabolic syndrome and depression through elevated levels of inflammatory markers in both conditions, establishing that both metabolic syndrome and depression are associated with dysfunctional immune response (Capuron et al., 2008; Pan et al., 2012). Chronic stress and depression elevate levels of inflammatory cytokines, which in turn increase the risk of coronary artery disease (N. Frasure-Smith et al., 2007a; N. Frasure-Smith, Lesperance, Irwin, Talajic, & Pollock, 2009b).

Thus, the evidence shows a reciprocal relationship between depression and chronic illness. The presence of depression and other mental illnesses may contribute to the development of chronic illnesses; and chronic illness may be a risk factor for the development of depression (Chapman, Perry, & Strine, 2005a). This considerable body of evidence suggests changes in practice: for example, the systematic evaluation of mental health status of individuals suffering from chronic illnesses. Conversely, the presence of depression should be considered a possible indicator of an underlying illness.

Hispanics and Depression

Four out of five leading causes of death among Hispanics are chronic illnesses that the evidence has shown are frequently comorbid with depression (Cutshaw et al., 2011); thus examining associations between chronic illness and depression among Hispanics is particularly relevant. Diabetes in particular is a significant risk: many local providers do not meet international standards for diabetes care in the US-Mexico border region, much less evaluate mental health status(Diaz-Apodaca, de Cosio, Canela-Soler, Ruiz-Holguin, & Cerqueira, 2010). In a study among border Hispanics conducted between 2001 and 2002, 42.1% of Hispanics on the US side and 37.6% on the Mexico side had controlled diabetes (Diaz-Apodaca et al., 2010). Given that depression has been shown to be associated with diabetes, these figures may also represent risk for depression. Social factors undoubtedly play a role with regard to depression among Hispanic border residents. Female Hispanics are at higher risk for depression, according to the National Alliance on Mental Illness (NAMI), because of poverty, immigration and acculturation, low social status, poorly paid, stressful jobs or unemployment, family responsibilities that fall more on women than men, stigma, and the association of depression with a divine etiology. In the US, the rates of attempted suicide among Hispanic female adolescents are 1.5 times that of White or Black female adolescents (National Alliance on Mental Illness, 2009).

However, the literature on depression among Mexican Hispanics is both ambiguous and scarce. NAMI identifies "Latinos" as a high-risk group for depression, especially women and adolescent females, without distinguishing between culturally-distinct Latino subgroups. Other scholars have found that cultural factors, such as close family ties and social networks, are protective; and for this reason, some investigators have found that the prevalence of depression among Mexicans in both sexes is less than that of other ethnic groups (Catalano, 2000). Further, Latinos and Hispanics exhibit low levels of help-seeking behavior and underutilization of mental health services, creating health disparities(Aguilar-Gaxiola et al., 2002; Berk, Schur, Chavez, & Frankel, 2000; Vega, Kolody, & Aguilar-Gaxiola, 2001; Vega, Kolody, Aguilar-Gaxiola, & Catalano, 1999) and the underreporting of mental health issues. Thus, it is up to the health care provider to probe carefully for mental health issues when a client presents with a chronic illness, somatic symptoms, or with a "folk "idiom of distress such as *nervios,* which has been shown to be a predictor of depression(Cabassa, Hansen, Palinkas, & Ell, 2008; Guarnaccia, Lewis-Fernandez, & Marano, 2003; Kay & Portillo, 1989; Lewis-Fernandez et al., 2010; Low, 1981; O'Connor, Stoecklin-Marois, & Schenker, 2013; Salgado de Snyder, Diaz-Perez, & Ojeda, 2000; Salman et al., 1998).

