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Anxiety and Physical Health Conditions in Older Adults:

An Examination of Co-occurrence, Predictors of Co-occurrence, and Mental Health Service Use

By

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Abstract

The dramatic growth of the older adult population corresponds with several challenges relating to complex comorbidities of commonly occurring physical health conditions and mental disorders. The 'Strength and Vulnerability Integration (SAVI)' theoretical model (Charles, 2010) posits that aging is associated with enhancements in emotional well-being. Unfortunately these emotional enhancements are compromised in the context of a chronic, unrelenting stressor such as a physical health condition and vulnerabilities in emotional well-being are associated with maladaptive physiological changes. Understanding age-related vulnerabilities within this framework, the present research explored the comorbidity of anxiety disorders and physical health conditions longitudinally and mental health service use implications of comorbidities in adults aged 55 years and older. This research specifically focused on arthritis, gastrointestinal disease, and cardiovascular disease. Study 1 examined the bi-directional relationship between individual anxiety disorders and the specified physical health conditions, and further examined sociodemographic and health predictors of incident comorbidities in a longitudinal population-based sample of American older adults. Results provided support for a bi-directional relationship across a 3 year period. Any anxiety disorder and post-traumatic stress disorder were significant independent predictors of incident gastrointestinal disease and arthritis was a significant independent predictor of incident generalized anxiety disorder. Being female and poor mental health related quality of life at baseline were independent predictors of incident comorbid any anxiety disorder and the specified physical health conditions. Study 2 examined the effect of comorbid any anxiety disorder and the specified physical health conditions on past-year mental health service use in a cross-sectional Canadian population-based sample of older adults. Differential relationships emerged across specified physical health conditions on mental health

service use with gastrointestinal disease and comorbid any anxiety disorder being associated with

lower rates of use. Results have important clinical implications for identification and possible

prevention initiatives. The findings are discussed within the context of SAVI and current

healthcare practices for older adults.

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Dedication

This thesis is dedicated to my late grandparents, Martha Butland and Saad El-Gabalawy. They both played a pivotal role in my development and taught me important life lessons. They continue to have a presence and influence in my life. My grandmother was my greatest advocate and taught me about the value of cultivating close relationships. My grandfather taught me about the importance of hard work and self-reflection. They have contributed to my commitment to older adults and my utmost respect for older adults' wisdom based on a long life lived.

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    10.1016/j.exger.2014.09.012

2. El-Gabalawy, R., Mackenzie, C., & Sareen, J (in press). Mental health service use among

    older Canadians with anxiety and comorbid physical conditions. *Aging and Mental*

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The above publications appear in this doctoral thesis as Chapter 1 and Chapter 2. As primary

author, these works can be reproduced with information regarding access.

As primary author, I was responsible for idea conception, literature searches, planned and

executed analyses, interpreting findings, writing the first draft and editing subsequent drafts,

across both studies.

Chapter One: General Introduction

The older adult population is rapidly growing and is projected to continue to dramatically increase in the coming years as a result of advancements in medicine and science. Older adults can present with complex physical and mental health comorbidities, which have historically not been sufficiently researched and therefore are misunderstood. Suffering from one or more physical health conditions can significantly impact well-being and has substantial economic, psychological and physical costs. The prevalence of one or more physical health conditions among older adults is estimated to be as high as 92% and a large majority of older adults suffer from multiple physical health problems (Dall et al., 2013; Fried, Ferrucci, Darer, Williamson, & Anderson, 2004). Recently there has been an expanding body of literature investigating the relationship between physical health conditions and mental disorders. Existing research has primarily investigated depressive disorders in conjunction with physical health conditions in the general adult population (Evans et al., 2005; Katon, Lin, & Kroenke, 2007; Moussavi et al., 2007). With respect to anxiety, which is the focus of this thesis, population-based research has found a significant association between anxiety disorders and physical health conditions, with the combination of the two resulting in worse clinical outcomes (Katon, et al., 2007; Sareen, Cox, Clara, & Asmundson, 2005). However, it is unclear whether similar comorbid relationships exist in older adults, who are more likely to experience physical health problems and have a high rate of anxiety disorders (Beekman et al., 1998; Bryant, Jackson, & Ames, 2008; Reynolds, Pietrzak, El-Gabalawy, Mackenzie, & Sareen, 2015) that can persist for years (Schuurmans et al., 2005). In fact, physical health conditions and poor physical health related quality of life are associated with persistence of particular anxiety disorders in late life (Mackenzie, El-Gabalawy, Chou, & Sareen, 2013). Preliminary cross-sectional research by our group suggests that anxiety disorders in

Canadian older adults co-occur with several physical health conditions and this comorbidity results in poorer quality of life outcomes, particularly physical health related quality of life (El-Gabalawy, Mackenzie, Shooshtari, & Sareen, 2011). However, the relationship between anxiety disorders and commonly occurring physical health conditions in older adults has not been examined longitudinally, is not clearly understood, and has been primarily restricted to clinical and small community samples. Older adults' quality of life and well-being are also greatly affected by whether they seek effective professional help for their mental health, but unfortunately older adults with mental disorders are disproportionately less likely to seek professional mental health services (Bartels, 2003; Karlin & Fuller, 2007; Trollor, Anderson, Sachdev, Brodaty, & Andrews, 2007; Wang et al., 2005) and this may be particularly true for older adults with anxiety disorders (Scott, Mackenzie, Chipperfield, & Sareen, 2010). It is still unknown, however, the effect of co-occurring anxiety disorders and physical health conditions on mental health service utilization.

The primary purpose of this thesis was to critically examine the potentially complex relationship between commonly occurring physical health conditions and anxiety disorders in older adults using American and Canadian population-based samples. The specific research objectives of this thesis were:

1. To examine specific physical health conditions as predictors of incident individual anxiety disorders and individual anxiety disorders as predictors of incident physical health conditions. To further examine a number of sociodemographic, physical health, and mental health predictors of incident comorbid any anxiety disorder and the assessed physical health conditions in a longitudinal nationally representative American sample of older adults (Study 1).

2. To examine the effect of comorbid any anxiety disorder and physical health conditions on mental health service utilization in a nationally representative Canadian sample of older adults (Study 2).

I specifically examined anxiety disorders and comorbid arthritis, cardiovascular disease, and gastrointestinal disease. Although these survey data included other physical health conditions, these specified conditions were included in both the Canadian and American datasets and are highly prevalent in late life. In addition, these conditions have particularly strong relationships to psychological health, as detailed below. Therefore the other assessed physical health conditions were beyond the scope of this thesis. In both studies, I restricted my analyses to adults 55 years of age or older. Not only did this age cutoff increase my sample size and enhance statistical power across both samples, but the traditional cutoff age of 65 years is less relevant today as adults are retiring well before 65 years old or much later in life. Accordingly, this age cutoff is consistent with a large body of recent research focusing on older adults (e.g., (Beaulaurier, Seff, & Newman, 2008; Corna, Cairney, & Streiner, 2010; El-Gabalawy, Mackenzie, Pietrzak, & Sareen, 2014; Mackenzie, et al., 2013; Mackenzie, Reynolds, Chou, Pagura, & Sareen, 2011; Scott, et al., 2010)).

Older Adults' Imminent Mental Health Crisis

There is a looming mental health crisis for older adults, which is attributable to this demographic rapidly growing at an unprecedented rate. In fact, more than 25% of adults are expected to be over the age of 65 by the year 2031 (Belanger, 2005) and the older adult population is expected to double by the year 2050 (Centers for Disease Control and Prevention, 2011b). This growing demographic is due to post-war "baby boomers" reaching late adulthood and the increasing adult lifespan. Of concern, this growing older adult population corresponds

with little understanding of mental health issues in late life as few resources have been devoted to geriatric training and mental health care delivery systems for treating older adults (Bartels et al., 2003; Jeste et al., 1999; Shrestha, Robertson, & Stanley, 2011). This is not only true in the United States where less than 5% of Psychologists focus their clinic work on older adults (Bartels & Naslund, 2013), but also in Canada where there are no doctoral programs with a formal concentration in Geropsychology (Konnert, 2009). As a result of this demographic growth, lack of research devoted to older adults' mental health, and inadequate geriatric training, Bartels and Naslund (2013) note that there will be a drastic increase of older adults with mental health issues, which will be associated with significant personal and societal costs. These challenges will require "dramatic changes in what we do and how we do it".

Understanding mental health issues in older adults is imperative given that recent research suggests that greater numbers of older adults suffer from mental health problems than previously recognized (Reynolds et al., 2015) and mental disorders tend to be under-diagnosed in older persons (Wolitzky-Taylor, Castriotta, Lenze, Stanley, & Craske, 2010). Under-diagnosis may be partly due to assessment and screening instruments not being validated in older adults (Dennis, Boddington, & Funnell, 2007; Fuentes & Cox, 1997; Kogan, Edelstein, & McKee, 2000; Palmer, Jeste, & Sheikh, 1997; Therrien & Hunsley, 2012). In regard to anxiety disorders specifically, recent research suggests that this is a commonly occurring mental health problem among older adults with prevalence rates estimated between 3.2 and 14.2% (Wolitzky-Taylor et al., 2010). Late life anxiety has been associated with diminished well-being and disability (Brenes et al., 2005; de Beurs et al., 1999; Porensky et al., 2009) and, at the extreme, suicide (Bartels et al., 2002; Juurlink, Herrmann, Szalai, Kopp, & Redelmeier, 2004; Raposo, El-Gabalawy, Erickson, Mackenzie, & Sareen, 2014). It is therefore essential to understand mental health issues,

especially anxiety disorders that have traditionally received less attention than depressive

disorders, among the older adult population.

Comorbidity of Physical Health Conditions and Mental Disorders Among Older Adults

Age related changes result in declines in general health and the onset of a number of

physical health problems (Dall et al., 2013; Fried et al., 2004; Jette, 1996). There is a growing

body of research examining the unique interplay between mental health problems and physical

health conditions in older adults. Both empirical evidence and theoretical models provide support

for the comorbidity of anxiety disorders and physical health problems in late life.

Empirical Evidence

Empirical investigations examining the relationship between mental health problems and

physical health conditions have been largely restricted to depressive disorders (Chang-Quan et

al., 2010); however, anxiety disorders in physically unwell older persons are gaining considerable

interest. In fact, as detailed below, preliminary research suggests that anxiety disorders may be

more prevalent than depressive disorders in medically ill populations. Recent research by my

colleagues and I examined the association of any anxiety disorder and a variety of physical health

conditions among older adults using the nationally representative Canadian Community Health

Survey (CCHS) 1.2. We found that after adjusting for sociodemographic variables and depressive

and substance use disorders, the presence of chronically painful conditions (i.e., arthritis, back

pain, and migraine) and other commonly occurring physical health conditions (i.e., allergies,

cataracts, gastrointestinal, lung, heart, and endocrine disease) were significantly and positively

associated with any anxiety disorder (El-Gabalawy et al., 2011). Moreover, the comorbidity of

any anxiety disorder and allergies, cataracts, arthritis, and lung disease resulted in poorer self-

rated physical and/or mental health after adjusting for sociodemographic variables, other

depressive and substance use disorders, and physical health comorbidity. These findings are corroborated by clinical research (Goldberg et al., 1990; Todaro, Shen, Raffa, Tilkemeier, & Niaura, 2007) and research using smaller community samples (van Balkom et al., 2000). As previously indicated, in this thesis I specifically investigated comorbid anxiety disorders and arthritis, cardiovascular disease, and gastrointestinal disease.

Arthritis. Arthritis is one of the most commonly occurring physical health conditions among older adults (Gureje, Von Korff, Simon, & Gater, 1998; Reginster, 2002). Nationally representative data suggests that approximately 40-50% of older adults report having arthritis or rheumatism (El-Gabalawy et al., 2011; Helmick et al., 2008). With the aging population, epidemiologists predict that approximately seven million Canadians (20%) will suffer from a form of arthritis by the year 2030 with the largest increases in those aged 65 years and older (Legace, 2010). The high prevalence rate of arthritis is partially attributable to the fact that there are over 100 different forms of the disease. The most common form, occurring in more than 10% of Canadian adults, is osteoarthritis, which refers to a degenerative joint disease. Inflammatory arthritis, namely rheumatoid arthritis, is the second most common type of arthritis and refers to a systemic immune-mediated disease that targets the joints and affects approximately 1% of Canadian adults (Legace, 2010). Of note, prior research has found that levels of anxiety appear to be similar across different types of arthritis (Hawley & Wolfe, 1988).

These high prevalence rates are particularly concerning given that arthritis significantly impacts quality of life (Gureje et al., 1998; Reginster, 2002) and is the leading cause of chronic pain and disability (McNeil, 1999; Centers for Disease Control and Prevention, 2011a). Researchers and clinicians alike are also recognizing the significant psychological burden associated with arthritis. Psychological distress is common in middle aged and older adults who

suffer form arthritis, and psychological distress in arthritis sufferers is associated with several negative correlates including being underweight or obese, being inactive, and reporting impaired physical and general health (Strine et al., 2004). In terms of mental disorders, the overwhelming majority of research on arthritis has been devoted to examining depressive disorders, where a strong link has been established (Dickens & Creed, 2001; Dickens, McGowan, Clark-Carter, & Creed, 2002; Sheehy, Murphy, & Barry, 2006). A review of the literature by Margaretten and colleagues (2011) indicates that prevalence rates of major depressive disorder in adults with rheumatoid arthritis ranges from 13 to 42% (Margaretten, Julian, Katz, & Yelin, 2011). However, recent research suggests that anxiety disorders are also highly comorbid with arthritis, particularly rheumatoid arthritis, and may be more prevalent than depressive disorders among arthritis sufferers (Covic et al., 2012; el-Miedany & el-Rasheed, 2002; Ho, Fu, Chua, Cheak, & Mak, 2011; McDonough et al., 2014; McWilliams, Cox, & Enns, 2003; Stang et al., 2006; Treharne et al., 2005). Despite the large and growing body of research examining depressive and anxiety disorders, respectively, among arthritis sufferers, very little attention has been devoted to these relationships in older adults who are at significantly greater risk of developing arthritis than younger adults. Preliminary population based research examining adults aged 45+ corroborated previous findings that anxiety is more prevalent than depression in arthritis sufferers, with an estimated prevalence rate of approximately 30%; and anxiety among those with arthritis is associated with poor functioning. In addition, these researchers found that despite this high comorbidity rate only half of arthritis sufferers with anxiety and/or depression sought help for their mental disorder in the past year (Murphy, Sacks, Brady, Hootman, & Chapman, 2012).

Cardiovascular Disease. Cardiovascular disease is also a commonly occurring condition in older adults and increasing age is one of the strongest etiological risk factors (Gershlick, 2009;

Lloyd-Jones et al., 2010). The prevalence of self-reported hypertension and heart disease is estimated to be approximately 35.2% and 15.6%, respectively, among older Canadian adults (El-Gabalawy et al., 2011). According to the Centers for Disease Control and Prevention, over 50% of older adults suffer from hyperlipidemia and hypertension, which are strong risk factors for heart disease (Racine, Troyer, Warren-Findlow, & McAuley, 2011). Of concern, cardiovascular disease is the leading cause of mortality in older adults (Gershlick, 2009; Lloyd-Jones et al., 2010). The American Heart Association outlined critical goals for cardiovascular health in its 2020 Strategic Impact Goals statement. A recent study evaluated these goals by examining maladaptive behaviors (e.g., physical inactivity, poor diet, obesity, and smoking) and health factors (e.g., blood pressure, cholesterol levels, and fasting blood glucose) among the American population. This study found that increasing age was significantly associated with several poor cardiovascular health behaviors and health factors (Shay et al., 2012). This is of concern given that maladaptive behaviors that are risk factors for cardiovascular disease are also significantly associated with anxiety (Bonnet et al., 2005).

As with many other physical health conditions, the large majority of research examining the relationship between mental health problems and comorbid cardiovascular disease have focused on depressive disorders (Yohannes, Willgoss, Baldwin, & Connolly, 2010). For example, depression and depressive symptoms are highly comorbid with cardiovascular disease (Almeida et al., 2007; Van der Kooy et al., 2007), and depressive symptoms have been found to increase the risk of mortality and poor outcomes among cardiovascular disease sufferers (Barth, Schumacher, & Herrmann-Lingen, 2004; Yohannes, et al., 2010). Recent research suggests that anxiety may also be highly comorbid with cardiovascular disease (Fan, Strine, Jiles, & Mokdad, 2008). A meta-analysis by Clarke and Currie (2009) found that anxiety is more common in

individuals with heart disease and stroke than in the general population (Clarke & Currie, 2009).

In fact, 40% of older adult cardiac patients have been found to suffer from comorbid anxiety in a

clinical setting (Lavie & Milani, 2004). This is corroborated by other clinical research (Goldberg

et al., 1990; Kubzansky, Koenen, Spiro, Vokonas, & Sparrow, 2007; Todaro et al., 2007) and

preliminary population-based research (Goodwin, Davidson, & Keyes, 2009; van Balkom et al.,

2000) that has also validated the link between anxiety disorders and cardiovascular disease.

Although inconclusive, there is evidence to suggest that anxiety plays an important role as a risk

factor for the onset of cardiovascular disease but plays less of a role in its progression (Suls &

Bunde, 2005). However, as noted by Yohannes and colleagues (2010), anxiety is likely under

diagnosed in adults with cardiovascular disease such as chronic heart failure so the relationships

between anxiety and cardiovascular diseases are likely not fully understood. As with other

physical health conditions, there is a dearth of research examining the relationship between

anxiety disorders and cardiovascular disease in older adults. Our preliminary population based

research found that there is a significant association between any anxiety disorder and heart

disease after controlling for several possible confounding variables in older adults aged 55 years

and older (El-Gabalawy et al., 2011). In addition, adults aged 45 years and older with

cardiovascular disease were more likely than those without to have a lifetime diagnosis of an

anxiety disorder (16.6% with a cardiovascular disease history versus 10% without) and this

comorbidity may have several negative implications (Fan et al., 2008).

  Gastrointestinal Disease. Gastrointestinal disease is also highly prevalent in late-life. The

prevalence of self-reported gastrointestinal disease is 9.2% in a nationally representative sample

of Canadian older adults (El-Gabalawy et al., 2011). Gastrointestinal disease frequently presents

with a severe course in older persons (Durazzo, Premoli, Bo, & Pellicano, 2007) and older adults

who suffer from gastrointestinal problems make up a significant proportion of specialty and general hospital workload. This workload includes a significant proportion of referrals, longer stays in surgical wards, and consuming extra time in radiology (Chaplin, Curless, Thomson, & Barton, 2000; Purkayastha, Salter, & Holmes, 1988). The gut is physiologically responsive to both environmental and emotional stimulation (Bonaz & Bernstein, 2013; Drossman et al., 1999). Both mental and physical health related quality of life and functionality are greatly affected in gastrointestinal disease sufferers (Iglesias-Rey et al., 2014; Mant et al., 1998; Peery et al., 2012) and this is largely explained by psychological factors (Halder et al., 2004). Gastrointestinal disease is frequently associated with mental health comorbidity and a large body of research has specifically examined associations between mental health problems and inflammatory bowel disease and irritable bowel syndrome (Fond et al., 2014; Olden & Drossman, 2000; Sajadinejad, Asgari, Molavi, Kalantari, & Adibi, 2012; Walker, Graff, Dutz, & Bernstein, 2011). For example, it is estimated that 50 to 60% of those with irritable bowel syndrome suffer from a comorbid mental disorder (Mayer, Craske, & Naliboff, 2001).

Anxiety is highly prevalent in gastrointestinal disease and the prevalence of anxiety increases with greater numbers of gastrointestinal symptoms in adults (Folks & Kinney, 1992; Graff, Walker, & Bernstein, 2009; Lydiard et al., 1994; Norton, Norton, Asmundson, Thompson, & Larsen, 1999; Walker, Katon, Jemelka, & Roy-Bryne, 1992; Wu, 2011) and older adults (Wetherell et al., 2010). Functional gastrointestinal symptoms are highly prevalent in adults with a history of panic disorder and panic attacks in comparison to other mental disorders (Lydiard et al., 1994). Moreover, in comparison to other commonly occurring physical health conditions, anxiety disorders are more prevalent in bowel disorders and stomach or intestinal ulcers (Gadalla, 2008). Prior research has also found that anxiety and stress may induce peptic ulcers and

clinically worsen their course (Levenstein, 1999). However, the relationship between anxiety disorders and gastrointestinal disease in late life is not well understood as it has been largely understudied.

Theoretical Evidence

Theoretical evidence, now grounded in empirical evidence, also suggests that these specified physical health conditions and anxiety disorders may be highly comorbid, and bi-directional temporal associations may exist. The Strength and Vulnerability Integration (SAVI) theoretical model (Charles, 2010) suggests that emotional well-being increases with age because of skills acquired through an older adult's life. Older adults are motivated to maintain emotional well-being as a result of a perception of limited time to live, which is described by the Socioemotional Selectivity Theory (Carstensen, 1992; Carstensen, Isaacowitz, & Charles, 1999). In addition, time lived provides additional advantages in emotional well being in the context of daily stressors because of accrued experience and self-knowledge. The skills that older adults possess first include attentional strengths characterized by an enhanced ability to focus attention away and disengage from negative stimuli. Second, older adults display appraisal strengths characterized by perceiving a past event in more positive (less severe) terms rather than negative terms. Finally, older adults use behavioral regulation strategies in order to avoid and/or remove themselves from negative situations. These skills are particularly effective in reducing negative affect and enhancing positive emotional experiences in the context of minor setbacks or stressors. However, enhanced emotional well-being is compromised or attenuated when an older person is faced with a chronic unrelenting stressor where these skills can no longer be employed. Although these chronic unrelenting stressors can present in many forms such as loss of social belonging or neurological dysregulation, of relevance to this thesis, emotional well-being is also compromised

in the case of a debilitating chronic illness. When emotional dysregulation occurs and older adults' adaptive skills cannot be employed, physiological arousal will result and persist, which may result in adverse physical responses. Taken together, this suggests that the onset of a chronic illness such as arthritis may compromise older adults' emotional regulation strategies, which will put them at risk of mental health problems, including anxiety disorders. Subsequently, the onset of an anxiety disorder in the context of a chronic illness will result in high levels of chronic physiological arousal, which will ultimately negatively impact older adults' physical conditions (e.g., arthritis) and may result in poorer health outcomes. It is particularly difficult for an older adult to recover from this sustained physiological arousal because of biological age related vulnerabilities, which may put them at risk of multiple or severe presentations of physical health conditions. Charles (2010) indicates that concurrent chronic illnesses may be particularly damaging to emotional well-being. There is also evidence to support anxiety disorders being a risk factor for incident physical conditions. As indicated, SAVI suggests that high levels of stress or emotional dysregulation, such as in the case of an anxiety disorder, will result in sustained physiological arousal that can significantly impact an older adults' physical health by compromising their physiological functioning such as immune functioning. These deleterious effects on physiological health may increase the risk of incident physical health conditions. SAVI therefore provides support for both temporal relationships.

The Present Research

Two studies comprise this thesis using two nationally representative datasets: the longitudinal United States National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) conducted in 2001-2002 and 2004-2005 (Study 1) and the cross-sectional Canadian Community Health Survey: Mental Health and Well-Being (CCHS 1.2) conducted in 2002

(Study 2). The NESARC is one of the only existing nationally representative datasets that includes a comprehensive, longitudinal assessment of mental disorders (including anxiety disorders) and physical health conditions. The CCHS 1.2 is Canada's first national survey focusing specifically on mental health and well-being that includes detailed health information including an assessment of service use. These population-based investigations allowed for a critical and thorough examination of the relationship between anxiety disorders and physical health conditions and the effect of comorbidity on mental health service utilization in late life.

Chapter Two describes the NESARC study, which evaluated the longitudinal relationship between individual anxiety disorders and arthritis, cardiovascular disease, and gastrointestinal disease in older adults. In this study I evaluated bi-directional temporal relationships. Specifically, I examined the physical health conditions of interest as predictors of incident individual anxiety disorders and individual anxiety disorders as predictors of incident physical health conditions. I further examined a number of sociodemographic, physical health, and mental health predictors of incident comorbid anxiety disorder and the assessed physical health conditions. This component of the thesis has been published in Experimental Gerontology (El-Gabalawy et al., 2014).

Chapter Three describes the CCHS 1.2 study that examined the effect of comorbid any anxiety disorder and arthritis, cardiovascular disease, and gastrointestinal disease on mental healthcare utilization in late life. In this study, I was interested in examining the effect of comorbidity in comparison to both the anxiety disorder alone and the physical health conditions of interest alone on past-year mental health service use from the specialty mental health care sector and general sector. This study expands on Study 1 by understanding one particular implication of comorbidity. This component of the thesis is in press in the journal of Aging and

Mental Health (El-Gabalawy, Mackenzie, & Sareen, in press). Chapter Four presents a general

discussion focusing on broader theoretical and translational implications of these studies that

comprise this thesis.

References

Almeida, O. P., Flicker, L., Norman, P., Hankey, G. J., Vasikaran, S., van Bockxmeer, F. M., &
Jamrozik, K. (2007). Association of cardiovascular risk factors and disease with
depression in later life. *American Journal of Geriatric Psychiatry, 15*(6), 506-513. doi:
01.JGP.0000246869.49892.77 [pii]10.1097/01.JGP.0000246869.49892.77

Bartels, S. J. (2003). Improving system of care for older adults with mental illness in the
United States. Findings and recommendations for the President's New Freedom
Commission on Mental Health. *The American Journal of Geriatric Psychiatry: Official
Journal of the American Association for Geriatric Psychiatry, 11*(5), 486-497.

Bartels, S. J., Coakley, E., Oxman, T. E., Constantino, G., Oslin, D., Chen, H., . . . Sanchez, H.
(2002). Suicidal and death ideation in older primary care patients with depression,
anxiety, and at-risk alcohol use. *American Journal Geriatric Psychiatry, 10*(4), 417-
427.

Bartels, S. J., Dums, A. R., Oxman, T. E., Schneider, L. S., Arean, P. A., Alexopoulos, G. S., &
Jeste, D. V. (2003). Evidence-based practices in geriatric mental health care: an
overview of systematic reviews and meta-analyses. *The Psychiatric Clinics of North
America, 26*(4), 971-990, x-xi.

Bartels, S. J., & Naslund, J. A. (2013). The underside of the silver tsunami--older adults and
mental health care. *The New England Journal of Medicine, 368*(6), 493-496. doi:
10.1056/NEJMp1211456

Barth, J., Schumacher, M., & Herrmann-Lingen, C. (2004). Depression as a risk factor for
mortality in patients with coronary heart disease: a meta-analysis. *Psychosomatic
Medicine, 66*(6), 802-813. doi: 66/6/802 [pii]10.1097/01.psy.0000146332.53619.b2

Beaulaurier, R. L., Seff, L. R., & Newman, F. L. (2008). Barriers to help-seeking for older

   women who experience intimate partner violence: a descriptive model. *Journal of*

   Women & Aging, 20(3-4), 231-248.

Beekman, A. T., Bremmer, M. A., Deeg, D. J., van Balkom, A. J., Smit, J. H., de Beurs, E., . . . van

   Tilburg, W. (1998). Anxiety disorders in later life: a report from the Longitudinal

   Aging Study Amsterdam. *International Journal of Geriatric Psychiatry, 13*(10), 717-

   726. doi: 10.1002/(SICI)1099-1166(1998100)13:10<717::AID-GPS857>3.0.CO;2-M

   [pii]

Belanger, A., Martel, L., & Caron-Malenfant, E. (2005). Population projections for Canada,

   provinces and territories: 2005-2031 *Statistics Canada*.