Methods

In the original study, residential blocks were mapped and households enumerated. Study participants were randomly selected from enumerated households. Adults aged 17 and older were eligible to participate. Research assistants were hired from the Universidad Autonóma de Ciudad Juárez (UACJ) and the University of Texas at El Paso (UTEP), and trained in interview methods, survey administration, and human subjects research. Interviews were conducted in Spanish during 2006 and 2007with 274 residents of Colonia Felipe Angeles, with a response rate of nearly 90%. The interviews, including survey administration, took place in home visits. The survey instrument contained demographic questions including gender, age, marital status, family composition, household income, work status, birthplace, and length of residency (Table 1). For a more complete description of the survey, its development and administration, see Anders et al, 2008 (Anders et al., 2008). Participants were also assessed for acculturation, alcohol abuse, health histories, health status, and questions on behavioral risk factors, including depression, from the Behavioral Risk Factor Surveillance System (BRFSS; CDC, 2002).

Table 1. Demographic Characteristics of Participants from the Colonia		
Characteristic	Frequency	Percentage
Age		
18-40 yrs	159	58.0
41-81 yrs	115	42.0
Gender		
Male	85	31.0
Female	189	69.0
Civil status		
Married	203	74.1
Single	71	25.9
Time in Juárez		
10 yrs or less	39	14.2
10 yrs or more	235	85.8
Yearly income		
$9650 or less	191	88.0
$9651 or more	26	12.0
Only 217 provided data on yearly income.		

Statistical Methods

Statistical analysis was conducted with the software Statistical Package for the Social Sciences (SPSS) version 20.0. Prevalence of depression in participants reporting a chronic illness was explored through cross-tabulation, whereas the association between depression and chronic illnesses was assessed through phi correlation. Phi-coefficient was especially formulated to compare truly dichotomous distributions (Chedzoy, 2006), as it is the case of the data collected in this study in which participants reported either yes or no to the presence of depression and chronic illness. (Table 2). Chronic diseases included: diabetes, high blood pressure, high cholesterol, asthma, emphysema, hepatitis or cirrhosis, kidney disease, ulcer, colitis, cancer, HIV, tuberculosis, arthritis, and prior heart attack as a partial measure of cardiovascular disease. In addition, logistic regression analyses were conducted to assess the effect of having a chronic disease on the likelihood that the participants from the *colonia* reported depression. The unique contribution of each chronic illness in the prediction of depression was also examined. The first analysis included the entire sample under study. Subsequently, the sample was divided by age, gender, and income to examine whether these demographic variables influence the significance of the model and its predictors. Statistical significance was set at alpha .05.

Table 2. Prevalence of Depression in Participants Reporting a Chronic Illness

Chronic disease	w/Depression		Phi correlation	
	N	% within group	Value	Significance
Diabetes n=35	12	34.3	.06	.313
High blood pressure n=70	30	42.9	.21	.001**
High blood cholesterol n =40	18	45.0	.17	.006**
Asthma n =14	7	50.0	.12	.050*
Heart attacks in the past/CVD n =12	7	58.3	.15	.011*
Emphysema n=6	4	66.7	.13	.029*
Hepatitis or cirrhosis n =6	1	16.7	-.036	.554
Kidney disease n =42	14	33.3	.06	.340
Ulcer n=24	9	37.5	.07	.240
Colitis n =40	20	50.0	.21	.000**
Cancer n =8	3	37.5	.04	.511
HIV/AIDS n =1	0	0	-.04	.539
Tuberculosis n =1	0	0	-.04	.545
Arthritis n =31	13	41.9	.12	.052***
*Significant at alpha <05, **Significant at alpha <01, ***approaches significance				

Results

Demographic Characteristics

The ratio of women to men participating in the survey was approximately two-thirds women to one-third men, with female participants tending to be younger than males (See Table 1). Married women constituted 74.1% of the sample. Females were less likely to report being married, although men were more likely to report being single; approximately equal numbers by gender reported being divorced. As shown in Table 1, 88.0% of the sample reported incomes of $9,650 or less. Women were poorer than men by the equivalent of $1500 in US dollars in annual income levels (results not shown). Of all participants, 85.8% lived 10 years or more in Cuidad Juárez, Mexico. Most female respondents had lived in the *colonia*for more than ten years, and all but four were born in Mexico. Males reported higher levels of education than females.