Bonaz, B. L., & Bernstein, C. N. (2013). Brain-gut interactions in inflammatory bowel

   disease. *Gastroenterology, 144*(1), 36-49. doi: 10.1053/j.gastro.2012.10.003

Bonnet, F., Irving, K., Terra, J. L., Nony, P., Berthezene, F., & Moulin, P. (2005). Anxiety and

   depression are associated with unhealthy lifestyle in patients at risk of

   cardiovascular disease. *Atherosclerosis, 178*(2), 339-344. doi:

   10.1016/j.atherosclerosis.2004.08.035

Brenes, G. A., Guralnik, J. M., Williamson, J. D., Fried, L. P., Simpson, C., Simonsick, E. M., &

   Penninx, B. W. (2005). The influence of anxiety on the progression of disability.

   Journal of the American Geriatrics Society, 53(1), 34-39. doi: 10.1111/j.1532-

   5415.2005.53007.x

Bryant, C., Jackson, H., & Ames, D. (2008). The prevalence of anxiety in older adults:

   methodological issues and a review of the literature. *Journal of Affective Disorders,*

   109(3), 233-250. doi: 10.1016/j.jad.2007.11.008

Carstensen, L. L. (1992). Social and emotional patterns in adulthood: support for

   socioemotional selectivity theory. *Psychology and Aging, 7*(3), 331-338.

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously. A theory of

   socioemotional selectivity. *The American Psychologist, 54*(3), 165-181.

Centers for Disease Control and Prevention. (2011a). Arthritis Retrieved July 15, 2011,

   from http://www.cdc.gov/arthritis/data_statistics/faqs/cost_analysis.htm

Centers for Disease Control and Prevention. (2011b). National Center for Health Statistics

   Retrieved July 5, 2011, from http://www.cdc.gov/NCHS/

Chang-Quan, H., Xue-Mei, Z., Bi-Rong, D., Zhen-Chan, L., Ji-Rong, Y., & Qing-Xiu, L. (2010).

   Health status and risk for depression among the elderly: a meta-analysis of

   published literature. *Age Ageing, 39*(1), 23-30. doi: afp187 [pii]

   10.1093/ageing/afp187

Chaplin, A., Curless, R., Thomson, R., & Barton, R. (2000). Prevalence of lower

   gastrointestinal symptoms and associated consultation behaviour in a British elderly

   population determined by face-to-face interview. *The British Journal of General

   Practice: the Journal of the Royal College of General Practitioners, 50*(459), 798-802.

Charles, S. T. (2010). Strength and vulnerability integration: A model of emotional well-

   being across adulthood. *Psychological Bulletin, 136*(6), 1068-1091.

Clarke, D. M., & Currie, K. C. (2009). Depression, anxiety and their relationship with chronic

   diseases: a review of the epidemiology, risk and treatment evidence. *Medical Journal

   of Australia, 190*(7 Suppl), S54-60. doi: cla10974_fm [pii]

Corna, L. M., Cairney, J., & Streiner, D. L. (2010). Suicide ideation in older adults: relationship

   to mental health problems and service use. *The Gerontologist, 50*(6), 785-797. doi:

   10.1093/geront/gnq048

Covic, T., Cumming, S. R., Pallant, J. F., Manolios, N., Emery, P., Conaghan, P. G., & Tennant, A.

   (2012). Depression and anxiety in patients with rheumatoid arthritis: prevalence

   rates based on a comparison of the Depression, Anxiety and Stress Scale (DASS) and

   the hospital, Anxiety and Depression Scale (HADS). *BMC Psychiatry, 12*, 6. doi:

   10.1186/1471-244X-12-6

Dall, T. M., Gallo, P. D., Chakrabarti, R., West, T., Semilla, A. P., & Storm, M. V. (2013). An

   aging population and growing disease burden will require a large and specialized

   health care workforce by 2025. *Health affairs, 32*(11), 2013-2020. doi:

   10.1377/hlthaff.2013.0714

de Beurs, E., Beekman, A. T., van Balkom, A. J., Deeg, D. J., van Dyck, R., & van Tilburg, W.

   (1999). Consequences of anxiety in older persons: its effect on disability, well-being

   and use of health services. *Psychological Medicine, 29*(3), 583-593.

Dennis, R. E., Boddington, S. J., & Funnell, N. J. (2007). Self-report measures of anxiety: are

   they suitable for older adults? *Aging & Mental Health, 11*(6), 668-677. doi:

   10.1080/13607860701529916

Dickens, C., & Creed, F. (2001). The burden of depression in patients with rheumatoid

   arthritis. *Rheumatology, 40*(12), 1327-1330.

Dickens, C., McGowan, L., Clark-Carter, D., & Creed, F. (2002). Depression in rheumatoid

   arthritis: a systematic review of the literature with meta-analysis. *Psychosomatic

   Medicine, 64*(1), 52-60.

Drossman, D. A., Creed, F. H., Olden, K. W., Svedlund, J., Toner, B. B., & Whitehead, W. E. (1999). Psychosocial aspects of the functional gastrointestinal disorders. *Gut, 45 Suppl 2*, II25-30.

Durazzo, M., Premoli, A., Bo, S., & Pellicano, R. (2007). Gastrointestinal problems in the elderly. *Panminerva Medicine, 49*(3), 151-158.

El-Gabalawy, R., Mackenzie, C. S., Pietrzak, R. H., & Sareen, J. (2014). A longitudinal examination of anxiety disorders and physical health conditions in a nationally representative sample of U.S. older adults. *Experimental gerontology, 60*, 46-56. doi: 10.1016/j.exger.2014.09.012

El-Gabalawy, R., Mackenzie, C. S., Shooshtari, S., & Sareen, J. (2011). Comorbid physical health conditions and anxiety disorders: a population-based exploration of prevalence and health outcomes among older adults. *General Hospital Psychiatry, 33*(6), 556-564. doi: 10.1016/j.genhosppsych.2011.07.005

El-Gabalawy, R., Mackenzie, C. S., Sareen, J. (in press). Mental Health Service Use among Older Canadians with Anxiety and Comorbid Physical Conditions. *Aging and Mental Health*. doi: http://dx.doi.org/10.1080/13607863.2015.1033678

el-Miedany, Y. M., & el-Rasheed, A. H. (2002). Is anxiety a more common disorder than depression in rheumatoid arthritis? *Joint Bone Spine, 69*(3), 300-306.

Evans, D. L., Charney, D. S., Lewis, L., Golden, R. N., Gorman, J. M., Krishnan, K. R., . . . Valvo, W. J. (2005). Mood disorders in the medically ill: scientific review and recommendations. *Biological Psychiatry, 58*(3), 175-189. doi: 10.1016/j.biopsych.2005.05.001

Fan, A. Z., Strine, T. W., Jiles, R., & Mokdad, A. H. (2008). Depression and anxiety associated

with cardiovascular disease among persons aged 45 years and older in 38 states of

the United States, 2006. *Preventative Medicine, 46*(5), 445-450. doi: S0091-

7435(08)00103-5 [pii]10.1016/j.ypmed.2008.02.016

Folks, D. G., & Kinney, F. C. (1992). The role of psychological factors in gastrointestinal

conditions. A review pertinent to DSM-IV. *Psychosomatics, 33*(3), 257-270.

Fond, G., Loundou, A., Hamdani, N., Boukouaci, W., Dargel, A., Oliveira, J., . . . Boyer, L. (2014).

Anxiety and depression comorbidities in irritable bowel syndrome (IBS): a

systematic review and meta-analysis. *European Archives of Psychiatry and Clinical

Neuroscience*. doi: 10.1007/s00406-014-0502-z

Fried, L. P., Ferrucci, L., Darer, J., Williamson, J. D., & Anderson, G. (2004). Untangling the

concepts of disability, frailty, and comorbidity: implications for improved targeting

and care. *The Journals of Gerontology. Series A, Biological Sciences and Medical

Sciences, 59*(3), 255-263.

Fuentes, K., & Cox, B. J. (1997). Prevalence of anxiety disorders in elderly adults: a critical

analysis. *Journal of Behavior Therapy and Experimental Psychiatry, 28*(4), 269-279.

Gadalla, T. M. (2008). Disability associated with comorbid anxiety disorders in women with

chronic physical illness in Ontario, Canada. *Women Health, 48*(1), 1-20. doi:

10.1080/03630240802131965

Gershlick, A. H. (2009). Managing myocardial infarction in the elderly: time to bury

inappropriate concerns instead. *European Heart Journal, 30*(8), 887-889. doi:

ehp117 [pii]10.1093/eurheartj/ehp117

Goldberg, R., Morris, P., Christian, F., Badger, J., Chabot, S., & Edlund, M. (1990). Panic

disorder in cardiac outpatients. *Psychosomatics, 31*(2), 168-173.

Goodwin, R. D., Davidson, K. W., & Keyes, K. (2009). Mental disorders and cardiovascular

disease among adults in the United States. *Journal of Psychiatric Research, 43*(3),

239-246. doi: 10.1016/j.jpsychires.2008.05.006

Graff, L. A., Walker, J. R., & Bernstein, C. N. (2009). Depression and anxiety in inflammatory

bowel disease: a review of comorbidity and management. *Inflammatory Bowel

Diseases, 15*(7), 1105-1118. doi: 10.1002/ibd.20873

Gureje, O., Von Korff, M., Simon, G. E., & Gater, R. (1998). Persistent pain and well-being: a

World Health Organization Study in Primary Care. *JAMA, 280*(2), 147-151. doi:

joc72070 [pii]

Halder, S. L., Locke, G. R., 3rd, Talley, N. J., Fett, S. L., Zinsmeister, A. R., & Melton, L. J., 3rd.

(2004). Impact of functional gastrointestinal disorders on health-related quality of

life: a population-based case-control study. *Aliment Pharmacological Therapy, 19*(2),

233-242. doi: 1807 [pii]

Hawley, D. J., & Wolfe, F. (1988). Anxiety and depression in patients with rheumatoid

arthritis: a prospective study of 400 patients. *The Journal of Rheumatology, 15*(6),

932-941.

Helmick, C. G., Felson, D. T., Lawrence, R. C., Gabriel, S., Hirsch, R., Kwoh, C. K., . . . Stone, J. H.

(2008). Estimates of the prevalence of arthritis and other rheumatic conditions in

the United States. Part I. *Arthritis and Rheumatism, 58*(1), 15-25. doi:

10.1002/art.23177

Ho, R. C., Fu, E. H., Chua, A. N., Cheak, A. A., & Mak, A. (2011). Clinical and psychosocial factors associated with depression and anxiety in Singaporean patients with rheumatoid arthritis. *International Journal of Rheumatic Diseases, 14*(1), 37-47. doi: 10.1111/j.1756-185X.2010.01591.x

Iglesias-Rey, M., Barreiro-de Acosta, M., Caamano-Isorna, F., Rodriguez, I. V., Ferreiro, R., Lindkvist, B., . . . Dominguez-Munoz, J. E. (2014). Psychological factors are associated with changes in the health-related quality of life in inflammatory bowel disease. *Inflammatory Bowel Diseases, 20*(1), 92-102. doi: 10.1097/01.MIB.0000436955.78220.bc

Jeste, D. V., Alexopoulos, G. S., Bartels, S. J., Cummings, J. L., Gallo, J. J., Gottlieb, G. L., . . . Lebowitz, B. D. (1999). Consensus statement on the upcoming crisis in geriatric mental health: research agenda for the next 2 decades. *Archives of General Psychiatry, 56*(9), 848-853.

Jette, A. (1996). Disability trends and transitions. In L. K. G. R. Binstock (Ed.), *Handbook of aging and the social sciences* (Vol. 4th ed., pp. 94-117). San Diego, CA: Academic Press.

Juurlink, D. N., Herrmann, N., Szalai, J. P., Kopp, A., & Redelmeier, D. A. (2004). Medical illness and the risk of suicide in the elderly. *Archives of Internal Medicine, 164*(11), 1179-1184. doi: 10.1001/archinte.164.11.1179164/11/1179 [pii]

Karlin, B. E., & Fuller, J. D. (2007). Meeting the mental health needs of older adults. *Geriatrics, 62*(1), 26-35.

Katon, W., Lin, E. H., & Kroenke, K. (2007). The association of depression and anxiety with medical symptom burden in patients with chronic medical illness. *General Hospital*

Psychiatry, 29(2), 147-155. doi: S0163-8343(06)00220-9

[pii]10.1016/j.genhosppsych.2006.11.005

Kogan, J. N., Edelstein, B. A., & McKee, D. R. (2000). Assessment of anxiety in older adults: current status. *Journal of Anxiety Disorders, 14*(2), 109-132.

Konnert, C., Dobson, K.S., Watt, A. (2009). Geropsychology training in Canada: A survey of doctoral and internship programs. *Canadian Psychology, 50*(4), 255-260. doi: http://dx.doi.org/10.1037/a0016513

Kubzansky, L. D., Koenen, K. C., Spiro, A., 3rd, Vokonas, P. S., & Sparrow, D. (2007). Prospective study of posttraumatic stress disorder symptoms and coronary heart disease in the Normative Aging Study. *Archives of General Psychiatry, 64*(1), 109-116. doi: 64/1/109 [pii]10.1001/archpsyc.64.1.109

Lavie, C. J., & Milani, R. V. (2004). Prevalence of anxiety in coronary patients with improvement following cardiac rehabilitation and exercise training. *American Journal Cardiology, 93*(3), 336-339. doi: 10.1016/j.amjcard.2003.10.015S0002914903014917 [pii]

Legace, C., O'Donnell, S., McCrae, L., Bradley, E., MacKay, C., Dale, V., Johnson, S., Koehn, C., Legare, J., Moore, L., Webster, G. . (2010). Life with arthritis in Canada: A personal and public health challenge. In P. Sales, Consulting, D. (Ed.), (pp. 1-128).

Levenstein, S. (1999). Peptic ulcer at the end of the 20th century: biological and psychological risk factors. *Canadian Journal of Gastroenterology, 13*(9), 753-759.

Lloyd-Jones, D., Adams, R. J., Brown, T. M., Carnethon, M., Dai, S., De Simone, G., . . . Wylie-Rosett, J. (2010). Heart disease and stroke statistics--2010 update: a report from the

American Heart Association. *Circulation, 121*(7), e46-e215. doi:

    CIRCULATIONAHA.109.192667 [pii]10.1161/CIRCULATIONAHA.109.192667

Lydiard, R. B., Greenwald, S., Weissman, M. M., Johnson, J., Drossman, D. A., & Ballenger, J. C.

    (1994). Panic disorder and gastrointestinal symptoms: findings from the NIMH

    Epidemiologic Catchment Area project. *American Journal Psychiatry, 151*(1), 64-70.

Mackenzie, C. S., El-Gabalawy, R., Chou, K. L., & Sareen, J. (2013). Prevalence and Predictors

    of Persistent Versus Remitting Mood, Anxiety, and Substance Disorders in a National

    Sample of Older Adults. *The American Journal of Geriatric Psychiatry : official journal

    of the American Association for Geriatric Psychiatry*. doi: 10.1016/j.jagp.2013.02.007

Mackenzie, C. S., Reynolds, K., Chou, K. L., Pagura, J., & Sareen, J. (2011). Prevalence and

    correlates of generalized anxiety disorder in a national sample of older adults. *The

    American Journal of Geriatric Psychiatry : official journal of the American Association

    for Geriatric Psychiatry, 19*(4), 305-315. doi: 10.1097/JGP.0b013e318202bc62

Mant, J. W., Jenkinson, C., Murphy, M. F., Clipsham, K., Marshall, P., & Vessey, M. P. (1998).

    Use of the Short Form-36 to detect the influence of upper gastrointestinal disease on

    self-reported health status. *Quality of Life Research, 7*(3), 221-226.

Margaretten, M., Julian, L., Katz, P., & Yelin, E. (2011). Depression in patients with

    rheumatoid arthritis: description, causes and mechanisms. *International Journal of

    Clinical Rheumatology, 6*(6), 617-623. doi: 10.2217/IJR.11.6

Mayer, E. A., Craske, M., & Naliboff, B. D. (2001). Depression, anxiety, and the

    gastrointestinal system. *Journal of Clinical Psychiatry, 62 Suppl 8*, 28-36; discussion

    37.

McDonough, E., Ayearst, R., Eder, L., Chandran, V., Rosen, C. F., Thavaneswaran, A., & Gladman, D. D. (2014). Depression and anxiety in psoriatic disease: prevalence and associated factors. *The Journal of Rheumatology, 41*(5), 887-896. doi: 10.3899/jrheum.130797

McNeil, J., Binette, J., U.S. Department of Commerce, Centers for Disease Control and Prevention. (1999). Prevalence of disabilities and associated health conditions among adults. *MMWR 2001, 50*(7), 120-125.

McWilliams, L. A., Cox, B. J., & Enns, M. W. (2003). Mood and anxiety disorders associated with chronic pain: an examination in a nationally representative sample. *Pain, 106*(1-2), 127-133. doi: S0304395903003014 [pii]

Moussavi, S., Chatterji, S., Verdes, E., Tandon, A., Patel, V., & Ustun, B. (2007). Depression, chronic diseases, and decrements in health: results from the World Health Surveys. *Lancet, 370*(9590), 851-858. doi: 10.1016/S0140-6736(07)61415-9

Murphy, L. B., Sacks, J. J., Brady, T. J., Hootman, J. M., & Chapman, D. P. (2012). Anxiety and depression among US adults with arthritis: prevalence and correlates. *Arthritis Care & Research, 64*(7), 968-976. doi: 10.1002/acr.21685

Norton, G. R., Norton, P. J., Asmundson, G. J., Thompson, L. A., & Larsen, D. K. (1999). Neurotic butterflies in my stomach: the role of anxiety, anxiety sensitivity and depression in functional gastrointestinal disorders. *Journal Psychosomatic Research, 47*(3), 233-240. doi: S0022-3999(99)00032-X [pii]

Olden, K. W., & Drossman, D. A. (2000). Psychologic and psychiatric aspects of gastrointestinal disease. *Medical Clinics of North America, 84*(5), 1313-1327.

Palmer, B. W., Jeste, D. V., & Sheikh, J. I. (1997). Anxiety disorders in the elderly: DSM-IV and

   other barriers to diagnosis and treatment. *Journal of Affective Disorders, 46*(3), 183-

   190.

Peery, A. F., Dellon, E. S., Lund, J., Crockett, S. D., McGowan, C. E., Bulsiewicz, W. J., . . .

   Shaheen, N. J. (2012). Burden of gastrointestinal disease in the United States: 2012

   update. *Gastroenterology, 143*(5), 1179-1187 e1171-1173. doi:

   10.1053/j.gastro.2012.08.002

Porensky, E. K., Dew, M. A., Karp, J. F., Skidmore, E., Rollman, B. L., Shear, M. K., & Lenze, E. J.

   (2009). The burden of late-life generalized anxiety disorder: effects on disability,

   health-related quality of life, and healthcare utilization. *The American Journal of

   Geriatric Psychiatry: Official Journal of the American Association for Geriatric

   Psychiatry, 17*(6), 473-482.

Purkayastha, S. K., Salter, R. H., & Holmes, K. M. (1988). Contribution of the elderly to a

   district hospital combined gastroenterology clinic. *Age Ageing, 17*(1), 49-53.

Racine, E., Troyer, J. L., Warren-Findlow, J., & McAuley, W. J. (2011). The Effect of Medical

   Nutrition Therapy on Changes in Dietary Knowledge and DASH Diet Adherence in

   Older Adults with Cardiovascular Disease. *The Journal of Nutrition, Health & Aging,

   15*(10), 868-876.

Raposo, S., El-Gabalawy, R., Erickson, J., Mackenzie, C. S., & Sareen, J. (2014). Associations

   between anxiety disorders, suicide ideation, and age in nationally representative

   samples of Canadian and American adults. [Research Support, Non-U.S. Gov't].

   Journal of Anxiety Disorders, 28(8), 823-829. doi: 10.1016/j.janxdis.2014.09.005

Reginster, J. Y. (2002). The prevalence and burden of arthritis. *Rheumatology (Oxford), 41 Supp 1*, 3-6.

Reynolds, K., Pietrzak, R. H., El-Gabalawy, R., Mackenzie, C. S., & Sareen, J. (2015). Prevalence of psychiatric disorders in U.S. older adults: findings from a nationally representative survey. *World Psychiatry: Official Journal of the World Psychiatric Association, 14*(1), 74-81. doi: 10.1002/wps.20193

Sajadinejad, M. S., Asgari, K., Molavi, H., Kalantari, M., & Adibi, P. (2012). Psychological issues in inflammatory bowel disease: an overview. *Gastroenterology Research and Practice, 2012*, 106502. doi: 10.1155/2012/106502

Sareen, J., Cox, B. J., Clara, I., & Asmundson, G. J. (2005). The relationship between anxiety disorders and physical disorders in the U.S. National Comorbidity Survey. *Depression and Anxiety, 21*(4), 193-202. doi: 10.1002/da.20072

Schuurmans, J., Comijs, H. C., Beekman, A. T., de Beurs, E., Deeg, D. J., Emmelkamp, P. M., & van Dyck, R. (2005). The outcome of anxiety disorders in older people at 6-year follow-up: results from the Longitudinal Aging Study Amsterdam. *Acta Psychiatrica Scandinavia, 111*(6), 420-428. doi: ACP531 [pii]10.1111/j.1600-0447.2005.00531.x

Scott, T., Mackenzie, C. S., Chipperfield, J. G., & Sareen, J. (2010). Mental health service use among Canadian older adults with anxiety disorders and clinically significant anxiety symptoms. *Aging & Mental Health, 14*(7), 790-800. doi: 924384406 [pii] 10.1080/13607861003713273

Shay, C. M., Ning, H., Allen, N. B., Carnethon, M. R., Chiuve, S. E., Greenlund, K. J., . . . Lloyd-Jones, D. M. (2012). Status of Cardiovascular Health in US Adults: Prevalence

Estimates From the National Health and Nutrition Examination Surveys (NHANES)

2003-2008. *Circulation, 125*(1), 45-56. doi: 10.1161/CIRCULATIONAHA.111.035733

Sheehy, C., Murphy, E., & Barry, M. (2006). Depression in rheumatoid arthritis--

underscoring the problem. *Rheumatology, 45*(11), 1325-1327. doi:

10.1093/rheumatology/kel231

Shrestha, S., Robertson, S., & Stanley, M. A. (2011). Innovations in research for treatment of

late-life anxiety. *Aging & Mental Health, 15*(7), 811-821. doi:

10.1080/13607863.2011.569487

Stang, P. E., Brandenburg, N. A., Lane, M. C., Merikangas, K. R., Von Korff, M. R., & Kessler, R.

C. (2006). Mental and physical comorbid conditions and days in role among persons

with arthritis. *Psychosomatic Medicine, 68*(1), 152-158. doi: 68/1/152 [pii]

10.1097/01.psy.0000195821.25811.b4

Strine, T. W., Hootman, J. M., Okoro, C. A., Balluz, L., Moriarty, D. G., Owens, M., & Mokdad, A.

(2004). Frequent mental distress status among adults with arthritis age 45 years and

older, 2001. *Arthritis and Rheumatism, 51*(4), 533-537. doi: 10.1002/art.20530

Suls, J., & Bunde, J. (2005). Anger, anxiety, and depression as risk factors for cardiovascular

disease: the problems and implications of overlapping affective dispositions.

Psychological Bullentin, 131(2), 260-300. doi: 2005-01973-009 [pii]

10.1037/0033-2909.131.2.260

Therrien, Z., & Hunsley, J. (2012). Assessment of anxiety in older adults: a systematic review

of commonly used measures. *Aging & Mental Health, 16*(1), 1-16. doi:

10.1080/13607863.2011.602960

Todaro, J. F., Shen, B. J., Raffa, S. D., Tilkemeier, P. L., & Niaura, R. (2007). Prevalence of anxiety disorders in men and women with established coronary heart disease. *J Cardiopulmonary Rehabilitation Prevention, 27*(2), 86-91. doi: 10.1097/01.HCR.0000265036.24157.e7 01273116-200703000-00006 [pii]

Treharne, G. J., Hale, E. D., Lyons, A. C., Booth, D. A., Banks, M. J., Erb, N., . . . Kitas, G. D. (2005). Cardiovascular disease and psychological morbidity among rheumatoid arthritis patients. *Rheumatology (Oxford), 44*(2), 241-246. doi: keh441 [pii] 10.1093/rheumatology/keh441

Trollor, J. N., Anderson, T. M., Sachdev, P. S., Brodaty, H., & Andrews, G. (2007). Prevalence of mental disorders in the elderly: the Australian National Mental Health and Well-Being Survey. *American Journal of Geriatric Psychiatry, 15*(6), 455-466. doi: 15/6/455 [pii]10.1097/JGP.0b013e3180590ba9

van Balkom, A. J., Beekman, A. T., de Beurs, E., Deeg, D. J., van Dyck, R., & van Tilburg, W. (2000). Comorbidity of the anxiety disorders in a community-based older population in The Netherlands. *Acta Psychiatrica Scandinavia, 101*(1), 37-45.

Van der Kooy, K., van Hout, H., Marwijk, H., Marten, H., Stehouwer, C., & Beekman, A. (2007). Depression and the risk for cardiovascular diseases: systematic review and meta analysis. *International Journal of Geriatric Psychiatry, 22*(7), 613-626. doi: 10.1002/gps.1723

Walker, E. A., Katon, W. J., Jemelka, R. P., & Roy-Bryne, P. P. (1992). Comorbidity of gastrointestinal complaints, depression, and anxiety in the Epidemiologic Catchment Area (ECA) Study. *American Journal of Medicine, 92*(1A), 26S-30S.

Walker, J. R., Graff, L. A., Dutz, J. P., & Bernstein, C. N. (2011). Psychiatric disorders in

    patients with immune-mediated inflammatory diseases: prevalence, association with

    disease activity, and overall patient well-being. *The Journal of Rheumatology.*

    Supplement, 88, 31-35. doi: 10.3899/jrheum.110900

Wang, P. S., Lane, M., Olfson, M., Pincus, H. A., Wells, K. B., & Kessler, R. C. (2005). Twelve-

    month use of mental health services in the United States: results from the National

    Comorbidity Survey Replication. *Archives of General Psychiatry, 62*(6), 629-640. doi:

    10.1001/archpsyc.62.6.629

Wetherell, J. L., Ayers, C. R., Nuevo, R., Stein, M. B., Ramsdell, J., & Patterson, T. L. (2010).

    Medical conditions and depressive, anxiety, and somatic symptoms in older adults

    with and without generalized anxiety disorder. *Aging & Mental Health, 14*(6), 764-

    768. doi: 924376300 [pii]10.1080/13607861003713240

Wolitzky-Taylor, K. B., Castriotta, N., Lenze, E. J., Stanley, M. A., & Craske, M. G. (2010).

    Anxiety disorders in older adults: a comprehensive review. *Depression and Anxiety,*

    27(2), 190-211. doi: 10.1002/da.20653

Wu, J. C. (2011). Community-based study on psychological comorbidity in functional

    gastrointestinal disorder. *Journal of Gastroenterology and Hepatology, 26 Suppl 3*, 23-

    26. doi: 10.1111/j.1440-1746.2011.06642.x

Yohannes, A. M., Willgoss, T. G., Baldwin, R. C., & Connolly, M. J. (2010). Depression and

    anxiety in chronic heart failure and chronic obstructive pulmonary disease:

    prevalence, relevance, clinical implications and management principles.

    International Journal of Geriatric Psychiatry, 25(12), 1209-1221. doi:

    10.1002/gps.2463

Chapter Two

A Longitudinal Examination of Anxiety Disorders and Physical Health Conditions in a

Nationally Representative Sample of U.S. Older Adults

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Abstract

Background: There has been growing interest in the relation between anxiety disorders and physical conditions in the general adult population. However, little is known about the nature of this association in older adults. Understanding the complex relationship between these disorders can help to inform prevention and treatment strategies unique to this rapidly growing segment of the population.

Methods: A total of 10,409 U.S. adults aged 55+ participated in Wave 1 (2001-2002) and Wave 2 (2004-2005) of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). Lifetime and past-year DSM-IV anxiety, mood, and substance use disorders, and lifetime personality disorders, were assessed in both waves. Participants self-reported on whether they had been diagnosed by a healthcare professional with a broad range of physical health conditions; this study focuses on cardiovascular disease, gastrointestinal disease, and arthritis. Multivariable logistic regressions adjusted for sociodemographics, comorbid mental disorders, and number of physical health conditions assessed: (1) the relation between past-year physical conditions at Wave 1 and incident past-year anxiety disorders at Wave 2 and; (2) the relation between individual lifetime anxiety disorders at Wave 1 and incident physical conditions at Wave 2. A second set of adjusted multinomial logistic regressions examined Wave 1 sociodemographic and physical and mental health risk factors associated with incident physical condition alone, anxiety disorder alone, and comorbid anxiety and physical condition at Wave 2.

Results: Past-year arthritis at Wave 1 was significantly associated with increased odds of incident generalized anxiety disorder at Wave 2. Further, any lifetime anxiety disorder and posttraumatic stress disorder at Wave 1 were significantly associated with increased odds of incident gastrointestinal disease at Wave 2. Differential sociodemographic and physical and

mental health predictors were significantly associated with increased odds of incident comorbid anxiety disorder and physical conditions.

Conclusion: Results of the current study elucidate the longitudinal bi-directional relationships between anxiety disorders and physical health conditions in a large, nationally representative sample of older adults. These results have important implications for identifying at risk older adults, which will not only impact this growing segment of the population directly, but will also potentially lessen burden on the healthcare system as a whole.

Keywords: comorbidity; anxiety disorders; physical health conditions; older adults; epidemiology

Introduction

There is a looming mental health crisis for older adults, which is first attributable to this demographic rapidly growing at an unprecedented rate and, second, how little is known about older adults' mental health relative to younger adults. Approximately 89 million U.S. adults will be over the age of 65 by the year 2050, which is more than double the older adult population as of 2010 (Dall et al., 2013). The drastic increase in this demographic is due to the first of the post-war "baby boomers" turning 60 and the increasing adult lifespan. Mental health issues are not as well understood in older adults and fewer resources have been devoted to geriatric training and mental health care delivery systems for treating older adults (Holtzer, Zweig, & Siegel, 2012; Jeste et al., 1999). In terms of physical health, the prevalence of one or more physical health conditions among older adults is estimated to be as high as 92% and over two thirds of adults aged 65+ have two or more physical health conditions (Dall et al., 2013; Fried, Ferrucci, Darer, Williamson, & Anderson, 2004). Living with one or more chronic physical health conditions such as cardiovascular, gastrointestinal and inflammatory diseases can significantly impact older individuals' well-being, and has substantial economic, psychological and physical costs including disability and frailty (Fried et al., 2004); suffering from a mental disorder such as an anxiety disorder can have long term implications for physical health, which also translate into broader consequences on the economic and societal level (Schneiderman, Ironson, & Siegel, 2005). Anxious older adults may be particularly vulnerable to developing physical health conditions as a result of physiological dysregulation related to immunosenescence, the gradual loss of immune function that is typically associated with aging (Gruver, Hudson, & Sempowski, 2007). However, the relationship between commonly occurring physical health problems and mental disorders in late life is not well understood.

Recently, there has been an expanding body of literature investigating the relationship between physical health conditions and mental disorders in adulthood. Existing research has primarily investigated depressive disorders in conjunction with physical health conditions in large population-based, community and clinical samples. With respect to anxiety, population-based research has found significant associations between anxiety disorders and physical health conditions in adulthood, with the synergistic associations resulting in worse clinical outcomes (Chou, Huang, Goldstein, & Grant, 2013; Katon, Lin, & Kroenke, 2007; Sareen, Cox, Clara, & Asmundson, 2005). However, it is unclear whether a similar comorbid relationship exists in older adults, who are more likely to experience health problems, disability, and frailty and have a high rate of anxiety disorders (Beekman et al., 1998) that can persist for years (Schuurmans et al., 2005). Preliminary cross-sectional research suggests that anxiety disorders in older adults co-occur with several physical health conditions, and this comorbidity can result in poorer perceived mental and physical health (El-Gabalawy, Mackenzie, Shooshtari, & Sareen, 2011). However, this relationship has not been examined longitudinally, is not clearly understood in older adults, and has been primarily restricted to clinical and small community samples.

Evidence suggests that the relationship between anxiety disorders and physical health conditions in older persons may be bi-directional— suffering from a physical health condition can increase risk of developing an anxiety disorder; and suffering from an anxiety disorder can increase the risk of developing a comorbid physical health condition. Understanding temporal relationships between anxiety disorders and physical health conditions in older adults may provide insight into possible prevention and early intervention initiatives specific to this population. First, extant research suggests that suffering from a physical health condition is a risk factor for developing a comorbid anxiety disorder as the onset of a physical health problem and

declines in health can be traumatic and associated with a wide range of negative psychological

outcomes (Baum & Posluszny, 1999). The onset of a physical health condition may be

particularly difficult for older adults who are more likely than younger adults to worry and

ruminate about their health and are hyper-vigilant to changes in their physical health (El-

Gabalawy, Mackenzie, Thibodeau, Asmundson, & Sareen, 2013; Hunt, Wisocki, & Yanko, 2003;

Montorio, Nuevo, Marquez, Izal, & Losada, 2003; Skarborn & Nicki, 1996; Thomsen et al.,

2004). Second, prior research suggests that anxiety disorders may also be a significant risk factor

for incident physical health conditions through biological, hormonal or physiological reactivity

mechanisms (Schneiderman et al., 2005). In support of this temporal relationship, prior research

has found that the majority of older adults with a physical health condition do not have a

comorbid mental disorder, whereas the majority of older adults with mental disorders report

comorbid physical conditions (Scott et al., 2008).

　　　　Taken together, these results suggest that anxiety disorders and physical health conditions

may be mutual risk factors for one another. In direct support of a bi-directional pathway, previous

research has found that mental disorders are both an antecedent and consequence of chronic pain

in adults (Dersh, Polatin, & Gatchel, 2002) and older adults (Arola, Nicholls, Mallen, & Thomas,

2010). Conversely, preliminary research specifically examining arthritis and anxiety disorders did

not support either temporal relationship in the general adult population (van 't Land et al., 2010).

However, van't Land and colleagues' analyses did not adjust for important control variables such

as the presence of other mental disorders and, as indicated above, there is also evidence to

suggest that the presentation of anxiety disorders and comorbid physical health conditions may

be different in older adults than in the general adult population. Not only is it possible that a bi-

directional relationship exists, it is also possible that anxiety disorders and physical health

conditions may mutually maintain one another, which has been previously discussed in literature focused on younger adults (e.g., Asmundson, Coons, Taylor, & Katz, 2002).

To the best of our knowledge, no research has been devoted to examining sociodemographic and mental and physical health predictors of comorbid anxiety disorders and physical health conditions among older adults using longitudinal designs. Prior cross-sectional and longitudinal research suggests that health related quality of life may significantly predict comorbidity because quality of life tends to be poor in middle aged and older adults who suffer from anxiety disorders (Beard, Weisberg, & Keller, 2010) and adults with physical health conditions (Mant et al., 1998; Mili, Helmick, & Moriarty, 2003). Similarly, suffering from a comorbid mental disorder, being female, having higher socioeconomic status and being Hispanic may significantly predict comorbidity as these factors have been previously found to be significant predictors of incident individual anxiety disorders in older adults (Chou, Mackenzie, Liang, & Sareen, 2011). Prior research also suggests that age plays an important role in comorbidity as younger adults suffering from arthritis are more likely to suffer from a co-occurring mental disorder than those without arthritis (van 't Land et al., 2010). In terms of income, prior research has found that low income is significantly and positively associated with mental disorders (Sareen, Afifi, McMillan, & Asmundson, 2011) and poor physical health (Gallo & Matthews, 2003). Finally, suffering from multiple physical health conditions may significantly predict comorbidity because prior cross-sectional research has shown a dose-response relationship where the number of physical health conditions is significantly and positively associated with increased odds of anxiety disorders in older adults (El-Gabalawy et al., 2011).

The current study represents the first longitudinal investigation of commonly occurring physical health conditions (i.e., arthritis, gastrointestinal disease, and cardiovascular disease) and

anxiety disorders in a large, comprehensive, nationally representative survey of U.S. older adults. The objectives of the current study were threefold. First, we conducted longitudinal analyses to examine whether individual physical conditions at Wave 1 were predictors of incident individual anxiety disorders at Wave 2 conducted three years later. Second, we investigated whether individual anxiety disorders at Wave 1 were predictors of incident physical conditions at Wave 2. Finally, we investigated sociodemographic and physical and mental health predictors at Wave 1 of incident any anxiety disorder alone, physical health condition alone, and any anxiety disorder and comorbid physical conditions at Wave 2. In all of these analyses, we controlled for potentially confounding variables including sociodemographic factors, comorbid mental disorders, and number of physical health conditions. Based on prior research, we hypothesized that both temporal relationships would exist, and several sociodemographic and psychosocial factors would be significantly associated with incident comorbidity.

Method

Sample

We analyzed data from Wave 1 and Wave 2 (the 3-year prospective follow-up) of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). The NESARC is one of the largest comorbidity studies conducted to date that includes comprehensive longitudinal health data. Wave 1 of the NESARC was conducted between 2001 and 2002 and included 43,093 participants (81% response rate) who represent Americans aged 18 years or older residing in the United States including the District of Columbia, Alaska, and Hawaii. Excluding those participants who were deceased, deported, institutionalized or on active military duty on follow up, 34,653 respondents (86.7% response rate) participated in both Waves 1 and 2, creating a cumulative response rate (i.e., product of the Wave 1 and Wave 2 response rates) of 70.2%.

Trained lay interviewers from the U.S. Census Bureau conducted face-to-face lay interviews. Participants provided written informed consent and the US Census Bureau and the US Office of Management and Budget provided ethical approval. We included only individuals 55 years or older which resulted in a sample size of 10,409 participants who responded in both Waves 1 and 2. A more detailed description of methodology, sampling and weighting procedures for the NESARC can be found elsewhere (Grant et al., 2003; Grant et al., 2009; Grant & Kaplan, 2005; Grant et al., 2004).

Measures

      Sociodemographic variables. Sociodemographic variables assessed included age, sex, marital status, household income, education, and race at Wave 1. We assessed age continuously and categorized marital status (married or living with someone as if married, widowed/separated/divorced, never married), household income (0-$19,999, $20,000-$34,999, $35,000-$59,999, and $60,000+), education (less than high school, high school, some college or higher), and race/ethnicity (White, Black, Hispanic, and other).

      Mental disorders. The NESARC used the Alcohol Use Disorders and Associated Disabilities Interview Schedule IV (AUDADIS-IV) to assess *Diagnostic Statistical Manual of Mental Disorders 4th edition* (DSM-IV) mental disorders. The AUDADIS-IV is a reliable and valid instrument for the assessment of mental disorders designed for lay interviewers (Grant et al., 2003; Ruan et al., 2008). Waves 1 and 2 of the NESARC survey assessed anxiety disorders (i.e., panic with and without agoraphobia, agoraphobia, social phobia, specific phobia, and generalized anxiety disorder), mood disorders (i.e., major depression, dysthymia, mania, and hypomania), substance use disorders (i.e., alcohol abuse and dependence, nicotine dependence, and drug abuse and dependence), and personality disorders (PDs; i.e., antisocial, dependent,

obsessive compulsive, paranoid, schizotypal, avoidant, or histrionic personality disorders). All individual anxiety, mood, and substance use disorders were assessed at both Waves 1 and 2 with the exception of posttraumatic stress disorder (PTSD), which was assessed both in the past-year and retrospectively at Wave 2 of the survey. In terms of PDs, paranoid, schizoid, histrionic, avoidant, dependent, and obsessive-compulsive disorders were assessed at Wave 1 (Grant, Hasin, et al., 2004), antisocial PD was assessed at both waves (Goldstein & Grant, 2009), and schizotypal, narcissistic, and borderline PDs were assessed at Wave 2 (Grant et al., 2008; Stinson et al., 2008). We created aggregate categories to represent "any mood", "any substance", and "any personality" disorders and used these categories as covariates and predictors. For the longitudinal analyses examining temporality, we examined individual anxiety disorders in addition to "any anxiety disorder." However, we did not examine agoraphobia individually because of the small number of respondents who met criteria for this disorder. In the case of the analyses examining predictors of incident individual anxiety disorder, physical health condition, and comorbidity, we only used "any anxiety disorder" because of restricted statistical power.

Physical health conditions. The NESARC assessed 11 physical health conditions in Waves 1 and 2 that were based on respondents' self-reports of whether they had been diagnosed with each of the conditions by a health professional. Specifically, respondents were asked; "In the past 12 months, have you had [the physical health condition of interest]" and if they endorsed this question, they were subsequently asked; "Did a doctor or health professional tell you that you had [the physical health condition of interest]." We used the latter, more stringent criteria to indicate positive endorsement of physical health conditions. For the purposes of this study, we only examined commonly occurring physical health conditions in late-life. Specifically, we examined cardiovascular disease, which included chest pain or angina pectoris, rapid heartbeat or

tachycardia, heart attack or myocardial infarction, arteriosclerosis and any other form of heart disease; gastrointestinal disease, which included stomach ulcer and gastritis; and arthritis. We created these categories based on prior research using the NESARC (El-Gabalawy, Katz, & Sareen, 2010) and clinical presentation. Prior research has found that there is high agreement between self-reported physical health conditions and physician-assessed conditions, even after accounting for the possible influence of comorbid anxiety disorders (Baumeister, Kriston, Bengel, & Harter, 2010).

Number of physical health conditions. We created a continuous count variable based on the number of all the past-year chronic physical health conditions that respondents endorsed in Wave 1 to account for the effects of physical health comorbidity in multivariable analyses. The physical health conditions included in the NESARC are arteriosclerosis, hypertension, cirrhosis of the liver, liver disease, angina pectoris, tachycardia, myocardial infarction, heart disease, stomach ulcer, gastritis, and arthritis.

Number of past-year mental disorders. We created a continuous count variable of the number of past-year mood, anxiety, and substance use disorders at Wave 1 based on the AUDADIS-IV diagnoses, as described above. We did not include personality disorders because these were only assessed on a lifetime basis.

Physical and mental health-related quality of life. We derived both physical (PSC-12) and mental (MCS-12) component health-related quality of life scores using the 12-item self-report Medical Outcomes Study Short Form (SF-12) Version 2. The PSC-12 and MCS-12 have demonstrated good reliability and validity. For example, these two component scores are excellent predictors of the mental (MCS-36) and physical (PCS-36) health summary scores on the SF-36, demonstrate good test-retest reliability (correlations = 0.76-0.89), and the PCS-12 and

MCS-12 reach the same statistical conclusions about group differences as did the PCS-36 and MCS-36 when examining prior cross-sectional and longitudinal studies (Ware, Kosinski, & Keller, 1996). We reversed the PSC-12 and MCS-12 so that higher scores are indicative of poorer quality of life to enhance interpretability.

Analytic Strategy

We first derived weighted estimates of anxiety disorders, physical health conditions, sociodemographics and the mental and physical health predictors in the full older adult sample. To examine temporality between anxiety disorders and the physical health conditions of interest, we performed two sets of cross-tabulations and logistic regressions. First, we examined whether suffering from past-year arthritis, gastrointestinal disease, and cardiovascular disease at Wave 1 significantly predicted the incidence of a past-year anxiety disorder at Wave 2. We excluded those who met criteria for lifetime anxiety disorders at Wave 1 from the analyses. Second, we examined whether a diagnosis of lifetime anxiety disorders at Wave 1 significantly predicted incident past-year comorbid arthritis, gastrointestinal disease, and cardiovascular disease at Wave 2. We excluded those meeting criteria for the past-year physical health condition of interest at Wave 1 from the analyses. Both sets of regressions included an unadjusted model, as well as models adjusting for: (a) sociodemographic variables; (b) sociodemographics, mood, substance use and personality disorders; and (c) sociodemographics, mood, substance use, and personality disorders, and number of physical health conditions.

To examine predictors of incident any anxiety disorder, individual physical health condition, and comorbid relationships, we conducted adjusted multinomial logistic regressions and included each sociodemographic variable, physical and mental health-related quality of life, number of physical health conditions, number of mental disorders, mood and substance use

disorders, and personality disorders as individual predictors at Wave 1 of a 4 level outcome

variable at Wave 2 (i.e., none (reference), incident any anxiety disorder only, incident physical

health condition only, and incident comorbid physical condition and any anxiety disorder). For

each outcome, we excluded those who met criteria for the past-year physical health condition or

lifetime any anxiety disorder at Wave 1 in order to establish true incidence rates. When

examining sociodemographic predictors, we included all sociodemographic factors in a single

multinomial model. When examining mental and physical health predictors, we included

sociodemographics, other mood, substance use, and personality disorders, and number of

physical health conditions as covariates. We removed the predictor from the included covariates

in each model. For example, when examining personality disorders as the predictor, we included

only sociodemographics, other mood and substance use disorders, and number of physical health

conditions as covariates.

We employed appropriate statistical weights that adjust for response/nonresponse and

oversampling of Blacks, Hispanics, and young adults so that these data are representative of the

U.S. older adult population. We used the Taylor Series Linearization method (Levy, 1999) in

SUDAAN 10.0.1 (Shah, 2009) for variance estimation purposes to account for the complex

sampling design of the survey. To help control for Type I error and multiple comparisons, we

reported more conservative $p < 0.001$ and $p < 0.01$, which also included 99% confidence

intervals.

Results

As shown in Table 1, arthritis, cardiovascular disease, and gastrointestinal disease were

highly prevalent among the NESARC sample of adults aged 55+. Arthritis was the most highly

prevalent (Wave 1 % = 38.9; Wave 2 % = 45.3; Incidence % (i.e., those endorsing past-year

arthritis at Wave 2 but having denied past-year arthritis at Wave 1) = 24.2), followed by

cardiovascular disease (Wave 1 % = 17.4;Wave 2 % =20.1; Incidence % =13.2) and

gastrointestinal disease (Wave 1 % = 8.6; Wave 2 % = 9.6; Incidence % = 6.7). Any anxiety

disorder was also prevalent among older adults (Wave 1 lifetime % = 17.1; Wave 2 past-year % =

10.4; Incidence % (i.e., those meeting criteria for past-year any anxiety at Wave 2 but not

meeting lifetime criteria at Wave 1) = 5.7). Additionally, incident arthritis and comorbid any

anxiety disorder was the most prevalent (n = 394; % = 3.92), followed by incident cardiovascular

disease and any anxiety disorder (n = 218; % = 1.92) and incident gastrointestinal disease and

any anxiety disorder (n = 149; % = 1.22) at Wave 2. Other characteristics of the sample are

shown in Table 1.

Associations Between Physical Conditions at Wave 1 and Incident Anxiety Disorders at

Wave 2

Table 2 displays the weighted prevalence and associated odds ratios with their

corresponding 99% confidence intervals of each individual incident anxiety disorder at Wave 2

among older adults with arthritis, cardiovascular disease, and gastrointestinal disease at Wave 1.

Results indicated that, after adjustment for sociodemographic factors and comorbid mental

disorders, arthritis, gastrointestinal disease, and cardiovascular disease at Wave 1 were all

significantly associated with increased odds of incident panic disorder with or without

agoraphobia at Wave 2. In addition, arthritis at Wave 1 was significantly associated with

increased odds of incident generalized anxiety disorder at Wave 2. Gastrointestinal disease at

Wave 1 was significantly associated with increased odds of incident any anxiety disorder at

Wave 2. When number of physical health conditions was incorporated into these models as an

additional covariate, only arthritis at Wave 1 remained significantly associated with incident

generalized anxiety disorder at Wave 2.

Table 1
*Older Adult Sample Characteristics of Covariates and Predictors in the
NESARC Among Adults Aged 55+*

Variable	n (weighted prevalence %)
Categorical measures	
Sociodemographic Variables	
Sex	
Male	4141 (44.6)
Female	6268 (55.4)
Age Categories	
55-64	4405 (43.1)
65-74	3458 (33.8)
75+	2546 (23.1)
Education	
Less than high school	2649 (21.5)
High school	3310 (33.1)
Some college or higher	4450 (45.4)
Marital status	
Married/common law	5354 (66.4)
Widowed/separated/divorced	4459 (29.5)
Never married	596 (4.1)
Past-year household income	
0-$19,999	3992 (29.6)
$20,000-$34,999	2362 (22.9)
$35,000-$59,999	2181 (23.9)
$60,000+	1874 (23.6)
Race/Ethnicity	
White	6959 (80.0)
Black	1866 (8.6)
Hispanic	1236(6.2)
Other	348 (5.2)
Mental Disorder Covariates	
Any past-year mood disorder	579 (4.9)
Any past-year substance use disorder	891 (8.5)
Any lifetime personality disorder	1042 (10.0)
Primary Anxiety Disorder Variables	
Any lifetime anxiety disorder	1854 (17.1)
Wave 2 past-year anxiety disorder	1166 (10.4)
Incident past-year any anxiety disorder	522 (5.7)
Primary Physical Health Condition	

Variables

Past-year arthritis	4165 (38.9)
Past-year cardiovascular disease	1815 (17.4)
Past-year gastrointestinal disease	982 (8.6)
Wave 2 past-year arthritis	4846 (45.3)
Wave 2 past-year cardiovascular disease	2150 (20.1)
Wave 2 past-year gastrointestinal disease	1091 (9.6)
Incident Wave 2 past-year arthritis	1512 (24.2)
Incident Wave 2 past-year cardiovascular disease	1125 (13.2)
Incident Wave 2 past-year gastrointestinal disease	664 (6.7)
Continuous measures	**Mean(SE)**
Mental health status	32.08 (0.13)
Physical health status	31.02 (0.17)
Number of physical health conditions	2.17 (0.02)
Number of anxiety, mood and substance use disorders	0.18 (0.01)

Note. SF-12 scores have been reversed for interpretation. Higher scores are indicative of worse quality of life.

All variables assessed at Wave 1 unless otherwise specified.

Incident Wave 2=Those who did not endorse the conditions of interest at Wave 1 but who met past-year criteria at Wave 2

Table 2

Prevalence and Odds Ratios of the Assessed Physical Health Conditions at Wave 1 Predicting Incident Past-Year Anxiety Disorders at Wave 2 Among Adults Aged 55+

	Physical Health Conditions (Independent Variable)							
	Arthritis			Gastrointestinal Disease			Cardiovascular Disease	
Anxiety Disorders (Dependent Variable)	n (weighted %)		Odds Ratios (99%CI)	n (weighted %)		Odds Ratios (99%CI)	n (weighted %)		Odds Ratios (99%CI)
	no	yes		no	yes		no	yes	
Any Anxiety Disorder	272 (4.8)	231 (6.8)		433 (5.2)	68 (10.0)		404 (5.4)	99 (6.4)	
Unadjusted	--	--	**1.44(1.06-1.95)**	--	--	**2.05(1.30-3.23)***	--	--	1.19(0.83-1.71)
Model 1	--	--	1.34(0.98-1.83)	--	--	**1.90(1.19-3.02)***	--	--	1.23(0.85-1.78)
Model 2	--	--	1.28(0.93-1.76)	--	--	**1.77(1.10-2.84)**	--	--	1.17(0.82-1.69)
Model 3	--	--	1.07(0.73-1.57)	--	--	1.57(0.87-2.81)	--	--	0.78(0.46-1.31)
Social Phobia	43 (0.6)	49 (1.1)		74 (0.7)	17 (1.9)		66 (0.7)	26 (1.6)	
Unadjusted	--	--	1.78(0.90-3.52)	--	--	**2.71(1.08-6.78)**	--	--	2.32(0.93-5.76)
Model 1	--	--	1.95(0.90-4.22)	--	--	**2.76(1.09-6.99)**	--	--	**2.52(1.04-6.14)**
Model 2	--	--	1.66(0.76-3.60)	--	--	2.29(0.85-6.15)	--	--	2.18(0.88-5.37)
Model 3	--	--	1.37(0.61-3.09)	--	--	1.74(0.58-5.22)			1.56(0.36-6.70)
Specific Phobia	217 (3.6)	192 (4.5)		354 (3.8)	54 (6.3)		331 (4.0)	78 (3.9)	
Unadjusted	--	--	1.26(0.91-1.75)	--	--	**1.73(1.06-2.83)**	--	--	0.97(0.67-1.41)
Model 1	--	--	1.15(0.82-1.61)	--	--	1.57(0.95-2.57)	--	--	0.99(0.68-1.44)
Model 2	--	--	1.08(0.77-1.52)	--	--	1.46(0.89-2.40)	--	--	0.92(0.63-1.34)
Model 3	--	--	0.98(0.67-1.43)	--	--	1.53(0.83-2.84)			0.71(0.41-1.21)
Panic Disorder with	38	50		68 (0.7)	19		58	29	

or without Agoraphobia	(0.5)	(1.3)			(2.3)		(0.6)	(1.8)	
Unadjusted	--	--	**2.72(1.32-5.60)*** **	--	--	**3.67(1.73-7.78)*** **	--	--	**3.00(1.48-6.07)*** **
Model 1	--	--	**2.79(1.34-5.83)*** **	--	--	**3.34(1.57-7.09)*** **	--	--	**3.09(1.47-6.47)*** **
Model 2	--	--	**2.37(1.17-4.78)** **	--	--	**2.78(1.28-6.06)*** **	--	--	**2.61(1.25-5.41)*** **
Model 3	--	--	1.56(0.72-3.41)			1.57(0.58-4.23)	--	--	1.39(0.43-4.42)
Generalized	88	115		166	36		154	49	
Anxiety Disorder	(1.2)	(3.1)		(1.8)	(4.1)		(1.9)	(2.3)	
Unadjusted	--	--	**2.55(1.58-4.11)*** **	--	--	**2.39(1.21-4.72)** **	--	--	1.24(0.72-2.12)
Model 1	--	--	**2.42(1.46-4.00)*** **	--	--	**2.15(1.08-4.29)** **	--	--	1.27(0.72-2.23)
Model 2	--	--	**2.12(1.27-3.55)*** **	--	--	1.80(0.89-3.64)	--	--	1.06(0.62-1.83)
Model 3			**1.77(1.01-3.12)** **	--	--	1.25(0.61-2.58)	--	--	0.43(0.19-1.02)
Posttraumatic Stress	31	34		57 (0.6)	8 (1.1)		50	15	
Disorder	(0.5)	(1.0)					(0.6)	(0.9)	
Unadjusted	--	--	1.98(0.91-4.32)	--	--	1.77(0.52-6.05)	--	--	1.44(0.61-3.38)
Model 1	--	--	1.84(0.83-4.09)	--	--	1.57(0.45-5.44)	--	--	1.48(0.63-3.45)
Model 2	--	--	1.62(0.69-3.79)	--	--	1.32(0.35-4.96)	--	--	1.26(0.52-3.07)
Model 3	--	--	1.47(0.51-4.18)	--	--	1.04(0.26-4.26)	--	--	0.89(0.24-3.35)

Note. **p<0.01, ***p<0.001
Model 1=adjusted for sex, age, education, marital status, ethnicity and income
Model 2=adjusted for sociodemographic variables, any mood disorder, any substance use disorder, and any personality disorder
Model 3=adjusted for sociodemographic variables, mood, substance use, and personality disorders, and number of physical health conditions
Percentages are weighted. Prevalence rates in "yes" column indicate the prevalence of anxiety disorders among each physical health condition group.
Prevalence rates in "no" column indicate the prevalence of anxiety disorder among those who do not have the condition.
DV = dependent variables; IV = independent variable
Analyses exclude those who met the lifetime anxiety disorder of interest at Wave 1

Association Between Lifetime Anxiety Disorders at Wave 1 and Incident Physical

Conditions at Wave 2

Table 3 also displays results of cross-tabulations and logistic regression analyses examining the relationship between lifetime anxiety disorders at Wave 1 and incident arthritis, gastrointestinal disease, and cardiovascular disease at Wave 2. After adjustment for sociodemographic factors and comorbid mental disorders, any anxiety disorder at Wave 1 was significantly associated with increased odds of incident arthritis at Wave 2. Panic disorder with or without agoraphobia at Wave 1 was significantly associated with increased odds of incident cardiovascular disease at Wave 2. Any anxiety disorder, generalized anxiety disorder and PTSD at Wave 1 were associated with increased odds of incident gastrointestinal disease at Wave 2. When number of physical health conditions was incorporated into these models as an additional covariate, only PTSD and any anxiety disorder remained significantly associated with increased odds of incident gastrointestinal disease.