Prevalence of Depression and Other Multimorbid Chronic Illnesses

Women reported having been diagnosed with depression at nearly twice the rate of men. Among participants in the sample (*n* = 274), 27.2% overall reported that they had ever been told by a healthcare provider that they suffered from depression. Nearly half of respondents reported feeling stressed, and 43.1% reported feeling excess worry.

Phi correlation analysis showed that high blood pressure, high blood cholesterol, asthma, heart attacks in the past, emphysema, and colitis were significantly associated with physician-diagnosed depression. The rest of the chronic illnesses were not significantly associated with depression; however, arthritis approached significance ($p = .052$). Beyond statistical analysis, it is important to point out that the proportion of participants who reported depression in conjunction with a chronic disease was very high. In 7 out of 14 chronic illnesses under study, 40% or more of participants reported suffering from depression as well (Table 2). In contrast, in 2012, the prevalence of depression among adults suffering a chronic disease in Mexico City was between 12% and 20% (Subsecretaría de Prevención y Promoción de la Salud, 2012).

Table 3: Results from Logistic Regression Assessing the Effect of Chronic Diseases on the Likelihood that Participants Reported Depression

Chronic disease n	Wald	df	Sig.	Exp(B)
Diabetes (*n*=35)	.641	1	.423	.686
High blood pressure (*n*=70)	3.731	1	.053	1.982
High blood Cholesterol (*n*=40)	2.733	1	.098	2.032
Asthma (*n*=14)	1.060	1	.303	1.984
Heart attacks in the past (*n*=12)	.090	1	.764	1.258
Emphysema (*n*=6)	.784	1	.376	2.525
Hepatitis or cirrhosis (*n*=6)	.703	1	.402	.275
Kidney disease (*n*=42)	.120	1	.729	1.155
Ulcer (*n*=24)	.000	1	.994	1.004
Colitis (*n*=40)	6.518	1	.011*	2.700
Cancer (*n*=8)	.289	1	.591	1.528
HIV/AIDS (*n*=1)	.000	1	1.000	.000
Tuberculosis (*n*=1)	.000	1	1.000	.000
Arthritis (*n*=32)	.118	1	.731	1.176
*Significant at 0.05				

The logistic regression analysis revealed that having one or more chronic diseases significantly predicted depression in our sample. The model was statistically significant, χ^2 (14, $N = 265$) = 25.72, $p = 0.03$, indicating that the set of chronic diseases under analysis in the aggregate significantly predicted the presence of depression. That is, having a chronic disease raised the probability of suffering depression in the participants from the *colonia*. The model explained approximately 13.5% (Nagelkerke R^2) of the variance in depression and correctly classified 75.5% of cases. The Hosmer and Lemeshow test was not significant, χ^2 (5, $N = 265$) = 3.43, $p = .63$; indicating that the data conformed to the model. However, the only significant single predictor was colitis, $p = .011$; although high blood pressure and high blood cholesterol approached significance at $p = .053$ and $p = .098$, respectively.

That is, only colitis uniquely predicted the presence of depression in the participants from this study. Based on the results, those reporting colitis were 2.7 times more likely to report depression compared to those not reporting this chronic illness (Table 3). Regarding gender, logistic regression indicated that the set of chronic diseases under study significantly predicted depression in men, χ^2 (13, N = 81) = 29.71, (p = .005); with the model explaining 52.4% of the variance in depression and correctly classifying 91.4% of cases. However, there were no significant individual predictors. On the other hand, the model approached significance for the women χ^2 (12, N = 184) = 20.73, (p = .054), explained 15% of the variance in depression, and correctly classified 71.9% of cases. In addition, this model showed two significant individual predictors: cholesterol and colitis. Similarly, income levels contributed to significance. When analyzed separately based on income, the model was significant for the group earning less than $9650.00, χ^2 (13, N = 185) = 26.40 (p = .015), but not significant for the group earning more than $9651.00. χ^2 (12, N = 26) = 11.80 (p = .462). That is, chronic diseases significantly predicted the presence of depression in those with an income less than $9650 but not in those earning more than $9651 ($p$ = .015 vs. p = .462). Lastly, age group had no influence on the model significance or its predictors. That is, being younger than 40 years of age did not significantly predict the presence of depression, χ^2 (13, N = 15) = 18.46 (p = .141), nor being older than 40 yrs. of age χ^2 (13, N = 109) = 18.60 (p = .136).