Table 3

Prevalence and Odds Ratios of Lifetime Anxiety Disorders at Wave 1 Predicting Incident Past-Year Physical Conditions at Wave 2 in Adults Aged 55+

	Physical Health Conditions (Dependent Variable)							
	Arthritis			Gastrointestinal Disease			Cardiovascular Disease	
Anxiety Disorders (Independent Variable)	n (weighted %)		Odds Ratios (99%CI)	n (weighted %)		Odds Ratios (99%CI)	n (weighted %)		Odds Ratios (99%CI)
	no	yes		no	yes		no	yes	
Any Anxiety Disorder	1360 (23.5)	252 (28.7)		510 (6.7)	154 (10.0)		904 (12.8)	221 (15.2)	
Unadjusted	--	--	**1.31(1.03-1.68)****	--	--	**1.73(1.27-2.36)*****	--	--	1.22(0.93-1.59)
Model 1	--	--	**1.34(1.03-1.73)****	--	--	**1.70(1.23-2.35)*****	--	--	**1.37(1.04-1.80)****
Model 2	--	--	**1.31(1.01-1.70)****	--	--	**1.63(1.16-2.27)*****	--	--	1.28(0.97-1.71)
Model 3	--	--	1.28(0.98-1.67)	--	--	**1.58(1.13-2.21)*****	--	--	1.24(0.93-1.67)
Social Phobia	1458 (24.2)	54 (26.3)		626 (6.5)	38 (10.5)		1079 (13.2)	46 (14.0)	
Unadjusted	--	--	1.12(0.69-1.84)	--	--	1.69(0.96-2.96)	--	--	1.07(0.62-1.87)
Model 1	--	--	1.16(0.72-1.87)	--	--	1.70(0.97-3.00)	--	--	1.18(0.68-2.06)
Model 2	--	--	1.12(0.69-1.83)	--	--	1.57(0.87-2.83)	--	--	1.08(0.62-1.86)
Model 3	--	--	1.13(0.69-1.86)	--	--	1.63(0.91-2.92)	--	--	1.08(0.62-1.89)
Specific Phobia	1404 (24.0)	108 (27.2)		604 (6.6)	60 (8.5)		1025 (13.1)	100 (14.9)	
Unadjusted			1.18(0.81-1.72)	--	--	1.32(0.86-2.01)	--	--	1.16(0.78-1.73)
Model 1	--	--	1.17(0.80-1.72)	--	--	1.26(0.82-1.95)	--	--	1.33(0.88-2.00)
Model 2	--	--	1.15(0.78-1.68)	--	--	1.19(0.76-1.86)	--	--	1.26(0.83-1.90)
Model 3	--	--	1.10(0.75-1.62)	--	--	1.20(0.76-1.89)	--	--	1.22(0.81-1.84)
Panic Disorder with or without	1469 (24.2)	43 (25.1)		631 (6.6)	33 (9.8)		1070 (13.0)	55 (19.2)	

Agoraphobia									
Unadjusted	--	--	1.05(0.62-1.77)	--	--	1.54(0.89-2.69)	--	--	**1.59(1.00-2.53)****
Model 1	--	--	1.05(0.62-1.78)	--	--	1.47(0.84-2.58)	--	--	**1.80(1.13-2.88)****
Model 2	--	--	1.01(0.60-1.71)	--	--	1.33(0.73-2.42)	--	--	**1.65(1.02-2.65)****
Model 3	--	--	0.87(0.49-1.54)	--	--	1.18(0.66-2.13)	--	--	1.55(0.95-2.53)
Generalized Anxiety Disorder	1472	40		628	36		1080	45	
	(24.2)	(25.5)		(6.5)	(13.1)		(13.1)	(17.7)	
Unadjusted	--	--	1.07(0.59-1.95)	--	--	**2.17(1.25-3.77)*****	--	--	1.43(0.85-2.39)
Model 1	--	--	1.08(0.60-1.95)	--	--	**2.13(1.22-3.74)*****	--	--	1.57(0.92-2.69)
Model 2	--	--	1.01(0.56-1.84)	--	--	**1.89(1.05-3.41)****	--	--	1.38(0.78-2.46)
Model 3	--	--	0.96(0.51-1.81)	--	--	1.76(0.97-3.18)	--	--	1.33(0.75-2.37)
Posttraumatic Stress Disorder	1442	70		610	54		1065	60	
	(23.9)	(34.4)		(6.4)	(13.4)		(13.0)	(17.9)	
Unadjusted	--	--	**1.67(1.04-2.67)****	--	--	**2.24(1.39-3.61)*****	--	--	1.46(0.91-2.34)
Model 1	--	--	**1.66(1.03-2.68)****	--	--	**2.18(1.34-3.54)*****	--	--	1.56(0.97-2.52)
Model 2	--	--	1.62(0.99-2.63)	--	--	**2.04(1.24-3.36)*****	--	--	1.48(0.90-2.42)
Model 3	--	--	1.60(0.98-2.63)	--	--	**1.84(1.10-3.09)****	--	--	1.40(0.85-2.30)

Note. **p<0.01, ***p<0.001
Model 1=adjusted for sex, age, education, marital status, ethnicity and income
Model 2=adjusted for sociodemographic variables, any mood disorder, any substance use disorder, and any personality disorder
Model 3=adjusted for sociodemographic variables, mood, substance use and personality disorders, and number of physical health conditions
Percentages are weighted. Prevalence rates of "yes" column indicate the prevalence of the assessed physical health conditions among each anxiety disorder. Prevalence rates of "no" column indicate the prevalence of those with the physical condition among those without an anxiety disorder.
DV = dependent variables; IV = independent variable
Analyses exclude those who endorsed the physical condition at Wave 1.

Predictors at Wave 1 of Incident Comorbid Relationships at Wave 2

Table 4 displays results of adjusted multinomial logistic regression analyses examining sociodemographic predictors of incident anxiety disorder alone, individual physical health condition alone, and comorbid anxiety disorder and individual physical health conditions compared to none at Wave 2; Table 5 displays results of physical (i.e., physical health-related quality of life, and number of physical health conditions) and mental (i.e., mental health-related quality of life, number of anxiety, mood and substance use disorders, any mood or substance use disorder, and any personality disorder) health predictors at Wave 1 of incident outcomes at Wave 2. Results indicated that being female (Table 4) and poorer mental and physical health related quality of life (Table 5) were associated with increased odds of incident comorbid arthritis and anxiety disorder at Wave 2. These significant predictors were associated not only to incident comorbidity but also incident arthritis alone. Being female and having a mood or substance use disorder, and poorer mental health related quality of life at Wave 1 were associated with increased odds of incident any anxiety disorder and gastrointestinal disease at Wave 2. Having a mood or substance use disorder at Wave 1 was a unique predictor of incident comorbidity at Wave 2 and was not significant for incident anxiety disorder alone and gastrointestinal disease alone. Finally, being between the $35,000-$59,999 income level compared to $0-$19,999 was uniquely associated with decreased odds of incident any anxiety disorder and cardiovascular disease at Wave 2. Poorer mental health related quality of life at Wave 1 was associated with increased odds of not only incident comorbid anxiety disorder and cardiovascular disease but also incident anxiety disorder alone and cardiovascular disease alone at Wave 2.

Table 4

Adjusted Odds Ratios of Sociodemographics at Wave 1 and Their Association to Incident Anxiety and Physical Condition Outcomes at Wave 2 in Older Adults Aged 55+

	Neither anxiety or physical condition AOR(99%CI)	Incident anxiety disorder alone AOR(99%CI)	Incident physical condition alone AOR(99%CI)	Incident comorbid anxiety and physical condition AOR(99%CI)
Predictors		Arthritis		
Sociodemographic				
Sex				
Male	1.00	1.00	1.00	1.00
Female	1.00	**1.93(1.15-3.24)****	**1.46(1.15-1.87)*****	**2.11(1.08-4.14)****
Age	1.00	0.97(0.93-1.00)	**1.02(1.00-1.03)****	1.01(0.97-1.05)
Marital Status				
Married or common law	1.00	1.00	1.00	1.00
Widowed/Separated/ Divorced	1.00	1.09(0.58-2.06)	1.05(0.82-1.34)	1.33(0.64-2.77)
Never married	1.00	0.96(0.30-3.07)	1.01(0.63-1.62)	1.01(0.21-4.86)
Household Income				
0-$19,999	1.00	1.00	1.00	1.00
$20,000-$34,999	1.00	0.89(0.44-1.81)	0.94(0.71-1.25)	0.85(0.37-1.97)
$35,000-$59,999	1.00	0.82(0.34-1.96)	0.87(0.63-1.19)	0.73(0.26-2.05)
$60,000+	1.00	0.89(0.37-2.16)	0.73(0.50-1.07)	1.00(0.34-2.91)
Education				
Less than high school	1.00	1.00	1.00	1.00
High school	1.00	0.73(0.33-1.60)	0.78(0.57-1.08)	0.71(0.32-1.55)

Some college or higher	1.00	0.48(0.21-1.11)	**0.70(0.51-0.96)****	0.60(0.26-1.37)
Race/Ethnicity				
White	1.00	1.00	1.00	1.00
Black	1.00	**2.03(1.02-4.03)****	1.13(0.85-150)	1.46(0.71-3.02)
Hispanic	1.00	1.23(0.56-2.74)	0.81(0.50-1.31)	0.67(0.21-2.21)
Other	1.00	1.51(0.43-5.24)	1.05(0.58-1.87)	0.11(0.01-1.57)

Gastrointestinal Disease				
Sociodemographic				
Sex				
Male	1.00	1.00	1.00	1.00
Female	1.00	**1.91(1.30-2.80)*****	**1.51(1.10-2.07)****	**3.74(1.22-11.45)****
Age	1.00	**0.98(0.96-1.00)****	1.01(0.99-1.03)	1.00(0.95-1.05)
Marital Status				
Married or common law	1.00	1.00	1.00	1.00
Widowed/Separated/ Divorced	1.00	1.31(0.88-1.94)	0.93(0.67-1.30)	0.51(0.20-1.31)
Never married	1.00	0.79(0.33-1.90)	0.65(0.33-1.30)	0.81(0.11-6.08)
Household Income				
0-$19,999	1.00	1.00	1.00	1.00
$20,000-$34,999	1.00	0.96(0.63-1.48)	1.17(0.76-1.80)	0.55(0.15-2.05)
$35,000-$59,999	1.00	0.90(0.50-1.62)	0.87(0.53-1.41)	0.45(0.11-1.87)
$60,000+	1.00	0.91(0.49-1.69)	0.78(0.45-1.34)	0.24(0.03-2.08)
Education				
Less than high school	1.00	1.00	1.00	1.00
High school	1.00	0.77(0.49-1.18)	0.72(0.47-1.10)	0.76(0.22-2.62)
Some college or higher	1.00	**0.59(0.36-0.98)****	0.85(0.56-1.28)	0.58(0.16-2.05)
Race/Ethnicity				
White	1.00	1.00	1.00	1.00
Black	1.00	1.44(0.94-2.18)	1.18(0.80-1.73)	2.24(0.78-6.41)
Hispanic	1.00	0.87(0.49-1.56)	1.11(0.64-1.92)	1.61(0.51-5.05)
Other	1.00	1.36(0.53-3.51)	1.25(0.63-2.48)	0.76(0.05-10.78)

		Cardiovascular Disease		
Sex				
Male	1.00	1.00	1.00	1.00
Female	1.00	**2.05(1.37-3.06)***	0.87(0.67-1.13)	1.42(0.57-3.57)
Age	1.00	**0.97(0.94-0.99)**	**1.03(1.02-1.05)***	1.00(0.95-1.06)
Marital Status				
Married or common law	1.00	1.00	1.00	1.00
Widowed/Separated/ Divorced	1.00	1.05(0.66-1.67)	1.01(0.76-1.33)	1.30(0.58-2.89)
Never married	1.00	0.88(0.37-2.10)	0.89(0.56-1.43)	0.59(0.08-4.22)
Household Income				
0-$19,999	1.00	1.00	1.00	1.00
$20,000-$34,999	1.00	0.94(0.60-1.47)	1.07(0.78-1.47)	0.59(0.20-1.74)
$35,000-$59,999	1.00	1.13(0.62-2.06)	1.08(0.75-1.56)	0.20(0.04-0.99)**
$60,000+	1.00	0.95(0.51-1.74)	0.81(0.51-1.28)	0.45(0.12-1.74)
Education				
Less than high school	1.00	1.00	1.00	1.00
High school	1.00	0.72(0.41-1.27)	0.84(0.61-1.17)	1.13(0.37-3.40)
Some college or higher	1.00	**0.57(0.33-0.99)**	0.85(0.61-1.17)	1.10(0.34-3.59)
Race/Ethnicity				
White	1.00	1.00	1.00	1.00
Black	1.00	1.49(0.94-2.37)	0.80(0.59-1.10)	1.16(0.51-2.63)
Hispanic	1.00	0.83(0.42-1.63)	0.70(0.47-1.06)	2.47(0.87-7.04)
Other	1.00	1.20(0.46-3.18)	0.85(0.42-1.74)	0.93(1.10-8.39)

Note. **p<0.01, ***p<0.001

All sociodemographic variables were included in a single adjusted multinomial model. Age was included as a continuous variable whereas other sociodemographics were assessed categorically.

Table 5

Adjusted Odds Ratios of Physical, and Mental Health Predictors at Wave 1 and Their Association to Incident Anxiety and Physical Condition Outcomes at Wave 2 in Older Adults Aged 55+

	Neither anxiety or physical condition AOR(99%CI)	Incident anxiety disorder alone AOR(99%CI)	Incident physical condition alone AOR(99%CI)	Incident comorbid anxiety and physical condition AOR(99%CI)
Predictors		Arthritis		
Mental Health				
Mood and Substance Use Disorders	1.00	1.50(0.69-3.30)	1.13(0.75-1.71)	2.01(0.80-5.04)
Personality Disorders	1.00	1.85(0.85-4.00)	0.89(0.55-1.44)	1.29(0.39-4.23)
# of Anxiety, Mood and Substance Use Disorders	1.00	1.34(0.46-3.91)	1.09(0.59-2.00)	1.33(0.49-3.62)
Mental Health QOL	1.00	1.03(1.00-1.05)	**1.01(1.00-1.03)****	**1.05(1.02-1.09)*****
Physical Health				
# of Physical Health Conditions	1.00	**1.26(1.01-1.56)****	**1.25(1.09-1.44)*****	1.26(0.89-1.77)
Physical Health QOL	1.00	1.02(1.00-1.04)	**1.03(1.02-1.04)*****	**1.04(1.02-1.06)*****
		Gastrointestinal Disease		
Mental Health				
Mood and Substance Use Disorders	1.00	1.51(0.88-2.58)	1.09(0.63-1.88)	**4.15(1.33-12.97)****
Personality Disorders	1.00	**1.81(1.03-3.17)****	0.94(0.51-1.71)	1.03(0.24-4.49)
# of Anxiety, Mood, and Substance Use Disorders	1.00	1.55(0.73-3.26)	1.27(0.51-3.19)	2.20(0.60-8.00)
Mental Health QOL	1.00	**1.04(1.03-1.06)*****	**1.03(1.01-1.04)*****	**1.05(1.01-1.09)****
Physical Health				
# of Physical Health Conditions	1.00	1.09(0.95-1.26)	**1.31(1.16-1.48)*****	1.41(0.98-2.01)
Physical Health QOL	1.00	**1.02(1.00-1.03)****	**1.03(1.01-1.04)*****	1.02(0.98-1.06)
		Cardiovascular Disease		
Mental Health				
Mood and Substance Use Disorders	1.00	1.52(0.89-2.63)	**1.48(1.00-2.18)****	1.38(0.42-4.58)
Personality Disorders	1.00	1.52(0.84-2.77)	0.98(0.60-1.60)	2.48(0.61-10.09)
# of Anxiety, Mood, and Substance Use	1.00	1.86(0.89-3.88)	1.01(0.54-1.89)	0.54(0.08-3.51)

Disorders				
Mental Health QOL	1.00	**1.03(1.01-1.05)*****	**1.02(1.00-1.03)****	**1.04(1.00-1.08)****
Physical Health				
# of Physical Health Conditions	1.00	1.26(1.00-1.57)	**1.27(1.10-1.48)*****	1.40(0.92-2.13)
Physical Health QOL	1.00	1.01(0.99-1.03)	**1.03(1.02-1.04)*****	1.01(0.99-1.04)

Note. **p<0.01, ***p<0.001

AOR=adjusted for sociodemographic variables, any mood, substance use and personality disorders, and number of physical health conditions, excluding the predictor

QOL = quality of life; higher scores indicative of poorer quality of life

Discussion

To our knowledge, the current study represents the first longitudinal investigation of anxiety disorders, and arthritis, gastrointestinal disease, and cardiovascular disease in a large, nationally representative sample of older adults. There were several noteworthy and unique findings in regard to temporality between specific physical health conditions and anxiety disorders. Several findings highlight the importance of multiple physical health conditions in comorbid relationships, which has been discussed in prior research focusing on older adults (El-Gabalawy et al., 2013). We further found that primarily being female and poorer physical and mental health related quality of life at Wave 1 were significant predictors of incident comorbidity of any anxiety disorder and the assessed physical health conditions at Wave 2.

Our first primary finding was that all the assessed physical health conditions were significant predictors of incident panic disorder with or without agoraphobia after adjustment for sociodemographics and comorbid mental disorders. However, when additionally adjusting for comorbid physical health conditions, none of these relationships remained significant. Panic disorder is defined by symptoms of recurrent and unexpected panic attacks (American Psychiatric Association, 2013). In the case of multiple physical health conditions, an older adult may be hypersensitive to constant and often unpredictable changes such as health declines, which may result in a propensity to panic attacks. Prior research has also identified that a typically occurring presentation of panic disorder involves cardio-respiratory experiences (e.g., shortness of breath, chest pain, numbness) and fear of dying; somatic-autonomic experiences such as sweating, trembling, chills, hot flashes and nausea; and cognitive experiences such as fear of losing control (Meuret et al., 2006), which may also represent typical symptoms of a variety of physical health problems or may be a result of symptomatology associated with drug interactions. In fact, the

cardio-respiratory "subtype" appears to be the strongest predictor of panic disorder severity and frequency of panic attacks, which has the greatest overlap with physical health symptomatology (Meuret et al., 2006). Medically ill older adults may be at increased likelihood of panic disorder because the symptoms associated with multiple health problems are closely aligned with commonly occurring symptoms of panic disorder. Alternatively, multiple physical health problems may be a predictor for an untested mediator such as health anxiety, which increases the risk of panic disorder (El-Gabalawy et al., 2013). It is essential to understand the potentially complex relationship between panic symptoms and physical health problems in late life. It is possible that panic disorder may be either under- or over-identified in older adults. Specifically, health professionals may under-diagnose panic if they misattribute symptoms of panic disorder to a physical health problem. Alternatively, it is possible that health professionals may over-diagnose panic if they misattribute symptoms of a physical health condition to panic disorder. Future research should aim to disentangle this relationship.

Our results also demonstrated that arthritis was significantly and independently associated with incident generalized anxiety disorder. These results are concerning given that arthritis is one of the most commonly occurring conditions among older adults (Gureje, Von Korff, Simon, & Gater, 1998; Reginster, 2002) and preliminary research suggests that anxiety may be more prevalent than depression in those who suffer from arthritis (el-Miedany & el-Rasheed, 2002; Ho, Fu, Chua, Cheak, & Mak, 2011; McWilliams, Cox, & Enns, 2003; Stang et al., 2006; Treharne et al., 2005). In support of this comorbid relationship, previous research from our group revealed that anxiety and arthritis are strongly correlated in Canadian older adults, and that the co-occurrence of anxiety disorder and arthritis results in poorer physical-health related quality of life than having arthritis alone (El-Gabalawy et al., 2011). These results may be explained by the

symptoms that characterize arthritis as this disease is the leading cause of chronic pain and

disability in late life (Centers for Disease Control and Prevention, 2011) and presents with a

chronic painful progression marked by an unpredictable course and often-painful attacks

(Barlow, Cullen, & Rowe, 1999). This debilitation may result in an older adult acquiring

"excessive anxiety and worry (apprehensive expectation), occurring more days than not for at

least 6 months, about a number of events or activities" (American Psychiatric Association, 2013,

p. 222), a defining feature of generalized anxiety disorder. In fact, older adults with arthritis may

be at increased risk of falls (Stanmore et al., 2013) and previous research has found that falls are

significantly associated with both immediate anxiety and PTSD in older adults (Bloch, 2014).

Prior research has established a longitudinal relationship between decline in physical activity,

which may be a result of physical health conditions such as arthritis, and distress (Cairney,

Faulkner, Veldhuizen, & Wade, 2009), which may be synonymous to or a predictor of anxiety.

Our finding that arthritis is a key risk factor for generalized anxiety disorder in late life is

concerning in light of prior research that has found that anxiety is significantly associated with

one's rheumatoid factor, pain and other indicators of arthritis severity (Ho et al., 2011; Katon et

al., 2007), suggesting poorer outcomes in anxious older adults who suffer from arthritis.

Our second primary finding was that both any anxiety disorder and PTSD were

significant independent predictors of incident gastrointestinal disease. This finding aligns with

prior research indicating that compared to other commonly occurring physical health conditions,

anxiety disorders are more prevalent in bowel disorders and stomach or intestinal ulcers (Gadalla,

2008) and anxiety and stress may induce peptic ulcers and clinically worsen their course

(Levenstein, 1999). Moreover, previous research by our group found that gastrointestinal disease

was one of the most strongly associated physical conditions with any anxiety disorder in a large

cross-sectional sample of older Canadians (El-Gabalawy et al. 2011). The relationship between these anxiety disorders and incident gastrointestinal disease may be understood in the context of physiological stress responses. The gut is physiologically responsive to both environmental and emotional stimulation (Drossman et al., 1999). Stress and anxiety may induce gastric hypersecretion, reduce acidic buffering and blood flow, and influence inflammation in the stomach and duodenum, which may result in gastrointestinal diseases such as peptic ulcers (Levenstein, 1999). Other examples of physiological changes resulting from anxiety and stress include altered hormone and steroid levels, which play a critical role in immune regulation. For example, glucocorticoids, particularly the hormone cortisol, are crucial hormones in regulatory processes and play important roles in gut homeostasis, fluid volume, inflammation, and immunity (McEwen, 2003).

These anxiety disorders may also significantly predict the incidence of gastrointestinal disease through alternative mechanisms such as maladaptive behaviors. Negative emotions such as anxiety can result in adverse health behaviors that facilitate non-compliance to medical regimens and promote poor health habits. The relationship between emotional states such as anxiety and maladaptive behaviors that negatively influence health is the premise of Health Behavior Models (Lantz et al., 1998). For example, anxiety can result in risky health behaviors such as overeating, substance abuse, and smoking as a method to cope (Mayne, 1999). These maladaptive behaviors can modify immune system processes that result in an increased susceptibility to illness and physical health conditions (DiMatteo, Lepper, & Croghan, 2000; Everson et al., 1997; Kiecolt-Glaser & Glaser, 1988a, 1988b; Kritz-Silverstein, Barrett-Connor, & Corbeau, 2001). Although we included some of these health factors in our statistical models (e.g., nicotine dependence, drug and alcohol abuse and dependence), others that were not

included in the survey (e.g., poor eating habits) or poor health factors that do not meet DSM-IV

diagnostic criteria (e.g., recreational smoking or drinking alcohol) may be mediating the effects

of anxiety disorders on incident gastrointestinal disease. For example, Black and colleagues

(1999) found that individuals who are anxious, depressed, and angry have a tendency to smoke

more than those who do not experience such emotions (Black, Zimmerman, & Coryell, 1999) and

smoking is a critical risk factor for gastrointestinal problems such as peptic ulcer disease

(Rosenstock, Jorgensen, Bonnevie, & Andersen, 2003). Moreover, previous research has

established a strong relationship between diet and gut microbiota alterations in the elderly, which

may put an older adult at risk of several gastrointestinal diseases such as inflammatory bowel

disease and irritable bowel syndrome (Claesson et al. 2012).

     The short time frame of 3 years between Waves 1 and 2 may help explain why only

incident gastrointestinal disease was a significant outcome of anxiety disorders. Perhaps these

physiological changes acutely affect gut functioning, whereas in the case of cardiovascular

disease and arthritis, these changes would take longer to potentiate. Research has linked *chronic*

anxiety disorders such as PTSD to autoimmune disease and cardiovascular disease; and

cardiovascular disease is increasingly being considered an inflammatory disease (Boscarino,

2004). This relationship occurs through biological pathways that result in inflammation

(Boscarino, 2004), which may require years to express pathologically. In fact, the follow-up

period was 17 years on average in the study by Boscarino (2004) that established a relationship

between chronic PTSD and autoimmune disease. It is unclear why only any anxiety disorder and

PTSD were significant predictors of incident gastrointestinal disease, and this is a question that

requires further investigation. Understanding this relationship may have important implications

for geriatric healthcare, as gastrointestinal disease frequently presents with a severe course in

older persons (Durazzo, Premoli, Bo, & Pellicano, 2007). Older adults who suffer from

gastrointestinal problems make up a significant proportion of specialty and general hospital

workload, including a significant number of referrals, longer stays in surgical wards, and

radiology burden (Chaplin, Curless, Thomson, & Barton, 2000; Purkayastha, Salter, & Holmes,

1988). Moreover, prior research indicates that the prevalence of generalized anxiety disorder

increases with greater numbers of gastrointestinal symptoms in older adults (Wetherell et al.,

2010) and thus it is possible that both gastrointestinal disease and anxiety disorders may mutually

maintain one another.

Our third primary finding was that there were very few sociodemographic and physical

and mental health predictors at Wave 1 that were significantly associated with incident comorbid

anxiety disorders and physical conditions at Wave 2. Female sex was associated with increased

risk of both incident arthritis and gastrointestinal disease and any anxiety disorder. This is in line

with prior research that has found that being female is a significant predictor of mental disorders

in general in older adults (Chou et al., 2011). Interestingly, having an income between $35,000-

$59,999 compared to a lower income was protective against incident anxiety disorder and

cardiovascular disease. It is unclear why this would be unique to incident comorbidity but is in

line with research indicating that lower incomes are associated with increased risk of mental

disorders including anxiety disorders (Sareen et al., 2011). Although few mental and physical

health predictors were significantly associated with incident comorbidity, poorer mental health

related quality of life at Wave 1 was a significant predictor of incident comorbid anxiety disorder

and all the assessed physical conditions at Wave 2. Moreover, poor physical health related quality

of life at Wave 1 was a significant predictor of incident anxiety disorder and arthritis; and mood

and substance use disorders were unique predictors of incident anxiety disorder and

gastrointestinal disease at Wave 2. It may be particularly important to assess for poor mental

health related quality of life, and in some cases physical health related quality of life and

comorbid mental disorders, to identify those who may be at higher risk of not only anxiety

disorders and physical health problems alone but also the comorbidity between the two.

Identifying those older adults at risk and implementing appropriate treatments may significantly

impact their health trajectory. This is also particularly important as these factors have been found

to be significantly associated with chronicity of mental illnesses (Mackenzie, El-Gabalawy,

Chou, & Sareen, 2013), which could contribute to the onset of other physical health problems and

worsen outcomes.

Although using the longitudinally nationally representative NESARC provides several

important benefits including a population-based sample of older adults and DSM-IV diagnosed

anxiety disorders, results of this study must be considered in light of some key limitations. First,

physical health conditions were assessed based on self-reported physician diagnoses. Although

prior research has found a high agreement between self-reported and clinician assessed physical

health conditions (Baumeister et al., 2010), this does not eliminate a possible reporting bias.

Similarly, there is a possibility that highly anxious older adults may seek medical care at higher

rates resulting in an increased likelihood of being diagnosed with a physical health condition than

those without an anxiety disorder. Second, we were unable to examine indicators of disease

severity, and psychological and personality characteristics, which may influence comorbidity and

act as possible mediators or moderators in the association between anxiety disorders and physical

health conditions (e.g., (Ormel et al., 1997; Soo, Burney, & Basten, 2009)). Third, respondents

were only assessed over a 3-year period and therefore the NESARC data may not capture older

adults who developed a comorbid disorder (anxiety or the physical health condition of interest) at

later time-points. Fourth, diagnoses were based on DSM-IV criteria. With the recent release of

the DSM-5 and a number of changes to diagnostic criteria for particular anxiety disorders, it is

possible that this may result in differential relationships with physical health conditions.

Additionally, older adults present with unique features of anxiety disorders such as disability,

physical health comorbidity and cognitive decline (Wolitzky-Taylor, Castriotta, Lenze, Stanley,

& Craske, 2010). Although the AUDADIS-IV is both valid and reliable in the general population,

this has not been specifically validated in older adults and further research is warranted in order

to accurately classify anxiety disorders in late life. We were also unable to examine reasons for

attrition between Waves 1 and 2, which may include the onset of a severe or debilitating disorder

or condition that requires institutionalization or results in mortality. In addition, although these

longitudinal data allow one to assess temporal associations, true causal relationships cannot be

established. More rigorous longitudinal approaches such as long time-series data will be useful in

evaluating causal associations between anxiety disorders and physical health conditions (Menard,

2002).

Despite these limitations, this study is the first to evaluate prospective associations among

anxiety disorders and physical health conditions in late life. Results suggest that both temporal

relationships exist in older adults but these differ with respect to the type of anxiety disorder and

physical health condition. Future research should examine mechanisms that may underlie these

relationships, and whether interventions can reduce symptoms associated with co-occurring

conditions. For example, improvement in mental health and reduction of stress among adults with

rheumatoid arthritis are associated with increases in treatment success, including improvements

in coping, pain, health status, and joint involvement (Parker et al., 1995; Sharpe et al., 2001).

Thus, these findings are relevant for the entire range of efforts, from broad health promotion and

prevention initiatives to more narrow interventions, aimed at enhancing older adults' physical and

mental health.

Acknowledgments

References

American Psychiatric Association (2013). Diagnostic and statistical manual of mental disorders

(5th Ed.). Washington D.C.: Author.

Arola, H. M., Nicholls, E., Mallen, C., & Thomas, E. (2010). Self-reported pain interference and

symptoms of anxiety and depression in community-dwelling older adults: can a temporal

relationship be determined? *European Journal of Pain, 14*(9), 966-971. doi: S1090-

3801(10)00050-9 [pii]10.1016/j.ejpain.2010.02.012

Asmundson, G. J., Coons, M. J., Taylor, S., & Katz, J. (2002). PTSD and the experience of pain:

research and clinical implications of shared vulnerability and mutual maintenance models.

Canadian Journal of Psychiatry. Revue canadienne de psychiatrie, 47(10), 930-937.

Barlow, J. H., Cullen, L. A., & Rowe, I. F. (1999). Comparison of knowledge and psychological

well-being between patients with a short disease duration (< or = 1 year) and patients with

more established rheumatoid arthritis (> or = 10 years duration). *Patient Education and

Counseling, 38*(3), 195-203.

Baum, A., & Posluszny, D. M. (1999). Health psychology: mapping biobehavioral contributions

to health and illness. *Annual Review of Psychology, 50*, 137-163. doi:

10.1146/annurev.psych.50.1.137

Baumeister, H., Kriston, L., Bengel, J., & Harter, M. (2010). High agreement of self-report and

physician-diagnosed somatic conditions yields limited bias in examining mental-physical

comorbidity. *Journal of Clinical Epidemiology, 63*(5), 558-565. doi:

10.1016/j.jclinepi.2009.08.009

Beard, C., Weisberg, R. B., & Keller, M. B. (2010). Health-related Quality of Life across the

anxiety disorders: findings from a sample of primary care patients. *Journal of Anxiety*

Disorders, 24(6), 559-564. doi: S0887-6185(10)00075-7

[pii]10.1016/j.janxdis.2010.03.015

Beekman, A. T., Bremmer, M. A., Deeg, D. J., van Balkom, A. J., Smit, J. H., de Beurs, E., . . .
van Tilburg, W. (1998). Anxiety disorders in later life: a report from the Longitudinal
Aging Study Amsterdam. *International Journal of Geriatric Psychiatry, 13*(10), 717-726.
doi: 10.1002/(SICI)1099-1166(1998100)13:10<717::AID-GPS857>3.0.CO;2-M [pii]

Black, D. W., Zimmerman, M., & Coryell, W. H. (1999). Cigarette smoking and psychiatric
disorder in a community sample. *Annals of Clinical Psychiatry, 11*(3), 129-136.

Bloch, F., Blandin, M., Ranerison, R., Claessens, Y. E., Rigaud, A. S., Kemoun, G. (2014).
Anxiety after a fall in elderly subjects and subsequent risk of developing post traumatic
stress disorder at two months: A pilot study. *The Journal of Nutrition, Health & Aging,
18*(3), 303-306.

Boscarino, J. A. (2004). Posttraumatic stress disorder and physical illness: results from clinical
and epidemiologic studies. *Annals of the New York Academy of Sciences, 1032*, 141-153.
doi: 10.1196/annals.1314.011

Cairney, J., Faulkner, G., Veldhuizen, S., & Wade, T. J. (2009). Changes over time in physical
activity and psychological distress among older adults. *Canadian Journal of Psychiatry.
Revue Canadienne de Psychiatrie, 54*(3), 160-169.

Centers for Disease Control and Prevention. (2011). Arthritis Retrieved July 15, 2011, from
http://www.cdc.gov/arthritis/data_statistics/faqs/cost_analysis.htm

Chaplin, A., Curless, R., Thomson, R., & Barton, R. (2000). Prevalence of lower gastrointestinal
symptoms and associated consultation behaviour in a British elderly population

determined by face-to-face interview. *The British Journal of General Practice: the Journal of the Royal College of General Practitioners, 50*(459), 798-802.

Chou, K. L., Mackenzie, C. S., Liang, K., & Sareen, J. (2011). Three-year incidence and predictors of first-onset of DSM-IV mood, anxiety, and substance use disorders in older adults: results from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry, 72*(2), 144-155. doi: 10.4088/JCP.09m05618gry

Chou, S. P., Huang, B., Goldstein, R., & Grant, B. F. (2013). Temporal associations between physical illnesses and mental disorders--results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). *Comprehensive Psychiatry, 54*(6), 627-638. doi: 10.1016/j.comppsych.2012.12.020

Claesson, M. J., Jeffery, I. B., Conde, S., Power, S. E., O'Connor, E. M., Cusack, S., . . . O'Toole, P. W. (2012). Gut microbiota composition correlates with diet and health in the elderly. *Nature, 488*(7410), 178-184. doi: 10.1038/nature11319

Dall, T. M., Gallo, P. D., Chakrabarti, R., West, T., Semilla, A. P., & Storm, M. V. (2013). An aging population and growing disease burden will require a large and specialized health care workforce by 2025. *Health Affairs, 32*(11), 2013-2020. doi: 10.1377/hlthaff.2013.0714

Dersh, J., Polatin, P. B., & Gatchel, R. J. (2002). Chronic pain and psychopathology: research findings and theoretical considerations. *Psychosomatic Medicine, 64*(5), 773-786.

DiMatteo, M. R., Lepper, H. S., & Croghan, T. W. (2000). Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and

depression on patient adherence. *Archives of Internal Medicine, 160*(14), 2101-2107. doi: ioi90679 [pii]

Drossman, D. A., Creed, F. H., Olden, K. W., Svedlund, J., Toner, B. B., & Whitehead, W. E. (1999). Psychosocial aspects of the functional gastrointestinal disorders. *Gut, 45 Suppl 2*, II25-30.

Durazzo, M., Premoli, A., Bo, S., & Pellicano, R. (2007). Gastrointestinal problems in the elderly. *Panminerva Medica, 49*(3), 151-158.

El-Gabalawy, R., Katz, L. Y., & Sareen, J. (2010). Comorbidity and associated severity of borderline personality disorder and physical health conditions in a nationally representative sample. *Psychosomatic Medicine, 72*(7), 641-647. doi: PSY.0b013e3181e10c7b [pii]10.1097/PSY.0b013e3181e10c7b

El-Gabalawy, R., Mackenzie, C. S., Shooshtari, S., & Sareen, J. (2011). Comorbid physical health conditions and anxiety disorders: a population-based exploration of prevalence and health outcomes among older adults. *General Hospital Psychiatry, 33*(6), 556-564. doi: 10.1016/j.genhosppsych.2011.07.005

El-Gabalawy, R., Mackenzie, C. S., Thibodeau, M. A., Asmundson, G. J., & Sareen, J. (2013). Health anxiety disorders in older adults: conceptualizing complex conditions in late life. *Clinical Psychology Review, 33*(8), 1096-1105. doi: 10.1016/j.cpr.2013.08.010

el-Miedany, Y. M., & el-Rasheed, A. H. (2002). Is anxiety a more common disorder than depression in rheumatoid arthritis? *Joint Bone Spine, 69*(3), 300-306.

Everson, S. A., Kauhanen, J., Kaplan, G. A., Goldberg, D. E., Julkunen, J., Tuomilehto, J., & Salonen, J. T. (1997). Hostility and increased risk of mortality and acute myocardial

infarction: the mediating role of behavioral risk factors. *American Journal of Epidemiology, 146*(2), 142-152.

Fried, L. P., Ferrucci, L., Darer, J., Williamson, J. D., & Anderson, G. (2004). Untangling the concepts of disability, frailty, and comorbidity: implications for improved targeting and care. *The Journals of Gerontology. Series A, Biological sciences and medical sciences, 59*(3), 255-263.

Gadalla, T. M. (2008). Disability associated with comorbid anxiety disorders in women with chronic physical illness in Ontario, Canada. *Women Health, 48*(1), 1-20. doi: 10.1080/03630240802131965

Gallo, L. C., & Matthews, K. A. (2003). Understanding the association between socioeconomic status and physical health: do negative emotions play a role? *Psychological Bulletin, 129*(1), 10-51.

Goldstein, R. B., & Grant, B. F. (2009). Three year follow-up of syndromal antisocial behavior in adults: Results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry, 70*(9), 1237-1249.

Grant, B. F., Chou, S. P., Goldstein, R. B., Huang, B., Stinson, F. S., Saha, T. D., . . . Ruan, W. J. (2008). Prevalence, correlates, disability, and comorbidity of DSM-IV borderline personality disorder: results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry, 69*(4), 533-545.

Grant, B. F., Dawson, D. A., Stinson, F. S., Chou, P. S., Kay, W., & Pickering, R. (2003). The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): reliability of alcohol consumption, tobacco use, family history of depression and

psychiatric diagnostic modules in a general population sample. *Drug and Alcohol*

 Dependence, 71(1), 7-16. doi: S037687160300070X [pii]

Grant, B. F., Goldstein, R. B., Chou, S. P., Huang, B., Stinson, F. S., Dawson, D. A., . . .

 Compton, W. M. (2009). Sociodemographic and psychopathologic predictors of first

 incidence of DSM-IV substance use, mood and anxiety disorders: results from the Wave 2

 National Epidemiologic Survey on Alcohol and Related Conditions. *Molecular*

 Psychiatry, 14(11), 1051-1066. doi: mp200841 [pii]10.1038/mp.2008.41

Grant, B. F., Hasin, D. S., Stinson, F. S., Dawson, D. A., Chou, S. P., Ruan, W. J., & Pickering,

 R. P. (2004). Prevalence, correlates, and disability of personality disorders in the United

 States: results from the national epidemiologic survey on alcohol and related conditions.

 Journal of Clinical Psychiatry, 65(7), 948-958.

Grant, B. F., Kaplan, K. (2005). *Source and accuracy statement for the Wave 2 National*

 Epidemiological Survey on Alcohol and Related Conditions (NESARC). Bethesda, MD:

 National Institute on Alcohol Abuse and Alcoholism.

Grant, B. F., Stinson, F. S., Dawson, D. A., Chou, S. P., Dufour, M. C., Compton, W., . . .

 Kaplan, K. (2004). Prevalence and co-occurrence of substance use disorders and

 independent mood and anxiety disorders: results from the National Epidemiologic Survey

 on Alcohol and Related Conditions. *Archives of General Psychiatry, 61*(8), 807-816. doi:

 10.1001/archpsyc.61.8.80761/8/807 [pii]

Gruver, A. L., Hudson, L. L., & Sempowski, G. D. (2007). Immunosenescence of ageing. *The*

 Journal of Pathology, 211(2), 144-156. doi: 10.1002/path.2104

Gureje, O., Von Korff, M., Simon, G. E., & Gater, R. (1998). Persistent pain and well-being: a World Health Organization Study in Primary Care. *JAMA, 280*(2), 147-151. doi: joc72070 [pii]

Ho, R. C., Fu, E. H., Chua, A. N., Cheak, A. A., & Mak, A. (2011). Clinical and psychosocial factors associated with depression and anxiety in Singaporean patients with rheumatoid arthritis. *International Journal of Rheumatic Disease, 14*(1), 37-47. doi: 10.1111/j.1756-185X.2010.01591.x

Holtzer, R., Zweig, R. A., & Siegel, L. J. (2012). Learning From The Past and Planning For The Future: The Challenges Of And Solutions For Integrating Aging Into Doctoral Psychology Training. *Training and Education in Professional Psychology, 6*(3), 142-150. doi: 10.1037/a0029365

Hunt, S., Wisocki, P., & Yanko, J. (2003). Worry and use of coping strategies among older and younger adults. *Journal of Anxiety Disorders, 17*(5), 547-560. doi: S0887618502002293 [pii]

Jeste, D. V., Alexopoulos, G. S., Bartels, S. J., Cummings, J. L., Gallo, J. J., Gottlieb, G. L., . . . Lebowitz, B. D. (1999). Consensus statement on the upcoming crisis in geriatric mental health: research agenda for the next 2 decades. *Archives of General Psychiatry, 56*(9), 848-853.

Katon, W., Lin, E. H., & Kroenke, K. (2007). The association of depression and anxiety with medical symptom burden in patients with chronic medical illness. *General Hospital Psychiatry, 29*(2), 147-155. doi: S0163-8343(06)00220-9 [pii]10.1016/j.genhosppsych.2006.11.005

Kiecolt-Glaser, J. K., & Glaser, R. (1988a). Methodological issues in behavioral immunology research with humans. *Brain Behavior Immune, 2*(1), 67-78. doi: 0889-1591(88)90007-4 [pii]

Kiecolt-Glaser, J. K., & Glaser, R. (1988b). Psychological influences on immunity: making sense of the relationship between stressful life events and health. *Advances in Experimental Medicine and Biology, 245*, 237-247.

Kritz-Silverstein, D., Barrett-Connor, E., & Corbeau, C. (2001). Cross-sectional and prospective study of exercise and depressed mood in the elderly : the Rancho Bernardo study. *American Journal of Epidemiology, 153*(6), 596-603.

Lantz, P. M., House, J. S., Lepkowski, J. M., Williams, D. R., Mero, R. P., & Chen, J. (1998). Socioeconomic factors, health behaviors, and mortality: results from a nationally representative prospective study of US adults. *JAMA, 279*(21), 1703-1708. doi: joc72105 [pii]

Levenstein, S. (1999). Peptic ulcer at the end of the 20th century: biological and psychological risk factors. *Canadian Journal of Gastroenterology, 13*(9), 753-759.

Levy, P., Lemeshow, S. . (1999). *Sampling of populations*. New York: John Wiley & Sons.

Mackenzie, C. S., El-Gabalawy, R., Chou, K. L., & Sareen, J. (2013). Prevalence and predictors of persistent versus remitting mood, anxiety, and substance disorders in a national sample of older adults. *The American Journal of Geriatric Psychiatry : official journal of the American Association for Geriatric Psychiatry*. doi: 10.1016/j.jagp.2013.02.007

Mant, J. W., Jenkinson, C., Murphy, M. F., Clipsham, K., Marshall, P., & Vessey, M. P. (1998). Use of the Short Form-36 to detect the influence of upper gastrointestinal disease on self-reported health status. *Quality of Life Research, 7*(3), 221-226.

Mayne, T. J. (1999). Negative affect and health: The importance of being earnest. *Cognition and Emotion, 13*(5), 601-635. doi: 10.1080/026999399379203

McEwen, B. S. (2003). Interacting mediators of allostasis and allostatic load: towards an understanding of resilience in aging. *Metabolism, 52*(10 Suppl 2), 10-16. doi: S0026049503002956 [pii]

McNeil, J., Binette, J., U.S. Department of Commerce, Centers for Disease Control and Prevention. (1999). Prevalence of disabilities and associated health conditions among adults. *MMWR 2001, 50*(7), 120-125.

McWilliams, L. A., Cox, B. J., & Enns, M. W. (2003). Mood and anxiety disorders associated with chronic pain: an examination in a nationally representative sample. *Pain, 106*(1-2), 127-133. doi: S0304395903003014 [pii]

Menard, S. (2002). *Longitudinal Research*. Thousand Oaks, CA: Sage Publications Inc.

Meuret, A. E., White, K. S., Ritz, T., Roth, W. T., Hofmann, S. G., & Brown, T. A. (2006). Panic attack symptom dimensions and their relationship to illness characteristics in panic disorder. [Comparative Study]. *Journal of Psychiatric Research, 40*(6), 520-527. doi: 10.1016/j.jpsychires.2005.09.006

Mili, F., Helmick, C. G., & Moriarty, D. G. (2003). Health related quality of life among adults reporting arthritis: analysis of data from the Behavioral Risk Factor Surveillance System, US, 1996-99. *Journal of Rheumatology, 30*(1), 160-166. doi: 0315162X-30-160 [pii]

Montorio, I., Nuevo, R., Marquez, M., Izal, M., & Losada, A. (2003). Characterization of worry according to severity of anxiety in elderly living in the community. *Aging & Mental Health, 7*(5), 334-341. doi: 10.1080/1360786031000150694L3VJ4A9WE11NK52V [pii]

Ormel, J., Kempen, G. I., Penninx, B. W., Brilman, E. I., Beekman, A. T., & van Sonderen, E. (1997). Chronic medical conditions and mental health in older people: disability and psychosocial resources mediate specific mental health effects. [Research Support, Non-U.S. Gov't]. *Psychological Medicine, 27*(5), 1065-1077.

Parker, J. C., Smarr, K. L., Buckelew, S. P., Stucky-Ropp, R. C., Hewett, J. E., Johnson, J. C., . . . Walker, S. E. (1995). Effects of stress management on clinical outcomes in rheumatoid arthritis. *Arthritis and Rheumatism, 38*(12), 1807-1818.

Purkayastha, S. K., Salter, R. H., & Holmes, K. M. (1988). Contribution of the elderly to a district hospital combined gastroenterology clinic. *Age Ageing, 17*(1), 49-53.

Reginster, J. Y. (2002). The prevalence and burden of arthritis. *Rheumatology (Oxford), 41 Supp 1*, 3-6.

Rosenstock, S., Jorgensen, T., Bonnevie, O., & Andersen, L. (2003). Risk factors for peptic ulcer disease: a population based prospective cohort study comprising 2416 Danish adults. *Gut, 52*(2), 186-193.

Ruan, W. J., Goldstein, R. B., Chou, S. P., Smith, S. M., Saha, T. D., Pickering, R. P., . . . Grant, B. F. (2008). The alcohol use disorder and associated disabilities interview schedule-IV (AUDADIS-IV): reliability of new psychiatric diagnostic modules and risk factors in a general population sample. *Drug and Alcohol Dependence, 92*(1-3), 27-36. doi: S0376-8716(07)00242-6 [pii]10.1016/j.drugalcdep.2007.06.001

Sareen, J., Afifi, T. O., McMillan, K. A., & Asmundson, G. J. (2011). Relationship between household income and mental disorders: findings from a population-based longitudinal study. *Archives of General Psychiatry, 68*(4), 419-427. doi: 10.1001/archgenpsychiatry.2011.15

Sareen, J., Cox, B. J., Clara, I., & Asmundson, G. J. (2005). The relationship between anxiety disorders and physical disorders in the U.S. National Comorbidity Survey. *Depression and Anxiety, 21*(4), 193-202. doi: 10.1002/da.20072

Schneiderman, N., Ironson, G., & Siegel, S. D. (2005). Stress and health: psychological, behavioral, and biological determinants. *Annual Review of Clinical Psychology, 1*, 607-628. doi: 10.1146/annurev.clinpsy.1.102803.144141

Schuurmans, J., Comijs, H. C., Beekman, A. T., de Beurs, E., Deeg, D. J., Emmelkamp, P. M., & van Dyck, R. (2005). The outcome of anxiety disorders in older people at 6-year follow-up: results from the Longitudinal Aging Study Amsterdam. *Acta Psychiatrica Scandinavia, 111*(6), 420-428. doi: ACP531 [pii]10.1111/j.1600-0447.2005.00531.x

Scott, K. M., Von Korff, M., Alonso, J., Angermeyer, M., Bromet, E. J., Bruffaerts, R., . . . Williams, D. (2008). Age patterns in the prevalence of DSM-IV depressive/anxiety disorders with and without physical co-morbidity. *Psychological Medicine, 38*(11), 1659-1669. doi: S0033291708003413 [pii]10.1017/S0033291708003413

Shah, B., Barnswell, BG., Bieler, GS. (2009). SUDAAN User's Manual: Release 10.0. Research Triangle Park, NC: Research Triangle Institute

Sharpe, L., Sensky, T., Timberlake, N., Ryan, B., Brewin, C. R., & Allard, S. (2001). A blind, randomized, controlled trial of cognitive-behavioural intervention for patients with recent onset rheumatoid arthritis: preventing psychological and physical morbidity. *Pain, 89*(2-3), 275-283.

Skarborn, M., & Nicki, R. (1996). Worry among Canadian seniors. *International Journal of Aging and Human Development, 43*(2), 169-178.

Soo, H., Burney, S., & Basten, C. (2009). The role of rumination in affective distress in people

    with a chronic physical illness: a review of the literature and theoretical formulation.

    Journal of Health Psychology, 14(7), 956-966. doi: 10.1177/1359105309341204

Stang, P. E., Brandenburg, N. A., Lane, M. C., Merikangas, K. R., Von Korff, M. R., & Kessler,

    R. C. (2006). Mental and physical comorbid conditions and days in role among persons

    with arthritis. *Psychosomatic Medicine, 68*(1), 152-158. doi: 68/1/152

    [pii]10.1097/01.psy.0000195821.25811.b4

Stanmore, E. K., Oldham, J., Skelton, D. A., O'Neill, T., Pilling, M., Campbell, A. J., & Todd, C.

    (2013). Fall incidence and outcomes of falls in a prospective study of adults with

    rheumatoid arthritis. *Arthritis Care & Research, 65*(5), 737-744. doi: 10.1002/acr.21892

Stinson, F. S., Dawson, D. A., Goldstein, R. B., Chou, S. P., Huang, B., Smith, S. M., . . . Grant,

    B. F. (2008). Prevalence, correlates, disability, and comorbidity of DSM-IV narcissistic

    personality disorder: Results from the Wave 2 national epidemiologic survey on alcohol

    and related conditions. *Journal of Clinical Psychiatry, 69*(7), 1033-1045.

Thomsen, D. K., Mehlsen, M. Y., Olesen, F., Hokland, M., Viidik, A., Avlund, K., & Zachariae,

    R. (2004). Is there an association between rumination and self-reported physical health? A

    one-year follow-up in a young and an elderly sample. *Journal of Behavioral Medicine,

    27*(3), 215-231.

Treharne, G. J., Hale, E. D., Lyons, A. C., Booth, D. A., Banks, M. J., Erb, N., . . . Kitas, G. D.

    (2005). Cardiovascular disease and psychological morbidity among rheumatoid arthritis

    patients. *Rheumatology (Oxford), 44*(2), 241-246. doi: keh441

    [pii]10.1093/rheumatology/keh441

van 't Land, H., Verdurmen, J., Ten Have, M., van Dorsselaer, S., Beekman, A., & de Graaf, R. (2010). The association between arthritis and psychiatric disorders; results from a longitudinal population-based study. *Journal Psychosomatic Research, 68*(2), 187-193. doi: S0022-3999(09)00190-1 [pii]10.1016/j.jpsychores.2009.05.011

Ware, J., Jr., Kosinski, M., & Keller, S. D. (1996). A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Medical Care, 34*(3), 220-233.

Wetherell, J. L., Ayers, C. R., Nuevo, R., Stein, M. B., Ramsdell, J., & Patterson, T. L. (2010). Medical conditions and depressive, anxiety, and somatic symptoms in older adults with and without generalized anxiety disorder. *Aging & Mental Health, 14*(6), 764-768. doi: 924376300 [pii]10.1080/13607861003713240

Wolitzky-Taylor, K. B., Castriotta, N., Lenze, E. J., Stanley, M. A., & Craske, M. G. (2010). Anxiety disorders in older adults: a comprehensive review. *Depression and Anxiety, 27*(2), 190-211. doi: 10.1002/da.20653

Chapter Three

Mental Health Service Use among Older Canadians with Anxiety and

Comorbid Physical Conditions

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Abstract

Objectives: The objective of this study was to understand the relationship between mental health service use and comorbid any anxiety and commonly occurring physical conditions (i.e., arthritis, cardiovascular disease, and gastrointestinal disease) in a national sample of older Canadians.

Methods: The sample consisted of older adults aged 55 years and older from the Canadian Community Health Survey 1.2 (N=12,792). Trained lay interviewers assessed mental disorders based on DSM-IV criteria. Physical conditions were based on self-reported diagnoses by health professionals. Past-year mental health service use was categorized into whether services were utilized in the general or specialty sectors. Crosstabulations and multiple logistic regressions examined the effects of both anxiety and physical conditions on mental health service use within the general and specialty mental health sectors.

Results: Adjusted logistic regressions indicated that there was no effect of anxiety among older adults with gastrointestinal disease on mental health service use. Conversely, in adjusted regressions, having a comorbid anxiety disorder with cardiovascular disease or arthritis was associated with increased odds of service use from the general sector in comparison to cardiovascular disease and arthritis, respectively, alone. Additionally, older adults with comorbid any anxiety disorder and gastrointestinal disease in comparison to anxiety alone had lower rates of seeking mental health services; however, these significant effects were no longer significant in an adjusted model.

Conclusion: Comorbidity between gastrointestinal conditions and anxiety was associated with unmet mental health service needs. This may be conceptualized in the context overlapping symptomatology in gastrointestinal conditions and anxiety.