Discussion

Summary of Main Findings

The analysis shows that suffering from one or more chronic illnesses is a significant predictor of comorbid depression. Low income levels significantly increased risk as did male sex. Among the chronic illnesses examined, high blood pressure, high blood cholesterol, asthma, heart attacks in the past, emphysema, and colitis were significantly associated with physician-diagnosed depression, with arthritis closely approaching significance. However, in our sample, diabetes, hepatitis or cirrhosis, kidney disease, ulcer, cancer, HIV, and tuberculosis were not significantly associated with physican-diagnosed depression. Behavioral health deserves systematic attention in the clinical setting to complement and bolster medical interventions, as well as increasing patient well-being overall, particularly because our analysis as well as evidence from the literature show an association between chronic illness and depression(Arigo, Anskis, & Smyth, 2012). A notable finding in our research was the association between poverty and depression. Income levels were linked to rates of depression among the chronically ill. Moreover, in the lower-income group, having an ulcer was a significant individual predictor of depression in addition to colitis. These findings are suggestive of the biopsychosocial toll of struggling with poverty. Gendered responses did not follow the expected: although depression was twice as prevalent among women, our results indicated that men are more likely to become depressed when faced with multimorbid conditions, that is having more than two chronic illnesses, than women. Similarly, although aging has been associated with increased risk of depression, we found no significant difference between age groups when examining the associations between multimorbidity and depression.

A *colonia* by definitionis a profoundly resource-poor area: many of the participants cannot afford to see a healthcare provider with regularity. In the comparison community on the US side of the border, San Elizario, a semisuburban neighborhood of El Paso characterized as a *colonia,* Anders et al found significant associations between depression, high cholesterol, and hypertension among participants reporting depression in the sample(Anders et al., 2008). Residents of San Elizario reported seeing a health provider an average of 5.1 times per year, while no data on number of annual visits to health providers was collected among residents of Colonia Felipe Angeles. Thus both chronic illness and depression may have been underreported in the Colonia Felipe Angeles sample because of lack of access to providers.

Limitations

There are several limitations to this study that should be mentioned, inherent to cross-sectional assessments based upon participant interview, such as recall bias and inability to determine temporal order. Recall bias is mitigated, however, because survey questions asked about provider-diagnosed illnesses and depression. Since much mental health need goes unmet, it is unclear when or from whom participants might have received their diagnoses of depression. In addition, the study measured doctor-diagnosed outcomes with no measurement of access to providers. For this reason it is possible that outcomes were underreported. Sample sizes for some illnesses, when considered separately, were too small to reach statistical significance, notably with the small percentage of participants reporting diabetes compared to the literature.

For example, in a 2001- 2002 study in the border region, Diaz-Apodaca et al found that self-reported, undiagnosed diabetes rates were 16.6% on the Mexican side and 14.7%among Hispanics on the US side (Díaz-Apodaca, Ebrahim, McCormack, Cosío, & Ruiz-Holguín, 2010). The prevalence of diabetes in our sample, 12.9%, and the small number in the subsample of participants with diabetes (*n*=35) suggest the possibility of recall bias or underreporting due to lack of accessibility or availability of health providers who could make the diagnosis. However, when considered in the aggregate, the association between chronic illness and depression was more conclusive. Further research with larger samples sizes of individual chronic illnesses and illness clusters, such as the cluster of high blood pressure/cardiovascular disease/high blood cholesterol and the relationship with depression is merited among the Mexican-origin Hispanic population. In future studies, depression should be measured with a validated depression scale such as the Beck Depression Inventory or the Composite International Diagnostic Interview of the World Health Organization.