Introduction

In the general population, 65% to 80% of adults with mental disorders do not seek out mental health services, and this lack of mental health service use is especially true and well documented for older adults (Klap, Unroe, & Unutzer, 2003; Olfson et al., 2002; Trollor, Anderson, Sachdev, Brodaty, & Andrews, 2007; Wang et al., 2005). Prior research has found that older adults are approximately three times less likely than younger adults to report that they received outpatient mental health treatment when they needed it (Karlin, Duffy, & Gleaves, 2008) and fail to accurately identify that they are suffering from anxiety and/or depression (Wetherell et al., 2009). Anxious older adults, in particular, are less likely to use mental health services than those who are depressed (Scott, Mackenzie, Chipperfield, & Sareen, 2010), even though highly effective pharmacological and psychological treatments exist for both depression and anxiety (Ayers, Sorrell, Thorp, & Wetherell, 2007; Bartels et al., 2003; Gatz, 2007; Hendriks, Oude Voshaar, Keijsers, Hoogduin, & van Balkom, 2008; Pinquart & Duberstein, 2007). The disproportionate number of older adults who do not receive adequate treatment for their psychological problems, particularly anxiety disorders, in combination with the rapidly increasing older adult population emphasizes the critical need for further investigation of the effect of anxiety disorders and comorbid physical conditions on mental health service use (Borson, Bartels, Colenda, Gottlieb, & Meyers, 2001; Jeste et al., 1999). In this study, we specifically examined the effect of anxiety and comorbid gastrointestinal disease, cardiovascular disease, and arthritis on mental health service use in late life.

Older adults are at increased risk of suffering from multiple physical conditions but few studies have taken physical condition comorbidity into account when examining mental health service use patterns among anxious older adults. Research indicates that anxiety disorders co-

occur with a number of physical health conditions in older adults, and that this comorbidity results in poorer quality of life outcomes (El-Gabalawy, Mackenzie, Pietrzak, & Sareen, 2014; El-Gabalawy, Mackenzie, Shooshtari, & Sareen, 2011). Arthritis, cardiovascular disease, and gastrointestinal disease, in particular, have strong associations to anxiety disorders, are highly prevalent in late life, and can involve inflammation. Arthritis is among the most prevalent diseases in later life (Gureje, Von Korff, Simon, & Gater, 1998; Reginster, 2002) and is associated with significant disability and chronic pain (Centers for Disease Control and Prevention, 2011; McNeil & Binette, 2001). Recent research suggests that anxiety disorders may be more prevalent than mood disorders among arthritis sufferers (Covic et al., 2012; el-Miedany & el-Rasheed, 2002; Ho, Fu, Chua, Cheak, & Mak, 2011; McDonough et al., 2014; McWilliams, Cox, & Enns, 2003; Stang et al., 2006; Treharne et al., 2005) emphasizing the importance of understanding the comorbidity of anxiety and arthritis in relation to mental health service use. Cardiovascular disease is also a commonly occurring condition in older adults and increasing age is one of its strongest etiological risk factors (Gershlick, 2009; Lloyd-Jones et al., 2010). Research indicates that anxiety is significantly associated with several cardiovascular diseases and comorbidity may result in negative implications including poorer quality of life (El-Gabalawy et al., 2011; Fan, Strine, Jiles, & Mokdad, 2008). Finally, although gastrointestinal disease can be prevalent across the lifespan, it frequently presents with a severe course in older people (Durazzo, Premoli, Bo, & Pellicano, 2007), and older adults who suffer from gastrointestinal problems make up a significant proportion of specialty and general hospital workload. This workload includes a significant proportion of referrals, longer stays in surgical wards, and extra time in radiology (Chaplin, Curless, Thomson, & Barton, 2000; Purkayastha, Salter, & Holmes, 1988). Given the large proportion of older adults with gastrointestinal disease

utilizing health care services, it is possible that comorbidity between gastrointestinal disease and anxiety disorders may result in an increased likelihood of mental health service use as well. Anxiety is highly prevalent in gastrointestinal disease and the prevalence of anxiety increases with greater numbers of gastrointestinal symptoms in older adults (Wetherell et al., 2010). Understanding the relationship between comorbid anxiety and these physical conditions on mental service use is critical given that untreated mental health problems in older adults have significant social, medical, financial, and physical consequences for individuals and society as a whole (Karlin & Fuller, 2007).

Andersen's behavioral model of health services use describes that individual factors such as predisposing characteristics, enabling resources and, most notably, the need for care are associated with service use (Andersen, 1968, 1995). Although this model has been used to examine depression among older adults (e.g., Choi, Morrow-Howell, & Proctor, 2006), it has been used less often in research in the context of anxiety disorders. The need for care is considered the most influential predictor of mental health service use (Scott et al., 2010) and older adults who perceive the need for help are especially likely to seek it. Need for care factors include self-reported physical health status, which has been found to be significantly associated with mental healthcare use in older adults (Karlin, Duffy, & Gleaves, 2008). Specifically, older adults who receive mental health services tend to have poorer self-reported physical health than those who do no not receive mental health services; and older adults who self-report poor physical health are three times more likely than those who self-report good to excellent physical health to receive mental healthcare services (Karlin, Duffy, & Gleaves, 2008). Phillips and Murrell (1994) also found that older adults who sought mental health services in comparison to those who did not reported more physical health problems. In fact, Andersen characterized

disability and symptoms of illnesses as need factors (Andersen, 1968, 1995) and thus comorbid anxiety and physical conditions may have a particularly strong influence on mental health care service use.

Comorbid anxiety and physical health problems may also affect where older adults seek mental health services. A larger proportion of older adults seek mental health services from primary care physicians than from mental health professionals (Phillips & Murrell, 1994), perhaps because of a tendency to report psychological problems as having a physical origin (Haley, 1999). Of concern, however, primary care physicians often under-detect mental health problems in older adults (Karlin & Fuller, 2007) and are less likely to refer and treat older as compared to younger adults with mental health problems (Alvidrez & Arean, 2002; Mackenzie, Gekoski, & Knox, 1999). Despite this, being an anxious physically unwell older adult may be especially likely to push older adults to seek help for anxiety disorders from their primary care physician. This initial help-seeking from primary care could result in screening and subsequently treatment or referral for their mental health problem(s) if they are detected. However, the frequency of initial help-seeking and subsequent detection of an anxiety disorder may be somewhat dependent on older adults' comorbid physical condition and associated symptomatology. To the best of our knowledge, no studies have examined the role of specific comorbid physical conditions on anxious older adults' likelihood of receiving mental health services from specific sectors. Not only is it critical to understand the role of comorbid physical conditions and anxiety disorders on mental health service use in general, it is also important to examine potential differences among particular physical conditions. Understanding how particular physical conditions in anxious older adults relate to service use will help targeted

initiatives aimed at enhancing access to care. Thus, the findings of this study will have important research, clinical, and policy implications.

The specific purpose of this study is to investigate the role of commonly occurring physical conditions (i.e., gastrointestinal disease, cardiovascular disease, and arthritis) and comorbid anxiety disorders on mental health service use in the past year in a large, nationally representative sample of Canadian older adults. Our first aim was to confirm that having an anxiety disorder and a specified comorbid physical health condition, compared to older adults who only had the specified physical health condition without anxiety, would result in increased rates of service use from the general sector. We therefore hypothesized that older adults with comorbidity would have an increased likelihood of mental health service use from the general sector compared to older adults with specific physical health conditions who did not have anxiety. We were also interested in whether anxious older adults with specific physical health conditions, compared to older adults with specific physical health conditions without anxiety, were more likely to seek mental health services from the specialty sector when we eliminated those who also sought help from the general sector. This allowed us to examine specialty mental health service use without the influence of referrals from the general sector. Because older adults have low rates of utilizing specialty services (Phillips & Murrell, 1994), we expected that the effect of anxiety in physically unwell older adults would not affect specialty service use. Our second aim was to examine the effect of having an anxiety disorder and a specified comorbid physical health condition, compared to older adults who only had anxiety without the specified physical health condition, on mental health service utilization. In the second aim, we were interested in the effect of the specified physical conditions as opposed to the effect of anxiety, which was explored in the previous aim, on mental health service use. Based on prior research

(Karlin, Duffy, & Gleaves, 2008; Phillips & Murrell, 1994), we hypothesized that comorbid physical conditions and a past-year anxiety disorder would be significantly associated with increased odds of seeking mental health services from both the general sector and specialty mental health sector when compared to those with an anxiety disorder and no physical health condition. In regard to potential differences between gastrointestinal disease, cardiovascular disease, and arthritis, we hypothesized that gastrointestinal disease in anxious older adults may be especially associated with mental health service use given that gastrointestinal disease is associated with high rates of general healthcare use (Chaplin et al., 2000; Purkayastha et al., 1988).

Method

Sample

The Canadian Community Health Survey: Mental Health and Well-Being (CCHS 1.2), includes comprehensive health data with a breadth of information on service use. The main objectives of the CCHS 1.2 were to assess the mental health of Canadians, functioning, ability and disability; the survey also aimed to examine sociodemographic correlates of mental health and to evaluate changes in patterns of mental health and service use. Statistics Canada conducted the cross-sectional CCHS 1.2 in 2002 over a period of eight months. The survey has a 77% response rate, and includes 36,984 Canadians aged 15 years or older living in private dwellings in the 10 Canadian provinces. Eligible respondents were chosen using a multistage, stratified cluster design. The survey excluded military personnel, individuals living in institutions, on Indian Reserves or Crown Lands, and individuals living in the three territories (Gravel & Beland, 2005). The content, sample design, interviewer training, data collection and computation are described elsewhere (Gravel & Beland, 2005). We only analyzed adults 55 years or older, which results in a

sample size of 12,792. This age cutoff is in accordance with a large body of recent research by

our group and others (e.g., (Beaulaurier, Seff, & Newman, 2008; Corna, Cairney, & Streiner,

2010; El-Gabalawy et al., 2014; Mackenzie, El-Gabalawy, Chou, & Sareen, 2013; Mackenzie,

Reynolds, Chou, Pagura, & Sareen, 2011; Scott et al., 2010), allows for a larger and more

comprehensive sample size given the relatively specific focus of the study, and it moves away

from the traditional age cutoff of 65 that is less relevant today as people often retire well before

or after that age.

Measures

      Sociodemographic variables. Sociodemographic variables included in the survey are

age, sex, marital status, education, and income. We assessed age and income continuously and

categorized marital status (married/common law, widowed, separated/divorced and never

married) and level of education (less than secondary school, secondary school/no postsecondary

education, some postsecondary education, and postsecondary degree/diploma). These

categorizations are in accordance with previous research examining older adults using the CCHS

1.2 (El-Gabalawy et al., 2011).

      Anxiety disorders and other mental disorders. Trained lay interviewers made

diagnoses of mental disorders using a modified version of the World Mental Health Composite

International Diagnostic Interview (WMH-CIDI) based on DSM-IV criteria. The survey included

one or more screening questions, which identified core symptoms, and individuals were screened

into appropriate diagnostic modules of the survey. Good concordance has been demonstrated

between diagnoses made by lay-interviewers using the CIDI and clinician administered structured

clinical interview diagnoses (Haro et al., 2006). We categorized mental disorders into "any past-

year anxiety disorder" (i.e., panic disorder, agoraphobia, social phobia, and post-traumatic stress

disorder), "any past-year mood disorder" (i.e., major depression, mania), and "any past-year substance use disorder" (i.e., alcohol dependence and illicit drug dependence). Unlike the other anxiety disorders indicated above, respondents self-reported on post-traumatic stress disorder in the chronic conditions section of the survey. Specifically, the interviewers indicated to participants that they were interested in "long-term conditions which are expected to last or have already lasted six months or more and that have been diagnosed by a health professional" and within this module participants were subsequently asked, "do you suffer from post-traumatic stress disorder?". As in previous research (El-Gabalawy et al., 2011), we included post-traumatic stress disorder in the "any anxiety disorder" category.

Physical conditions. The survey assessed 23 physical conditions that were based on self-reported diagnoses by health professionals. As indicated above, we focused our analyses on prevalent physical conditions: arthritis or rheumatism (excluding fibromyalgia), cardiovascular disease (i.e., heart disease, stroke), and gastrointestinal disease (i.e., bowel disorder such as Crohn's Disease or colitis, stomach or intestinal ulcers). Respondents specifically responded to having chronic health conditions that were "long-term conditions which are expected to last or have already lasted six months or more and that have been diagnosed by a health professional". We based final categorizations on clinical presentation and prior research using the CCHS 1.2 (El-Gabalawy et al., 2011).

Physical health comorbidity. We used number of physical conditions to represent physical health comorbidity. This was based on all 23 physical conditions that were assessed in the survey (i.e., food allergies, other allergies, asthma, fibromyalgia, arthritis or rheumatism, back problems, high blood pressure, migraine headaches, chronic bronchitis, emphysema or COPD, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, stroke, bowel disorder,

Alzheimer's disease or other dementia, cataracts, glaucoma, thyroid condition, chronic fatigue

syndrome, and multiple chemical sensitivities).

Mental health service use. The CCHS 1.2 collected information on both lifetime and

past-year mental health service use. The survey specifically asked whether the person had seen,

or talked on the telephone, with a professional about their "emotions, mental health or use of

alcohol or drug". We categorized variables on the basis of whether an older adult sought any

services, sought services from the general medical sector (i.e., family doctor or general

practitioner, other medical doctor such as cardiologist, gynecologist or urologist, or nurse), or

specialty mental health sector (i.e., psychiatrist, psychologist, social worker, counselor, or

psychotherapist) in the past-year, which is in accordance with prior research (Scott et al., 2010).

Analytic Strategy

We analyzed data from the CCHS 1.2 master file maintained at the Statistics Canada

Research Data Centre in Winnipeg, Manitoba Canada. We calculated weighted frequencies for all

independent and dependent variables and crosstabulations corresponding with the regression

analyses.

Our first set of analyses, corresponding with Aim 1, employed univariate and

multivariable logistic regressions to examine whether comorbid "any anxiety disorder" and the

physical condition of interest in comparison to the physical condition of interest alone (i.e.,

gastrointestinal disease, cardiovascular disease, and arthritis) increased the odds of seeking

mental health services from (1) the general medical sector, and (2) the specialty mental health

sector excluding individuals who utilized mental health services from the general medical sector.

Corresponding with Aim 2, we subsequently employed univariate and multivariable logistic

regressions to examine whether comorbid "any anxiety disorder" and the physical health

condition of interest compared to "any anxiety disorder" alone increased the odds of seeking

mental health services from (1) the general medical sector, (2) the specialty mental health sector,

or (3) any sector. All analyses included an unadjusted model and a model adjusted for

sociodemographics, past-year mood and substance use disorders, and physical health

comorbidity. We analyzed the data using SUDAAN 10.0.1 (Shah, Barnswell, & Bieler, 2009)

and employed appropriate weights for the CCHS 1.2 to ensure that these data are representative

of the general Canadian population aged 55+. We also used the bootstrapped weights provided by

Statistics Canada to account for the complex sampling design of the survey.

Results

Table 1 displays the sample size and weighted prevalence rates of sociodemographic

factors and the primary variables among adults aged 55+. A total of 3.4% of older adults met

criteria for past-year any anxiety disorder. The prevalence of past-year mental health service use

in older adults was 5.3% in any sector, 4.0% in the general medical sector, and 2.8% in the

specialty mental health sector.

Table 2 includes crosstabulation results, which display a number of trends and correspond

with the primary regression analysis results in Tables 3 and 4. Crosstabulations indicate that

comorbidity is associated with higher prevalence rates of past-year mental health service

utilization from the general medical sector than having a physical condition alone without

anxiety, with service use rates being the highest for cardiovascular disease (29.0%), followed by

arthritis (25.8%) and gastrointestinal disease (16.7%) among older adults with an anxiety

disorder. These significant differences in prevalence rates are reflected by significant unadjusted

regressions in Table 3. Differential relationships exist for the specialty sector (excluding those

who sought help from the general sector), where comorbid anxiety and gastrointestinal disease

Table 1
Sample characteristics among adults aged 55 years and older (N = 12,792)

	n (weighted percentage)
Sex	
Male	5295 (46.8)
Female	7497 (53.2)
Education	
Less than secondary school	5565 (39.7)
Secondary school grad, no post-secondary	1860 (16.7)
Some post-secondary education	713 (5.6)
Post-secondary degree/diploma	4564 (38.0)
Marital Status	
Married or common law	6780 (68.3)
Widowed	3618 (18.3)
Separated or divorced	1532 (8.2)
Single	851 (5.2)
Physical Conditions	
Arthritis	5673 (39.4)
Cardiovascular disease (heart disease, stroke)	2467 (17.1)
Gastrointestinal disease (bowel disease stomach ulcer)	1247 (9.2)
Mental Disorders	
Past-year any anxiety disorder	380 (3.4)
Past-year any mood disorder	363 (3.0)
Past-year any substance use disorder	51 (0.5)
Service Use	
Past-year any service use	664 (5.3)
Past-year general medical sector service use (general sector)	519 (4.0)
Past-year specialty sector service use (specialty sector)	315 (2.8)

Note. All services = psychiatrist, family doctor, psychologist, nurse, social worker, counselor or psychotherapist, and other doctor; General sector = family doctor, nurse, other doctor; Specialty sector = psychologist, psychiatrist, social worker, counselor or psychotherapist

(3.3%) is associated with similar rates of specialty service use compared to gastrointestinal disease without anxiety (4.0%). Conversely, results for arthritis indicate a different relationship – a significantly higher prevalence rate of past-year service utilization from the specialty sector for comorbidity (7.5%) compared to arthritis without anxiety (1.4%), also indicated by unadjusted

regressions in Table 3. This table further displays lower prevalence rates of past-year service

utilization from the specialty sector for gastrointestinal disease, cardiovascular disease and

arthritis (8.7%, 17.7%, and 17.0%, respectively) among older adults with an anxiety disorder in

comparison to the general sector for gastrointestinal disease, cardiovascular disease and arthritis

(16.7%, 29.0%, and 25.8%, respectively) among older adults with an anxiety disorder. However,

direct statistical comparisons between service use sectors were not made. Taken together, these

results suggest that there may be something particularly unique about comorbid gastrointestinal

disease and anxiety in mental health service utilization compared to when anxiety is coupled with

cardiovascular disease and arthritis.

Table 2
*Prevalence rates of past year mental health service use from various sectors among
older adults with specified physical health conditions*

	n (weighted %)
	General Sector[a]
GI Disease	
Comorbid anxiety + GI disease	24 (16.7)
Anxiety without GI disease	82 (29.0)
GI disease without anxiety	61 (4.7)
CVD Disease	
Comorbid anxiety + CVD	27 (29.0)
Anxiety without CVD disease	79 (25.6)
CVD without anxiety	83 (4.2)
Arthritis	
Comorbid anxiety + arthritis	62 (25.8)
Anxiety without arthritis	44 (27.1)
Arthritis without anxiety	204 (3.9)
	Specialty Sector[c]
GI Disease	
Comorbid anxiety + GI disease	NR (8.7)
Anxiety without GI disease	NR (20.9)
CVD Disease	
Comorbid anxiety + CVD disease	NR (17.7)
Anxiety without CVD disease	NR (18.5)
Arthritis	
Comorbid anxiety + arthritis	38 (17.0)
Anxiety without arthritis	28 (20.0)

	Specialty Sector (Excluding General)[b]
GI Disease	
Comorbid anxiety + GI disease	NR (3.3)
GI disease without anxiety	NR (4.0)
CVD Disease	
Comorbid anxiety + CVD disease	--
CVD disease without anxiety	--
Arthritis	
Comorbid anxiety + arthritis	15 (7.5)
Arthritis without anxiety	42 (1.4)
	All Services[c]
GI Disease	
Comorbid anxiety + GI disease	29 (19.4)
Anxiety without GI disease	101 (34.2)
CVD Disease	
Comorbid anxiety + CVD	32 (31.6)
Anxiety without CVD disease	98 (30.9)
Arthritis	
Comorbid anxiety + arthritis	78 (31.8)
Anxiety without arthritis	52 (30.3)

Note. Displayed prevalence rates correspond with regression analyses in Tables 3 and 4.
Prevalence rates indicate the weighted percentage of older adults who utilized services from each specified sector among those with comorbidity, anxiety alone and/or physical condition alone. Specified condition groups (i.e., anxiety alone, physical condition alone, and comorbidity) are based on a priori hypotheses.
[a]=crosstabulations corresponding with Tables 3 and 4; [b]=crosstabulations corresponding with Table 3 only; [c]=crosstabulations corresponding with Table 4 only
GI disease = gastrointestinal disease; CVD disease = cardiovascular disease
--=insufficient sample size; NR=non-releasable data from the Research Data Centre

The Effect of Anxiety Among Older Adults with Physical Conditions on Service Use

Table 3 displays results of logistic regression analyses investigating comorbidity

compared to the physical condition alone without anxiety on mental health service use from the

general medical sector and the specialty mental health sector when excluding those who sought

services from the general medical sector. We hypothesized that comorbidity would be associated

with increased service use rates in the general sector but not the specialty sector (when excluding

older adults who sought services from the general sector). Results of the unadjusted regression

Table 3

Logistic regression analyses predicting mental health service use from comorbid physical conditions + anxiety in comparison to the specified physical condition alone without anxiety

	Dependent Variables	
	General Sector	Specialty Sector (Excluding General)
Independent Variables	Odds Ratios (95% CI)	Odds Ratios (95% CI)
Gastrointestinal Disease + Anxiety		
Unadjusted Model	**4.04 (1.95-8.36)*****	0.81 (0.07-8.89)
Adjusted Model	1.58 (0.56-4.48)	0.97 (0.12-7.70)
Cardiovascular Disease + Anxiety		
Unadjusted Model	**9.26 (4.05-21.13)*****	--
Adjusted Model	**3.02 (1.02-9.00)***	--
Arthritis + Anxiety		
Unadjusted Model	**8.47 (5.18-13.86)*****	**5.60 (1.67-18.77)****
Adjusted Model	**3.18 (1.65-6.14)*****	**3.75 (1.21-11.64)***

Note. *p<0.05, **p<0.01, ***p<0.001;
Unadjusted Model = unadjusted odds ratio
Adjusted Model = sociodemographics, any mood disorder, any substance use disorder and number of physical health conditions
Reference group: specified physical condition alone without anxiety; -- = insufficient sample size

analyses reveal that, for each of the physical health conditions, the addition of an anxiety disorder

significantly increased the odds of mental health service use from the general medical sector.

However, in the analyses adjusted for sociodemographics, mental disorders, and number of

physical conditions, the addition of an anxiety disorder among those with gastrointestinal disease

did not result in significantly increased odds of mental health service use from the general

medical sector. In terms of mental health service use from the specialty mental health sector when excluding those who sought services from the general medical sector, there was no effect of anxiety among those with gastrointestinal disease in utilizing mental health services in both the unadjusted and adjusted models. However, in the case of arthritis, comorbidity was associated with significantly increased odds of service use from the specialty sector (excluding service utilization from the general medical sector) in both unadjusted and adjusted models.

The Effect of Physical Conditions Among Older Adults with Anxiety on Service Use

Table 4 displays results of logistic regression analyses examining the relationship between anxiety and comorbid physical conditions, compared to anxiety alone, on mental health service use from the general medical sector, specialty mental health sector, and both (i.e., all services). We hypothesized that there would be an effect of comorbid physical conditions in older adults with an anxiety disorder on service use. Although comorbidity in anxiety and comorbid gastrointestinal disease was initially associated with significantly lower odds of mental health service use from the specialty mental health sector and both sectors in the unadjusted models, the adjusted models were non-significant. All other findings were non-significant.

<div align="center">

Discussion

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The current study represents the first investigation of comorbid physical conditions and anxiety disorders on mental health service use in late life. We found partial support for our hypotheses based on Andersen's behavioral model of health services use (Andersen, 1995). Results indicated that physical health comorbidity among older adults with anxiety disorders did not result in an increased likelihood of receiving mental health care services (Table 4). However, when exploring whether anxiety had an impact on service use in physically unwell older adults several noteworthy findings emerged (Table 3).

Table 4

Logistic regression analyses predicting mental health service use from comorbid physical health conditions + anxiety in comparison to anxiety alone without the specified physical condition

	Dependent Variables		
	All services	General Sector	Specialty Sector
Independent Variables	Odds Ratios (95% CI)	Odds Ratios (95% CI)	Odds Ratios (95% CI)
Gastrointestinal Disease + Anxiety			
Unadjusted Model	**0.46 (0.23-0.94)***	0.49 (0.24-1.02)	**0.36 (0.14-0.97)***
Adjusted Model	0.43 (0.14-1.30)	0.59 (0.19-1.76)	0.28 (0.05-1.57)
Cardiovascular Disease + Anxiety			
Unadjusted Model	1.03 (0.46-2.28)	1.18 (0.50-2.79)	0.95 (0.30-2.98)
Adjusted Model	1.35 (0.48-3.81)	1.66 (0.58-4.73)	1.42 (0.30-6.71)
Arthritis + Anxiety			
Unadjusted Model	1.07 (0.55-2.08)	0.94 (0.47-1.88)	0.82 (0.34-2.00)
Adjusted Model	1.14 (0.42-3.14)	0.94 (0.34-2.65)	1.01 (0.23-4.46)

Note. *p<0.05

Unadjusted model = unadjusted odds ratio

Adjusted model = sociodemographics, any mood disorder, any substance use disorder and number of physical health conditions

Reference group: any anxiety disorder alone without specified physical condition

Our first finding was that Canadian older adults have an overall higher prevalence of past-year mental health service use from the general medical sector (weighted prevalence rate = 4%) than the specialty mental health sector (weighted prevalence rate = 2.8%). Although there are few studies examining general prevalence rates of past-year service utilization among older adults, our finding is consistent with previous studies reporting that less than 3% of older adults seek mental health services within the past 12 months (Olfson & Pincus, 1996). Rates of service use were particularly low among older adults with an anxiety disorder and the comorbid physical conditions of interest. In this study, less than 20% of anxious older adults with all specified conditions sought help from the specialty mental health sector and less than 30% of anxious older adults with all specified conditions sought mental health services from the general sector. Anxious older adults with and without physical health problems have overall lower prevalence rates of service use from the specialty mental health sector compared to the general health sector, which is in accordance with prior research (Phillips & Murrell, 1994). The finding that older adults have a higher prevalence rate of service use from the general sector in comparison to the specialty sector may be due to more favorable attitudes among older adults towards seeking mental health care from primary care physicians (Mackenzie, Gekoski, & Knox, 2006) and that older adults are less likely to be referred for specialty services than younger adults (Alvidrez & Arean, 2002; Mackenzie, Gekoski, & Knox, 1999). In fact, older age is associated with less desirability for specialty services such as mental health counseling and stress management relative to younger adults (Wetherell et al., 2004). The differences in prevalence rates of mental health service utilization from the general sector compared to the specialty sector are concerning given the stress on primary care physicians who deal with complex medical issues and have severe time constraints (Kaplan, Adamek, & Calderon, 1999). There is a need for greater

collaboration between primary care physicians and the specialty mental health sector (Patel et al., 2013), particularly in regard to care for older adults (Speer & Schneider, 2003). In fact, older adults with mental disorders display greater treatment engagement and commitment to care in an integrated treatment model (i.e., mental health services co-located in a primary care setting) compared to an enhanced referral model (i.e., expedited referrals, scheduling and transportation to external mental health services)(Bartels et al., 2004).

Our second finding from this study is that differential relationships exist in mental health service use in older adults with anxiety disorders and particular comorbid physical conditions. With respect to gastrointestinal disease, older adults with both anxiety and gastrointestinal disease had a significantly lower prevalence of mental health service use than those who only had anxiety (Tables 2 and 4). Further, there was no independent effect of anxiety on mental health service use from the specialty sector and, surprisingly, also the general sector among gastrointestinal disease sufferers in adjusted models (Table 3). The unique trends of mental health service use specific to gastrointestinal disease relative to arthritis and cardiovascular disease may be a result of overlapping symptomatology with anxiety disorders. Specifically, anxiety disorders in older adults often manifest somatically (e.g., stomach pains; Scott et al., 2008) and may be particularly difficult to differentiate from gastrointestinal disease symptoms, resulting in a decreased likelihood of seeking help for anxiety disorders and potentially an increased likelihood of seeking help for physical health complaints (Lenze et al., 2005). Concurrently, health professionals may have more difficulty identifying an anxiety disorder in late life when combined with gastrointestinal disease because of these prominent somatic complaints (Karlin & Fuller, 2007). Particular gastrointestinal diseases and bowel disorders, such as irritable bowel syndrome, are diagnosed largely based on rule out criteria and particular clinical symptoms being met (i.e.,

Rome criteria) as opposed to clear-cut physical markers (Boyce, Koloski, & Talley, 2000) making symptomatology especially difficult to differentiate from somatic presentations of anxiety disorders. Alternatively, easier distinctions between physical health states and anxiety disorders can be made in the case of arthritis or cardiovascular disease because of the clear-cut physical health identifiers (e.g., inflammatory markers in the case of rheumatoid arthritis). The results specific to gastrointestinal disease may also be a result of symptomatology associated with particular gastrointestinal symptoms (e.g., diarrhea, vomiting) when linked with anxiety that dissuades older adults from leaving their house and thus seeking mental health services. Finally, prior research indicates that particular pharmacological treatments for gastrointestinal disease can result in anxiety as an adverse effect. For example, psychiatric symptoms such as anxiety are known side effects of particular antibiotics, which are frequently prescribed for Crohn's disease (Turjanski, 2005). Anxiety as a side effect of medication may further complicate diagnosis. Both the older adult and physician may not believe that the prominent anxiety symptoms warrant individual treatment if they are perceived to be a side effect of particular pharmacological treatments. Given these findings, future research should aim to understand the role of physical health symptomatology on mental health service utilization in anxious older adults.

Anxiety in arthritis sufferers was associated with increased mental health service use from both the general sector and, surprisingly, the specialty sector compared to arthritis alone. Arthritis is associated with significant disability (Centers for Disease Control and Prevention, 2011; McNeil & Binette, 1999) and anxiety in arthritis sufferers results in poorer overall physical health related quality of life in comparison to having arthritis alone (El-Gabalawy et al., 2011). Therefore, it is possible that older adults with arthritis who suffer from comorbid anxiety may be utilizing healthcare for their arthritis at higher rates because of higher rates of disability and

poorer physical functioning, which also increases the likelihood of receiving care for their anxiety. This may be particularly true for younger older adults (e.g., 55-64) who typically continue to work and suffer from role disability. Of note, it is promising that anxiety in arthritis sufferers (compared to arthritis sufferers without anxiety) was more likely to result in specialty mental health sector use, excluding service utilization from the general sector. This suggests that older anxious adults with arthritis may be independently seeking mental health services in the absence of referrals. Despite this, rates of service use among anxious older adults with physical conditions were still relatively low, and lower than what has been reported in prior research. For example, in a population based US study of adults aged 45+, anxious older adults with arthritis had a 50% prevalence rate of seeking professional help for their mental disorder and those who sought help were also most likely to seek services from family doctors (Murphy, Sacks, Brady, Hootman, & Chapman, 2012). In comparison, the current study found a prevalence rate of 31.8% of mental health service use (i.e., in all services) in anxious older adults with arthritis, with also the majority seeking services from the general sector. These low rates of service use emphasize the need for identification of anxiety among physically unhealthy older adults.

The current study must be considered in light of several important limitations. First, physical conditions were based on self-reports of a diagnosis by a healthcare professional. Although prior research has found high concordance between self-report and physician diagnosed conditions (Baumeister, Kriston, Bengel, & Harter, 2010), this does not eliminate the possibility of recall bias, particularly among older adults. Moreover, physical health condition categories were limited and other diseases that fit into diagnostic categories, or markers of varying severity of the physical conditions assessed, may present quite differently. This is an important area of future research given the drawbacks of this epidemiological dataset. Second, although we only

investigated past-year conditions and past-year service use, this study employed cross-sectional data and therefore we cannot determine causality of the relationships. Third, given restrictions in these data, we were unable to determine whether service use was specifically sought for an anxiety disorder or another mental disorder. To help resolve this, we controlled for other mental disorders in the statistical models. Fourth, we restricted our analyses to older adults aged 55+. It is possible that service use rates may significantly differ among younger older adults compared to the oldest old in a number of ways such as insurance status and coverage, health status, and attitudinal barriers. This expanded age range may have also inflated service use rates in our study as younger adults are more likely to seek mental health services than older adults. Future research should aim to understand the effect of comorbidity on service use among subgroups of older adults. Fifth, although the survey assessed a range of anxiety disorders, the commonly occurring generalized anxiety disorder was not included, which may have influenced trends of service use. Finally, differences between sectors (e.g., general versus specialty) in this study were descriptive and significance tests were not employed because of restricted statistical power. Future research should examine whether service use from the general sector among particular condition groups statistically differs from service use in the specialty sector.

Although there is recognition that anxious older adults are less likely to seek mental health care services, particularly in the specialty mental health sector, less was known about the effect of physical health comorbidities on mental health service utilization. This is the first nationally representative study to specifically examine the role of commonly occurring physical conditions in anxious older adults on mental health service use from both the general sector and specialty mental health sector. Canadian older adults seek services from the specialty sector at lower rates than the general sector despite the fact that mental health treatment is more effective

in the specialty than general sector (Young, Klap, Sherbourne, & Wells, 2001). We should continue to attempt to enhance accessibility of specialty services to older adults. Results further indicated that comorbid anxiety disorders and physical conditions in older adults may sometimes increase and other times decrease the likelihood of mental health service use. This may be a result of symptom overlap between particular physical health conditions and anxiety and emphasizes the importance of careful screening of anxiety when comorbid with particular physical conditions so that appropriate interventions or referrals are employed. Further research should aim to understand physical health symptomatology in service use trends. It is particularly important to understand mental health service use patterns in physically unwell older adults as anxiety and comorbid physical conditions are associated with poorer quality of life and worse functioning than suffering from these conditions alone (El-Gabalawy et al., 2011; Sherbourne, Wells, Meredith, Jackson, & Camp, 1996). Additionally, treatments for anxiety are associated with a reduction in both somatic and anxious symptoms in late life (Lenze et al., 2005). Therefore adequate initial mental health treatment may subsequently result in a reduction of both health and mental health service utilization as a whole because of overall better health trajectories in individuals suffering from comorbidity. We are hoping that this study contributes to the groundwork for much needed research in this area. Understanding mechanisms that may promote or prevent anxious older adults from seeking care is critical for prevention and will likely have important implications for individuals and the healthcare system as a whole.

Acknowledgments

References

Alvidrez, J., & Arean, P. A. (2002). Physician willingness to refer older depressed patients for psychotherapy. *International Journal of Psychiatry in Medicine, 32*(1), 21-35.

Andersen, R. M. (1968). *Behavioral Model of Families' Use of Health Services*. Chicago, IL: Center for Health Administration Studies, University of Chicago.

Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: does it matter? *Journal of Health and Social Behavior, 36*(1), 1-10.

Ayers, C. R., Sorrell, J. T., Thorp, S. R., & Wetherell, J. L. (2007). Evidence-based psychological treatments for late-life anxiety. *Psychology and Aging, 22*(1), 8-17. doi: 2007-03358-003 10.1037/0882-7974.22.1.8

Bartels, S. J., Coakley, E. H., Zubritsky, C., Ware, J. H., Miles, K. M., Arean, P. A., . . . Levkoff, S. E. (2004). Improving access to geriatric mental health services: a randomized trial comparing treatment engagement with integrated versus enhanced referral care for depression, anxiety, and at-risk alcohol use. *The American Journal of Psychiatry, 161*(8), 1455-1462. doi: 10.1176/appi.ajp.161.8.1455

Bartels, S. J., Dums, A. R., Oxman, T. E., Schneider, L. S., Arean, P. A., Alexopoulos, G. S., & Jeste, D. V. (2003). Evidence-based practices in geriatric mental health care: an overview of systematic reviews and meta-analyses. *Psychiatric Clinics of North America, 26*(4), 971-990, x-xi.

Baumeister, H., Kriston, L., Bengel, J., & Harter, M. (2010). High agreement of self-report and physician-diagnosed somatic conditions yields limited bias in examining mental-physical comorbidity. *Journal of Clinical Epidemiology, 63*(5), 558-565. doi: 10.1016/j.jclinepi.2009.08.009

Beaulaurier, R. L., Seff, L. R., & Newman, F. L. (2008). Barriers to help-seeking for older

women who experience intimate partner violence: a descriptive model. *Journal of Women*

& Aging, 20(3-4), 231-248.

Borson, S., Bartels, S. J., Colenda, C. C., Gottlieb, G. L., & Meyers, B. (2001). Geriatric mental

health services research: Strategic Plan for an Aging Population: Report of the Health

Services Work Group of the American Association for Geriatric Psychiatry. *American*

Journal of Geriatric Psychiatry, 9(3), 191-204.

Boyce, P. M., Koloski, N. A., & Talley, N. J. (2000). Irritable bowel syndrome according to

varying diagnostic criteria: are the new Rome II criteria unnecessarily restrictive for

research and practice? *The American Journal of Gastroenterology, 95*(11), 3176-3183.

doi: 10.1111/j.1572-0241.2000.03197.x

Centers for Disease Control and Prevention (2011). Arthritis Retrieved July 15, 2011, from

http://www.cdc.gov/arthritis/data_statistics/faqs/cost_analysis.htm

Chaplin, A., Curless, R., Thomson, R., & Barton, R. (2000). Prevalence of lower gastrointestinal

symptoms and associated consultation behaviour in a British elderly population

determined by face-to-face interview. *The British Journal of General Practice : The*

Journal of the Royal College of General Practitioners, 50(459), 798-802.

Choi, S., Morrow-Howell, N., & Proctor, E. (2006). Configuration of services used by depressed

older adults. *Aging & Mental Health, 10*(3), 240-249. doi: U7747Q68483G1811

10.1080/13607860500310591

Corna, L. M., Cairney, J., & Streiner, D. L. (2010). Suicide ideation in older adults: relationship

to mental health problems and service use. *The Gerontologist, 50*(6), 785-797. doi:

10.1093/geront/gnq048

Covic, T., Cumming, S. R., Pallant, J. F., Manolios, N., Emery, P., Conaghan, P. G., & Tennant, A. (2012). Depression and anxiety in patients with rheumatoid arthritis: prevalence rates based on a comparison of the Depression, Anxiety and Stress Scale (DASS) and the hospital, Anxiety and Depression Scale (HADS). *BMC Psychiatry, 12*, 6. doi: 10.1186/1471-244X-12-6

Durazzo, M., Premoli, A., Bo, S., & Pellicano, R. (2007). Gastrointestinal problems in the elderly. *Panminerva Medica, 49*(3), 151-158.

El-Gabalawy, R., Mackenzie, C. S., Pietrzak, R. H., & Sareen, J. (2014). A longitudinal examination of anxiety disorders and physical health conditions in a nationally representative sample of U.S. older adults. *Experimental Gerontology, 60*, 46-56. doi: 10.1016/j.exger.2014.09.012

El-Gabalawy, R., Mackenzie, C. S., Shooshtari, S., & Sareen, J. (2011). Comorbid physical health conditions and anxiety disorders: a population-based exploration of prevalence and health outcomes among older adults. *General Hospital Psychiatry, 33*(6), 556-564. doi: 10.1016/j.genhosppsych.2011.07.005

el-Miedany, Y. M., & el-Rasheed, A. H. (2002). Is anxiety a more common disorder than depression in rheumatoid arthritis? *Joint Bone Spine, 69*(3), 300-306.

Fan, A. Z., Strine, T. W., Jiles, R., & Mokdad, A. H. (2008). Depression and anxiety associated with cardiovascular disease among persons aged 45 years and older in 38 states of the United States, 2006. *Preventive Medicine, 46*(5), 445-450. doi: S0091-7435(08)00103-5 10.1016/j.ypmed.2008.02.016

Gatz, M. (2007). Commentary on evidence-based psychological treatments for older adults. *Psychol Aging, 22*(1), 52-55. doi: 2007-03358-007 10.1037/0882-7974.22.1.52

Gershlick, A. H. (2009). Managing myocardial infarction in the elderly: time to bury

    inappropriate concerns instead. *European Heart Journal, 30*(8), 887-889. doi: ehp117

    10.1093/eurheartj/ehp117

Gravel, R., & Beland, Y. (2005). The Canadian Community Health Survey: mental health and

    well-being. *Canaidan Journal of Psychiatry, 50*(10), 573-579.

Gureje, O., Von Korff, M., Simon, G. E., & Gater, R. (1998). Persistent pain and well-being: a

    World Health Organization Study in Primary Care. *JAMA, 280*(2), 147-151. doi: joc72070

Haley, W. E. (1999). Psychotherapy with older adults in primary care medical settings. *Journal of*

    Clinical Psychology, 55, 991-1005.

Haro, J. M., Arbabzadeh-Bouchez, S., Brugha, T. S., de Girolamo, G., Guyer, M. E., Jin, R., . . .

Kessler, R. C. (2006). Concordance of the Composite International Diagnostic Interview Version

    3.0 (CIDI 3.0) with standardized clinical assessments in the WHO World Mental Health

    surveys. *International Journal of Methods in Psychiatric Research, 15*(4), 167-180.

Hendriks, G. J., Oude Voshaar, R. C., Keijsers, G. P., Hoogduin, C. A., & van Balkom, A. J.

    (2008). Cognitive-behavioural therapy for late-life anxiety disorders: a systematic review

    and meta-analysis. *Acta Psychiatrica Scandinavia, 117*(6), 403-411. doi: ACP1190

    10.1111/j.1600-0447.2008.01190.x

Ho, R. C., Fu, E. H., Chua, A. N., Cheak, A. A., & Mak, A. (2011). Clinical and psychosocial

    factors associated with depression and anxiety in Singaporean patients with rheumatoid

    arthritis. *International Journal of Rheumatic Disease, 14*(1), 37-47. doi: 10.1111/j.1756-

    185X.2010.01591.x

Jeste, D. V., Alexopoulos, G. S., Bartels, S. J., Cummings, J. L., Gallo, J. J., Gottlieb, G. L., . . .

    Lebowitz, B. D. (1999). Consensus statement on the upcoming crisis in geriatric mental

health: research agenda for the next 2 decades. *Archives of General Psychiatry, 56*(9), 848-853.

Kaplan, M. S., Adamek, M. E., & Calderon, A. (1999). Managing depressed and suicidal geriatric patients: differences among primary care physicians. *The Gerontologist, 39*(4), 417-425.

Karlin, B. E., Duffy, M., Gleaves, D. H. (2008). Patterns and predictors of mental health service use and mental illness among older and younger adults in the United States. *Psychological Services, 5*(3), 275-294.

Karlin, B. E., & Fuller, J. D. (2007). Meeting the mental health needs of older adults. *Geriatrics, 62*(1), 26-35.

Klap, R., Unroe, K. T., & Unutzer, J. (2003). Caring for mental illness in the United States: A focus on older adults. *American Journal of Psychiatry, 11*, 517-524.

Lenze, E. J., Karp, J. F., Mulsant, B. H., Blank, S., Shear, M. K., Houck, P. R., & Reynolds, C. F. (2005). Somatic symptoms in late-life anxiety: treatment issues. *Journal of Geriatric Psychiatry and Neurology, 18*(2), 89-96. doi: 10.1177/0891988705276251

Lloyd-Jones, D., Adams, R. J., Brown, T. M., Carnethon, M., Dai, S., De Simone, G., . . . Wylie-Rosett, J. (2010). Heart disease and stroke statistics--2010 update: a report from the American Heart Association. *Circulation, 121*(7), e46-e215. doi: CIRCULATIONAHA.109.192667 [pii]10.1161/CIRCULATIONAHA.109.192667

Mackenzie, C. S., El-Gabalawy, R., Chou, K. L., & Sareen, J. (2013). Prevalence and Predictors of Persistent Versus Remitting Mood, Anxiety, and Substance Disorders in a National Sample of Older Adults. *The American Journal of Geriatric Psychiatry : Official Journal of the American Association for Geriatric Psychiatry*. doi: 10.1016/j.jagp.2013.02.007

Mackenzie, C. S., Gekoski, W. L., & Knox, V. J. (1999). Do family physicians treat older

    patients with mental disorders differently from younger patients? *Canadian Family*

    Physician, 45, 1219-1224.

Mackenzie, C. S., Gekoski, W. L., & Knox, V. J. (2006). Age, gender, and the underutilization of

    mental health services: the influence of help-seeking attitudes. *Aging & Mental Health,*

    10(6), 574-582. doi: M0222V7376P5M826 [pii]10.1080/13607860600641200

Mackenzie, C. S., Reynolds, K., Chou, K. L., Pagura, J., & Sareen, J. (2011). Prevalence and

    correlates of generalized anxiety disorder in a national sample of older adults.

    The American Journal of Geriatric Psychiatry : Official Journal of the American

    Association for Geriatric Psychiatry, 19(4), 305-315. doi:

    10.1097/JGP.0b013e318202bc62

McDonough, E., Ayearst, R., Eder, L., Chandran, V., Rosen, C. F., Thavaneswaran, A., &

    Gladman, D. D. (2014). Depression and anxiety in psoriatic disease: prevalence and

    associated factors. *The Journal of Rheumatology, 41*(5), 887-896. doi:

    10.3899/jrheum.130797

McNeil, J., Binette, J., U.S. Department of Commerce, Centers for Disease Control and

    Prevention. (1999). Prevalence of disabilities and associated health conditions among

    adults. *MMWR 2001, 50*(7), 120-125.

McWilliams, L. A., Cox, B. J., & Enns, M. W. (2003). Mood and anxiety disorders associated

    with chronic pain: an examination in a nationally representative sample. *Pain, 106*(1-2),

    127-133. doi: S0304395903003014 [pii]

Murphy, L. B., Sacks, J. J., Brady, T. J., Hootman, J. M., & Chapman, D. P. (2012). Anxiety and depression among US adults with arthritis: prevalence and correlates. *Arthritis Care & Research, 64*(7), 968-976. doi: 10.1002/acr.21685

Olfson, M., Marcus, S. C., Druss, B., Elinson, L., Tanielian, T., & Pincus, H. A. (2002). National trends in the outpatient treatment of depression. *Journal of the American Medical Association, 287*, 203-209.

Olfson, M., & Pincus, H. A. (1996). Outpatient mental health care in nonhospital settings: distribution of patients across provider groups. *The American Journal of Psychiatry, 153*(10), 1353-1356.

Patel, V., Belkin, G. S., Chockalingam, A., Cooper, J., Saxena, S., & Unutzer, J. (2013). Grand challenges: integrating mental health services into priority health care platforms. *PLoS Medicine, 10*(5), e1001448. doi: 10.1371/journal.pmed.1001448

Phillips, M. A., & Murrell, S. A. (1994). Impact of psychological and physical health, stressful events, and social support on subsequent mental health help seeking among older adults. *Journal Consulting and Clinical Psychology, 62*(2), 270-275.

Pinquart, M., & Duberstein, P. R. (2007). Treatment of anxiety disorders in older adults: a meta-analytic comparison of behavioral and pharmacological interventions. *American Journal of Geriatric Psychiatry, 15*(8), 639-651. doi: 15/8/639 [pii]10.1097/JGP.0b013e31806841c8

Purkayastha, S. K., Salter, R. H., & Holmes, K. M. (1988). Contribution of the elderly to a district hospital combined gastroenterology clinic. *Age Ageing, 17*(1), 49-53.

Reginster, J. Y. (2002). The prevalence and burden of arthritis. *Rheumatology (Oxford), 41 Supp 1*, 3-6.

Scott, K. M., Von Korff, M., Alonso, J., Angermeyer, M., Bromet, E. J., Bruffaerts, R., . . .
Williams, D. (2008). Age patterns in the prevalence of DSM-IV depressive/anxiety
disorders with and without physical co-morbidity. *Psychological Medicine, 38*(11), 1659-
1669. doi: S0033291708003413 [pii]10.1017/S0033291708003413

Scott, T., Mackenzie, C. S., Chipperfield, J. G., & Sareen, J. (2010). Mental health service use
among Canadian older adults with anxiety disorders and clinically significant anxiety
symptoms. *Aging & Mental Health, 14*(7), 790-800. doi: 924384406
[pii]10.1080/13607861003713273

Shah, B., Barnswell, BG., Bieler, GS. (2009). SUDAAN User's Manual: Release 10.0. Research
Triangle Park, NC: Research Triangle Institute

Sherbourne, C. D., Wells, K. B., Meredith, L. S., Jackson, C. A., & Camp, P. (1996). Comorbid
anxiety disorder and the functioning and well-being of chronically ill patients of general
medical providers. *Archives of General Psychiatry, 53*(10), 889-895.

Speer, D. C. & Schneider,, M. G. (2003). Mental Health Needs of Older Adults and Primary
Care: Opportunity for Interdisciplinary Geriatric Team Practice. *Clinical Psychology:
Science and Practice, 10*, 85-101. doi: 10.1093/clipsy.10.1.85

Stang, P. E., Brandenburg, N. A., Lane, M. C., Merikangas, K. R., Von Korff, M. R., & Kessler,
R. C. (2006). Mental and physical comorbid conditions and days in role among persons
with arthritis. *Psychosomatic Medicine, 68*(1), 152-158. doi: 68/1/152 [pii]
10.1097/01.psy.0000195821.25811.b4

Treharne, G. J., Hale, E. D., Lyons, A. C., Booth, D. A., Banks, M. J., Erb, N., . . . Kitas, G. D.
(2005). Cardiovascular disease and psychological morbidity among rheumatoid arthritis
patients. *Rheumatology (Oxford), 44*(2), 241-246. doi: keh441 [pii]

10.1093/rheumatology/keh441

Trollor, J. N., Anderson, T. M., Sachdev, P. S., Brodaty, H., & Andrews, G. (2007). Prevalence of mental disorders in the elderly: the Australian National Mental Health and Well-Being Survey. *American Journal of Geriatric Psychiatry, 15*(6), 455-466. doi: 15/6/455 [pii] 10.1097/JGP.0b013e3180590ba9

Turjanski, N. L., G. G. (2005). Psychiatric side-effects of medications: Recent developments. *Advances in Psychiatric Treatment, 11*, 58 - 70. doi: 10.1192/apt.11.1.58

Wang, P. S., Lane, M., Olfson, M., Pincus, H. A., Wells, K. B., & Kessler, R. C. (2005). Twelve-month use of mental health services in the United States: results from the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62*(6), 629-640. doi: 10.1001/archpsyc.62.6.629

Wetherell, J. L., Ayers, C. R., Nuevo, R., Stein, M. B., Ramsdell, J., & Patterson, T. L. (2010). Medical conditions and depressive, anxiety, and somatic symptoms in older adults with and without generalized anxiety disorder. *Aging & Mental Health, 14*(6), 764-768. doi: 924376300 [pii]10.1080/13607861003713240

Wetherell, J. L., Kaplan, R. M., Kallenberg, G., Dresselhaus, T. R., Sieber, W. J., & Lang, A. J. (2004). Mental health treatment preferences of older and younger primary care patients. *International Journal of Psychiatry in Medicine, 34*(3), 219-233.

Wetherell, J. L., Petkus, A. J., McChesney, K., Stein, M. B., Judd, P. H., Rockwell, E., . . . Patterson, T. L. (2009). Older adults are less accurate than younger adults at identifying symptoms of anxiety and depression. *Journal of Nervous and Mental Disorder, 197*(8), 623-626. doi: 10.1097/NMD.0b013e3181b0c08100005053-200908000-00012 [pii]

Young, A. S., Klap, R., Sherbourne, C. D., & Wells, K. B. (2001). The quality of care for

depressive and anxiety disorders in the United States. *Archives of General Psychiatry,*

58(1), 55-61.

Chapter Four: General Discussion

Interactions between mental disorders and age-related vulnerabilities, such as reduced physical functioning and the onset of disease, can result in a cascade of declines in physical, psychological, social, and cognitive functioning in late life (Bryant, Jackson, & Ames, 2008; Institutes of Medicine, 2012). These interactions and subsequent declines not only have an effect at the micro level in regard to morbidity, reduced functionality and, at the extreme, mortality but also the macro level in terms of financial, system-related, and societal burden (Knight & Sayegh, 2011). This thesis addresses the compelling health care problem of anxiety disorders in older adults with commonly occurring physical health conditions by understanding longitudinal comorbid relationships and mental health service use implications of comorbidity. Specifically, the goal for Study 1 was to examine the temporal relationship between specific anxiety disorders and arthritis, cardiovascular disease, and gastrointestinal disease including examining predictors of comorbid relationships among older adults. The goal for Study 2 was to begin to understand one possible correlate of comorbidity by investigating mental health service use implications of comorbid any anxiety disorder and arthritis, cardiovascular disease, and gastrointestinal disease among older adults. Although these two studies included culturally distinct populations in the United States and Canada, I can begin to speculate on the complex relationship between anxiety disorders and physical health problems in late life, which have broader implications for healthcare systems.

In the New England Journal of Medicine, Bartels and Naslund (2013) discussed the health crisis that is unfolding for the increasing numbers of older adults with misunderstood and undertreated mental health issues, which they coined the "underside of the silver tsunami" (Bartels & Naslund, 2013). As summarized in Chapter One, the number of older adults with

mental health problems including substance use disorders is expected to double by the year 2030, which corresponds with the increasing older adult population (Institutes of Medicine, 2012). Concurrently, a significant proportion of older adults suffer from debilitating physical health conditions (Dall et al., 2013; Fried, Ferrucci, Darer, Williamson, & Anderson, 2004) and comorbidity of anxiety and physical health conditions results in poorer health outcomes and higher rates of medical service use (Institutes of Medicine, 2012). A thorough understanding of comorbid anxiety disorders and commonly occurring physical health conditions is clearly indicated in order to effectively identify at risk older adults for prevention and treatment purposes.

Conceptualizing Findings Using the Strength and Vulnerability Integration Theoretical Model

Comorbid Anxiety Disorders and Physical Health Conditions

In order to begin to develop interventions targeted at comorbid anxiety disorders and physical health conditions among the older adult population, we must attempt to answer the old causality dilemma of "which came first, the chicken or the egg?". Study 1 indicated that there is evidence to suggest both temporal relationships, but this may be dependent on both the anxiety disorder and physical condition assessed.

In addition to the mechanisms discussed in Chapter Two (Study 1), conceptualizing these findings using the Strength and Vulnerability Integration Theoretical model (SAVI; (Charles, 2010)) provides a unique theoretical perspective for understanding co-occurring relationships. Specifically, as indicated in Chapter One, SAVI outlines mechanisms behind older adults' enhanced emotional well-being compared to younger adults and situations in which this may be compromised. SAVI indicates that emotional well-being may be compromised in late life in the

case of a physical condition where pain and disability is chronic and unremitting and impacts daily life. In the case of such an illness, older adults do not have the capacity to employ the adaptive cognitive and behavioral skills associated with well-being and as a result may be emotionally dysregulated and susceptible to mental disorders. Specifically, a debilitating chronic illness is associated with constant cognitive and behavioral demands that do not allow an older adult to re-direct, re-appraise, or behaviorally remove him or herself from the illness. The chronicity of an illness will wear away physical and psychological reserves decreasing emotion regulation capacity. Results from Study 1 indicated that only arthritis was an independent predictor of incident generalized anxiety disorder after adjustment for sociodemographic factors, comorbid depressive and substance use disorders, and number of physical health conditions. Arthritis in particular often presents as a highly debilitating, painful chronic health condition (McNeil, 1999; Centers for Disease Control and Prevention, 2011), which over time may compromise emotional well-being resulting in the onset of an anxiety disorder. It is possible that the same temporal effects were not observed for cardiovascular disease and gastrointestinal disease because of the heterogeneity of these physical health conditions in terms of severity and disability presentations and that daily functionality may not be as greatly impacted. Therefore, in the case of these conditions, adaptive attentional, appraisal and behavioral skills can still be employed and emotional well-being is not compromised. For example, cardiovascular disease such as heart disease is frequently conceptualized as the "silent killer" because of its serious potential deleterious outcomes in the absence of phenotypic symptomatology or that physical symptoms (e.g., shortness of breath, fatigue) are not debilitating and chronic, particularly when adequately treated. Interestingly, recent research suggests that the onset of a serious illness (i.e., colorectal cancer) in older adults does initially result in increased negative affect that is on par

with younger adults' negative affect with the same illness. However, older adults' negative affect

declines more rapidly than their younger counterparts with further time elapsed since the

diagnosis and treatment as a result of having lower threat cognitive appraisals. Older adults'

strengths in emotional regulation in the context of colorectal cancer re-emerged once treatment

demands were completed 6 months following the diagnosis (Hart & Charles, 2013). Therefore in

older adults, the chronicity and debility of an illness may be critical in the susceptibility to an

anxiety disorder.