Models for Depression Screening as Standard Practice

A number of studies examine intervention strategies among Hispanic border populations that could be adapted for cross-cultural implementation, and which could easily incorporate depression and mental health screening. Most commonly known among these is the *promotora* model. The *promotora* model for intervention and outreach employs methods from community-based participatory research that have been proven to be very effective (Balcazar, Alvarado, Cantu, Pedregon, & Fulwood, 2009; Balcázar et al., 2012; Cutshaw et al., 2011; Staten et al., 2012); namely that of engaging respected community stakeholders to educate community members and implement positive changes in health behavior. The model has the advantage of using peers, who share culture, language and geography with the clients they serve; and would be adaptable to any cultural group. A model that was been tested in a randomized trial, *Pasos Adelante*: Steps Forward, a 12-week *promotora*-based outreach and intervention program in Douglas, Arizona, showed significant success in reducing risk factors for diabetes and cardiovascular disease, and achieved significant reduction in depressive symptoms among participants (Cutshaw et al., 2011; Staten et al., 2012). Among Mexican-origin Hispanics in the El Paso border region, several interventions for cardiovascular disease using the *promotora* model have been examined with success, notably *Salud para su Corazón:* Health for your Heart (Balcazar et al., 2009) and the HEART Project (Balcázar et al., 2012). Each of these programs could easily incorporate a culturally-appropriate mental health component. Although such programs show promise for a holistic, community-oriented model for mental health and chronic illness intervention, comprehensive community engagement and policy changes would be necessary to move into a community model with regard to health care provision and prevention (Balcázar et al., 2012).

Some forward-looking health care providers have already instituted depression screenings among patients, acknowledging that depression has a deleterious impact on physical illnesses (Butcher, 2012). The MacArthur Foundation instituted a long term program of research on a depression intervention called RESPECT that has had considerable success (Nutting et al., 2008). RESPECT is based on a three-component model that emphasizes hands-on care management. However, this effective intervention is plagued by lack of reimbursement by health insurance providers, a reflection of the low priority of mental health in the US healthcare system. Nurses, the front line of health management, can play a significant role in addressing the issue of multimorbidity and mental health, by implementing proactive, patient centered screenings and interventions(Katon et al., 2010). A shift to patient-reported outcomes (Novak, Mucsi, & Mendelssohn, 2013) including quality of life, patient satisfaction and psychological determinants of health, would appropriately include asking a patient how they feel in terms of feeling sad or down or implementing a relatively simple screener such as that proposed by Novak et al.(Novak et al., 2013) that might identify incipient problems.

Conclusion

Our data is from a border community with outcomes and demographic profile that are similar to corresponding communities in the US; thus the analysis suggests that more attention needs to be paid to the relationships between chronic illness and mental health outcomes such as depression. Prevention, non-pharmacological treatment modalities, wellness programs and other transcultural models including community resilience models based on culturally-mediated individual perceptions, may provide solutions to the ongoing problem of adequate and appropriate mental health care.

In future research, the implementation of such programs can be studied in relation to chronic illness to measure the effect of reduction of depressive outcomes on illness. However, the financial sustainability of mental health programs is crucial: many promising interventions end when study funding ends (Nutting et al., 2007). Prioritizing mental and behavioral health and on the development of sustainable first-line interventions seems called for in light of the increasing disability burden of mental health issues(World Health Organization, 2012). Such a shift in priorities will require a commitment across the board from providers, insurers and policymakers, including the employment of cost-effective peer and paraprofessional counselors to conduct initial screenings and interventions. Our research contributes to the growing body of evidence that multimorbidities created by co-occurring negative mental and physical health outcomes represent a serious augmentation of the global burden of disease.

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