Results from Study 1 further indicated that after controlling for several possible

confounding variables such as sociodemographics and comorbid depressive and substance use

disorders, all the assessed physical health conditions (i.e., arthritis, gastrointestinal disease, and

cardiovascular disease) significantly predicted incident panic disorder with or without

agoraphobia 3 years later. However, these effects were no longer significant in the most stringent

model, which suggests that increasing numbers of physical health conditions were associated

with incident panic disorder. Charles (2010) suggests that in the case of comorbid physical health

conditions, adaptive emotional regulation may be particularly compromised because of the

aforementioned processes, which may result in an increased risk of anxiety in late life.

Controlling for co-occurring physical health conditions may in fact control for emotional

dysregulation and help conceptualize why these findings became non-significant in the most

stringent model.

In Study 1 there was also evidence to suggest that anxiety disorders are significant

predictors of incident gastrointestinal disease 3 years later in older adults. Specifically, after

adjustment for sociodemographics, comorbid depressive and substance use disorders, and number

of physical health conditions, only PTSD and any anxiety disorder were significantly associated

with incident gastrointestinal disease. SAVI can also be used to conceptualize these temporal results. The theoretical model describes a positive relationship between adaptive physiological flexibility and emotional well-being (Charles, 2010). SAVI indicates that an older adult will experience the onset of physiological arousal in the context emotional dysregulation such as in the case of an anxiety disorder. Chronic physiological arousal will impact particular biological systems such as the immune system because of age related physiological vulnerabilities, which will put an older adult at increased risk of physical health problems. In support, recent research by Charles and colleagues (2013) suggests that a higher than average level of negative affect in older adults is significantly associated with changes in cortisol; however, this association does not exist in younger adults despite the fact that younger adults have overall higher averages of negative affect (Piazza, Charles, Stawski, & Almeida, 2013). This highlights this physiological vulnerability and sensitivity in late life. These physiological vulnerabilities may be particularly true to body systems especially sensitive to emotional stimuli such as the gastrointestinal tract (Drossman et al., 1999; Levenstein, 1999). There are also a number of other mechanisms that may be at play as discussed in Chapter Two. It is essential for future research to carefully evaluate these mechanisms in order to understand temporal relationships in older adults, which will contribute to prevention initiatives. In line with SAVI, recent research suggests that rumination may be a key risk factor among older adults in reducing adaptive emotional flexibility following a stressor. For example, rumination has been found to be significantly associated with delayed physiological recovery in older adults compared to younger adults (Robinette & Charles, 2014). This may be an important potential mediator to examine in the temporal relationship between anxiety disorders and physical health conditions given that rumination is highly amenable to treatment, particularly cognitive therapy. Implementing cognitive therapy in older

adults with anxiety may have a significant effect in reducing the likelihood of an incident

physical condition such as gastrointestinal disease.

Predictors of Comorbid Anxiety Disorders and Physical Health Conditions

Study 1 demonstrated that temporal relationships between anxiety disorders and physical

health conditions exist among older adults, but it is also important to understand risk factors of

these comorbid relationships in late life. Results from Study 1 indicated that, in most cases,

significant predictors of both incident physical health conditions alone and incident anxiety

disorders alone are also risk factors for incident comorbid any anxiety disorder and physical

health conditions. Specifically, being female was an independent risk factor of incident anxiety

disorder and comorbid gastrointestinal disease and arthritis, but not cardiovascular disease. The

non-significant findings for female sex and its association to cardiovascular disease may be due

to the fact that males tend to be at increased risk of most cardiovascular diseases (Fried et al.,

1998; Lee et al., 2009), which would impact significant findings in comorbid relationships.

Results further indicated that poor mental health related quality of life was a significant

independent risk factor for incident comorbid any anxiety disorder and the assessed physical

health conditions. Poor mental health related quality of life as a risk factor may also be

conceptualized using SAVI. As previously discussed, poor mental health related quality of life in

older adults (i.e., emotional dysregulation) may cause chronic physiological arousal increasing

the risk of physical health conditions and ultimately worsening mental health to the point of an

onset of an anxiety disorder. However, there is also another explanation that may help

conceptualize both being female and having poor mental health related quality of life being risk

factors for comorbidity using SAVI. As discussed in Chapter One, Charles (2010) describes three

key situations where emotional regulation and avoidance of negative affect may be compromised

for older adults. The first is in the case of a chronic unremitting stressor; the second is

neurobiological dysregulation; and the third is threats or loss to social belonging. In regard to the

latter, psychological literature suggests that being female and poor mental health related quality

of life are two correlates of social isolation in late life (Hawton et al., 2011). Older adult women

tend to live alone more often than their male counterparts likely because of women's longer life

expectancies (Denton, Prus, & Walters, 2004). Moreover, the transition from a marital

relationship to living alone, such as in the case of death of a spouse, is associated with significant

distress (Stone, Evandrou, & Falkingham, 2013), particularly for females. Social isolation factors

such as perceived isolation and disconnectedness are predictors of both compromised emotional

and physical health (Charles, 2010; Cornwell & Waite, 2009a, 2009b; Lin, Ye, & Ensel, 1999),

which may increase the risk of comorbidity. Thus, social isolation may be a critical mediator in

the relationship between being female and poor mental health related quality of life predicting

incident comorbidity of anxiety and physical health conditions. Future research should aim to

understand the relationship between particular risk factors and social isolation and its impact on

incident comorbid relationships. In addition, interventions should be targeted at identified risk

factors. It may be appropriate, for example, to carefully evaluate whether treatments (e.g.,

cognitive therapy) should be targeted at older adults who report poor mental health in the absence

of an identified mental disorder. As indicated, older adults with negative affect are at greater risk

of negative health implications than younger adults (Robinette & Charles, 2014). Mental health

related quality of life may therefore be an important indicator of subsequent declines in late life,

particularly given that older adults typically have enhanced emotional regulation and better

quality of life. In sum, although poor quality of life may not be significantly problematic in

younger adults, poor quality of life in older adults may be particularly concerning as it is an

important indicator for incident comorbid anxiety disorders and physical health conditions. Future research should investigate this possibility.

Mental Health Service Use Implications of Comorbidity

Health professionals are well aware that comorbid physical health conditions often complicate detection, diagnosis, treatment and subsequent management of mental disorders in late life. However, little is known about the impact of physical health conditions on mental health service use in anxious older adults. Understanding patterns of mental health service use including *if, in what contexts* and *where* anxious older adults with comorbid physical health conditions utilize mental health services is essential in considering health system reform to ensure older adults are receiving appropriate care. Study 2 aimed to understand trends of mental health service use in older adults with an anxiety disorder and specific comorbid physical health conditions. Results indicated unique relationships with anxiety disorders and specified physical health conditions, which are interesting with respect to the comorbidity findings implicated in Study 1. Rates of mental health service use did not significantly differ between older adults with anxiety alone compared to older adults with anxiety and both comorbid arthritis and cardiovascular disease. However, in the case of gastrointestinal disease, rates of mental health service use were lower when comorbid with anxiety than compared to anxiety alone. Additionally, after controlling for confounding variables, older adults with gastrointestinal disease alone were no more likely to seek mental health services than older adults with gastrointestinal disease and comorbid anxiety. Conversely, in the most stringent model, anxiety and comorbid arthritis and cardiovascular disease compared to these physical health conditions alone resulted in an increased likelihood of utilizing mental health services from the general mental health sector.

There is clearly something indicated with gastrointestinal disease, which was found to be a significant outcome of both any anxiety and PTSD in Study 1 and associated with reduced rates of mental health service use in the context of anxiety in Study 2. This suggests that although older adults may have an increased vulnerability to comorbid anxiety and gastrointestinal disease, this may not translate into receiving appropriate mental health care for their anxiety. I hypothesized that overlapping symptomatology in gastrointestinal disease and anxiety may explain differences in findings in mental health service use across the specified physical health conditions. Specifically, overlapping symptomatology may make it difficult to disentangle, and therefore accurately identify, an anxiety disorder. This is further complicated by the fact that not only do older adults frequently ruminate and worry about their physical health, anxiety may more often manifest somatically in late life (El-Gabalawy, Mackenzie, Thibodeau, Asmundson, & Sareen, 2013). This may make identification of an anxiety disorder particularly challenging in the context of gastrointestinal disease. SAVI describes physiological vulnerabilities in the context of emotional dysregulation for older adults. When an older adult experiences anxiety in the absence of a chronic physical condition, they may have internal physiological changes and coinciding cognitive and behavioral vulnerabilities that are associated directly with their anxiety disorder. However, SAVI indicates that a chronic unrelenting illness can further cause significant cognitive and behavioral changes (e.g., rumination) and emotional dysregulation, which may exacerbate the initial anxiety disorder. Perhaps in the case of an anxiety disorder and subsequent onset of gastrointestinal disease, these cognitive and behavioral changes are so significant that they impact seeking mental health services through, for example, avoidance or debility. This may be especially true because of the potential overlapping of symptoms of anxiety and gastrointestinal disease.

Health Service Reform Considerations

Training Level

Unfortunately, older adults with mental disorders are less likely than younger adults to utilize mental health services (Karlin, Duffy, & Gleaves, 2008) and as indicated, this may be further complicated by comorbid physical health conditions. Older adults also have an increased likelihood of seeking mental health services from medical professionals such as their primary care providers rather than mental health care specialists (Karlin & Karel, 2014). In fact in the United States, mental health services only account for 1% of Medicare expenditures (Bartels & Naslund, 2013). There is also another complicating factor that may decrease the likelihood of older adults with comorbid physical and mental health conditions utilizing mental health services: that appropriate services aren't available to them because many health professionals including mental health specialists and primary care physicians are not trained in geriatric healthcare. Only 4.2% of psychologists specialize in treating older adults according the American Psychological Association and more than half of the positions in geriatric psychiatry go unfilled every year (Bartels & Naslund, 2013; Institutes of Medicine, 2012). Pachana and colleagues (2010) emphasize the importance of geriatric training at both the undergraduate and graduate level, which is the best predictor of future geriatric specialization. Results from a study evaluating geriatric training in Psychology at the graduate level in both Canada and the United States indicated that applied geropsychology clinical experiences was the best opportunity for geropsychology exposure. A total of 28.3% of the sampled graduate programs in the United States indicated they had offered a non-required geropsychology course, whereas 20% of Canadian graduate programs had both a required and elective course in geropsychology (Pachana, Emery, Konnert, Woodhead, & Edelstein, 2010). As a first step to increasing the

number of health professionals with training in geriatrics, it will important to include additional

coursework and training opportunities for students. Interestingly, graduate programs in both

Canada and the United States indicated that there are barriers to hiring geropsychologists in order

to implement these opportunities (e.g., coursework, practica) such as insufficient access to older

adult patients. This is clearly a systemic and circular problem as there is concurrently an unmet

service need for older adults with mental health issues.

Consumer Level

      Health literacy and knowledge. There is a clear need to modify current healthcare

systems in order to increase the likelihood of appropriate identification of anxiety disorders and

subsequent treatment among older adults both with and without physical health conditions.

Accurate recognition of mental heath issues in the context of a medical illness could start at the

consumer level. Specifically, strategies to enhance health literacy and knowledge among older

adults may enhance their ability to accurately identify mental health difficulties in the presence of

a physical condition. It may be particularly important for an older adult to receive clear

information on symptoms relating to both a diagnosed physical condition and mental health

problem. It may be particularly important for healthcare providers to emphasize conditions with

high comorbidity rates, potential overlapping symptoms, and providing psychoeducation on

clinical outcomes for comorbid relationships. For example, in the case of arthritis, information

could be provided in regard to it being a risk factor for anxiety, how anxiety may manifest in the

presence of arthritis including possible side effects of medications, and where to seek additional

mental health services if an older adult with arthritis experiences symptoms of anxiety or panic.

      Providing accessible resources to older adults using a variety of outlets, including

websites, may enhance health literacy and knowledge; older adults represent the fastest growing

consumer demographic using the Internet (Wagner, 2010). Approximately one third of older

adults seek health information on the Internet following a medical appointment and

approximately half will seek out health information unrelated to a medical appointment (Flynn,

Smith, & Freese, 2006). Unfortunately health information on the web is often complicated and

innapropriate for older adults (Becker, 2004) who have been shown to have lower health literacy

than younger adults (Baker, Gazmararian, Sudano, & Patterson, 2000). It is therefore essential to

develop focused resources aimed at this demographic and that appropriate knowledge translation

occurs at the provider level in regard to accessibility of these resources.

  Holistic approaches and techniques. Finally, it may be important to provide information

to patients on health behaviors and accessible treatments or techniques that can be self initiated

and are holistic, improving both physical and mental health (Astin, Shapiro, Eisenberg, & Forys,

2003; Wolsko, Eisenberg, Davis, & Phillips, 2004). Early implementation of positive health

behaviors or engaging in accessible forms of treatments/techniques may improve quality of life

for those suffering from comorbid mental and physical health conditions, but ideally would also

play a role in reducing risk of an incident comorbid condition. Examples of modifiable health

behaviors that are known to positively affect mental and physical health include a balanced diet,

eliminating smoking, appropriate alcohol consumption, good sleep hygiene, and exercise

(Vreeland, 2007a, 2007b). This may be especially important in the case of certain physical health

conditions such as cardiovascular disease, where increasing age is associated with maladaptive

health behaviors that are risk factors for cardiovascular diseases and events (Shay et al., 2012).

  Exercise is well known to have both significant mental and physical health benefits for

adults (Penedo & Dahn, 2005) but especially older adults as activity declines with age (Taylor et

al., 2004). However, few Canadian and American adults meet or exceed the North American

guidelines for physical activity, which recommends 150 minutes of moderate-to-vigorous physical activity weekly (Bryan & Katzmarzyk, 2009; Carlson, Fulton, Schoenborn, & Loustalot, 2010; Centers for Disease Control and Prevention, 2004; Tucker, Welk, & Beyler, 2011) and a large majority of adults are unaware that these guidelines exist (Cunningham, Carroll, Carlson, & Fulton, 2013). Specific guidelines have also been established for older adults (aged 65+ or 50-64 with a medical condition or functional limitations) for healthy aging and preventive medicine that recommend moderate-intensity exercise for 30 minutes five days a week or vigorous-intensity aerobic exercise for 20 minutes three days a week. Further, it is recommended that older adults engage in resistance exercise by conducting 8-10 exercises on two non-consecutive days per week using major muscle groups, and conduct flexibility and balance exercises weekly (Nelson et al., 2007). The recommendations also include a discussion surrounding exercise in the context of chronic health conditions and urge older adults to avoid sedentary behavior. At this point in time, older adults have the highest medical expenditures of any other age group and the least amount of physical activity (Centers for Disease Control and Prevention, 2004). Research indicates that increases in physical activity by this older demographic would have significant positive implications for the health economy (Martinson, Crain, Pronk, O'Connor, & Maciosek, 2003).

It is well established that regular exercise reduces the risk of a large number of physical health conditions (Nelson et al., 2007) including cardiovascular diseases (Fletcher et al., 2001; Pollock et al., 2000; Thompson et al., 2003), gastrointestinal diseases (Johannesson, Simren, Strid, Bajor, & Sadik, 2011; Strate, Liu, Aldoori, & Giovannucci, 2009), and arthritis (American Geriatrics Society, 2001; Metsios et al., 2008). Regular exercise also reduces the risk of falls and associated injuries (Carter, Kannus, & Khan, 2001; Robertson & Campbell, 2001) and functional limitations (Keysor, 2003; Nelson et al., 2004) among older adults. Additionally, population-

based research has found that individuals who engage in regular activity are less likely to suffer from a number of chronic mental disorders (Goodwin, 2003). Asmundson and colleagues (2013) conducted a comprehensive review examining the efficacy of exercise treatments on anxiety disorders and found very promising effects on reduction of symptomatology across anxiety disorders (Asmundson et al., 2013). Exercise may therefore be used as individual treatments, but also as an adjunct therapy and/or implemented in those with immediate need (e.g., those on waitlists). Health professionals should (1) provide these exercise guidelines directly to older patients in writing, (2) engage in a discussion problem solving and creating adaptations around barriers (e.g., activities precluded by physical health conditions), and (3) creating a gradient or stepwise approach to meeting recommendations, which would ultimately promote success.

Health professionals may also consider providing education around relaxation or meditational techniques to at-risk older adults, such as components of mindfulness-based stress reduction, diaphragmatic breathing, guided imagery, Tai Chi or progressive muscle relaxation (frequently broadly referred to as complementary or alternative therapies). There is growing interest in the significant benefits of relaxation or meditational training, which have been highlighted recently in the media. Evidence suggests that there may be an increased likelihood of using complementary and alternative therapies compared to conventional medical and mental health treatments in anxious individuals (Kessler et al., 2001). A basic breathing exercise, such as diaphragmatic breathing, can be taught to patients in a few minutes, making it a compelling time effective treatment. Meta-analyses and systematic reviews have found that relaxation or meditational therapies can be useful for reductions in both mental health symptoms such as anxiety (Chen et al., 2012; Goyal et al., 2014) and improved physical health, functioning, and pain (Bohlmeijer, Prenger, Taal, & Cuijpers, 2010; Rainforth et al., 2007; Wang, Collet, & Lau,

2004). The consensus on these treatments are their utility as adjunct techniques as opposed to individual treatments.

Despite these compelling findings in regard to holistic approaches that could be communicated by health professionals, one study found that one in three physicians believe that addressing psychosocial factors would lead to minimal or no improvements in health outcomes. Physicians surveyed in this study also indicated that a lack of time and reimbursement, a false belief of an absence of empirically supported findings, and lack of training and expertise in psychosocial interventions create barriers for integrating education around holistic approaches (Astin, Soeken, Sierpina, & Clarridge, 2006). It is worthwhile to engage in creative solutions around these barriers, particularly for primary care physicians who have the greatest access to the majority of older adults. For example, in terms of policy, additional training in medical and residency programs on biopsychosocial/behavioral medicine practices may be warranted (Astin et al., 2006). Clinically, implementing a brief psychosocial self-report measure prior to appointments and a 5-minute psychosocial intervention based on these reports may have significant health implications. It will be worthwhile to investigate the utility and feasibility of implementing such interventions in future research.

Provider Level

At the provider level, there are a number of approaches to enhance identification and appropriate treatment of mental disorders in older adults with physical health problems but these also present with several challenges. Educational efforts (e.g., seminars) have been aimed at enhancing mental health knowledge in primary care physicians in order to appropriately screen older adults (Bartels et al., 2003). Given several limiting factors including time constraints, large numbers of patients, and required breadth of medical knowledge, mental disorders are often

misattributed to physical health conditions in primary care, especially for older adults (Fernandez et al., 2010; Karlin & Karel, 2014; Tai-Seale et al., 2005). This approach alone is therefore insufficient (Bartels et al., 2003). In addition to targeted educational opportunities, a coordinated approach between primary care providers and mental health specialists is indicated. This is particularly true in light that lack of coordination in medical and specialty mental health systems is associated with mortality in late life (Druss, Zhao, Von Esenwein, Morrato, & Marcus, 2011). Both older adults (Bartels et al., 2004); primary care physicians also prefer integrated primary care and mental health service models (i.e., co-located) over expedited referrals to mental health specialists (Gallo et al., 2004). An integrative approach could take many forms, however, one cost effective approach would be to have a mental health specialist in a consultative role in primary care clinics to accurately identify mental health problems and make appropriate referrals. Given the findings of poor mental health related quality of life as a predictor of incident comorbidity in Study 1, it might be particularly important to screen and refer for poor self-reported mental health in the presence or absence of a mental disorder within this context. Unfortunately, even if older adults are appropriately referred, a large proportion "get lost" in the referral process (Speer, 2003), particularly those with disability and a history of several medical appointments in the previous year (Zivin, 2009). A more integrated model where mental health specialists who conduct consultation, evaluation and subsequent treatment in the same setting as primary care physicians may be appropriate and result in greater numbers of suffering older adults receiving mental health care (Bartels et al., 2002).

System Level

Veterans Health Administration has adopted this integrated approach within Veterans Affairs hospitals throughout the United States with promising implications at both the patient

level in regard to accessibility, treatment outcome, and satisfaction, and the system level as a whole (Zeiss & Karlin, 2008). It represents the largest integrated mental health care system that most often involves a mental health professional being co-located in primary care. The mental health specialist will immediately follow-up with a patient who screens positive on a short mental health screen or is identified as a risk for mental health issues by their primary care physician. The mental health specialists, most often psychologists, will provide treatment in primary care when warranted and provide recommendations to the primary care physicians to optimize health care (Zeiss & Karlin, 2008). Efficiency is critical in these systems; therefore psychologists may receive additional training at the graduate, intern, or post-doctoral level in order to provide efficient evidence-based treatments (Bluestein & Cubic, 2009; Karlin & Cross, 2014). Health psychologists, who tend to have more experience working in the medical system, are occasionally employed and may be particularly suitable in primary care settings. Further, health psychologists have expertise in the complex relationships between mental and physical health and in providing behavioral medicine recommendations and treatment. Despite these potential advantages, an empirical evaluation of the effectiveness and cost-effectiveness of health psychologists, in particular, in a primary setting remains to be investigated (Thielke, Thompson, & Stuart, 2011). This integrated approach adopted by Veterans Affairs has several benefits for the growing numbers of older adults and significantly enhances accessibility to mental health care (Karlin & Karel, 2014). Working in a multidisciplinary collaborative team is essential for older adults' health promotion given the complexities between mental and physical health conditions and the challenges that present with these complexities such as diagnostic challenges and potential for polypharmacy (Karel, Gatz, & Smyer, 2012).

Veterans Affairs integrated care may provide a foundational model for private and public health sectors in both Canada and the United States. This becomes a complex issue, however, because of differences in Canadian and American healthcare systems in terms of financial, organizational and delivery distinctions. The healthcare systems between countries also differ from the system within Veterans Healthcare Administration. One of the primary differences is the universal access to publicly funded primary healthcare services for Canadians, whereas the majority of Americans require private insurance to cover healthcare costs, which coincide with out-of-pocket expenses. Government funded insurance is also available for primarily low-income individuals in the United who meet criteria for Medicaid and adults over the age of 65 who meet criteria for Medicare. Unfortunately, 11% of Americans do no have health insurance, which includes 26% from the lowest income quintile (Sanmartin et al., 2006). Health status is similar across countries, but the largest differences are likely in demographic disparities in healthcare utilization and more complexities in financing and administration of services in the United States. Interestingly, the Veterans Affairs model integrates elements from both American and Canadian systems, which includes a funded healthcare system of hospitals, community-based outpatient clinics, nursing homes, and counseling centers for veterans. Therefore this model may be especially useful in creating guidelines that are applicable in both countries.

As indicated, Veterans Affairs has specifically integrated mental health services within primary care. Rates of having a primary care physician are similar across countries (85% versus 80% in Canada and United States, respectively), with the 5% difference being likely attributable to the proportion of uninsured Americans (Sanmartin et al., 2006). Research indicates that an increased supply of primary care services is significantly associated with decreased Medicare spending in the United States and enhanced quality of life for Americans (Baicker & Chandra,

2004). These high rates for the use of primary care physicians across the United States and

Canada and the financial and personal benefits of primary care use are promising for an

integrated model. It would be particularly important to establish an integrated care model in

clinics or hospitals where primary care services are delivered. Similar models have been

proposed across countries, for example, the New Model of practice (Martin et al., 2004) and

Chronic Care Model (Bodenheimer, Wagner, & Grumbach, 2002) in the United States and the

Collaborative Care initiative in Canada (Horgan et al., 2009). There are benefits and drawbacks

to these reformed models. In order to be successful in creating a workable, integrated, and

efficient model, we must carefully and critically evaluate these proposed and initiated models,

with perhaps a particular emphasis on the Veterans Affairs primary care model given its success

with mental health integration. In fact, Karlin and Cross (2014) stress that it was careful

consideration of other models that led to the success of integrating evidence based practices for

mental and physical health into the Veterans Health Administration. Financing, in particular,

would create complexities but a standard of care established in both Canada and the United States

could follow the financial healthcare structure currently in place. For example, a standard

consultation of 15 minutes could be implemented, followed up by appropriate accommodations

within the system (e.g., follow-up appointments with the attending psychologist or trainees).

Regardless of the approach taken, it will be important to ensure that an adequate number of

primary care physicians are available for the growing older adult demographic and this may

require revitalization in itself in current systems (Fiscella, 2011). Rates of primary care

physicians have declined with advancements in specialized medicine (Bluestein & Cubic, 2009).

If any of these suggested changes are initiated, it is imperative to have a solid foundation in place

on which to build and this begins at the primary care level.

Strengths and Limitations

This thesis includes several noteworthy findings, with broad implications for older adults with complex comorbid anxiety and physical health conditions. There are a number of strengths across both studies including diverse samples, a gold standard of assessment for anxiety and other psychiatric disorders, and sophistication in data collection methods. Perhaps the greatest strength of these studies are that they are population-based and therefore generalizable to community dwelling older adults. There are limitations, however, inherent in this methodology. First, data collection in both surveys was conducted over 10 years ago. It is possible that more contemporary data would impact the findings and this may be especially true for Study 2. For example, the commitment to enhancing access to healthcare in Canada over the past decade, particularly for older adults (e.g., conception of the Mental Health Commission of Canada in 2007), may influence findings. Second, both surveys only included community dwelling older adults and did not include older adults who are institutionalized and have potentially more severe health presentations. In Study 1, this limitation may result in underestimated bi-directional comorbidity rates. In Study 2, older adults with anxiety disorders and comorbid physical health conditions may have an increased likelihood of being appropriately referred for mental health services because of increased exposure to health professionals in institutionalized settings. However, on the other hand, institutionalized older adults may have greater cognitive declines or neurocognitive disorders increasing the complexity of identification and appropriate referral. Another limitation that is of particular relevance to this thesis is that physical health conditions were based on self-report, which could also create biased estimates. This also did not allow for an understanding of how severity and heterogeneity among particular physical health conditions impacted the results and, as discussed in this chapter, these health factors may have implications

for the findings shedding light on possible mediators or moderators. Clinical follow-up research will therefore be important to understand these nuances. Moreover, although genotypic and phenotypic presentations of both mental and physical health conditions are likely consistent across countries, differences in policy and systems may impact findings from both studies. It will be particularly important to understand how health systems impact complex comorbid physical and mental health conditions in older adults, particularly in considering reform.

Conclusion

Ross and Detsky (2008) in a commentary in JAMA accurately identify that one of the greatest challenges in both the American and Canadian healthcare systems will be managing the complex health and disease needs of the aging population. With a large number of baby boomers reaching late life, it is essential that health care providers understand mental disorders such as anxiety disorders in the context of chronic physical health conditions. As evidenced in this discussion, there are a number of challenges in accurately identifying, assessing, treating, and managing mental disorders in late life and this may be particularly true when they are coupled with chronic physical health conditions. As a first step, enhancing our understanding of these complex relationships such as temporal presentations and mechanisms will lay the groundwork to establish preventative measures. An integration of preventative measures in healthcare practices may be appropriate in older adults presenting with particular physical or mental health problems that are known to be risk factors for later morbidity and comorbidities. It is also imperative to understand health profiles that may push or pull older adults from receiving adequate healthcare services so that vulnerable older adults with unmet healthcare needs can be targeted. Given the complexity of comorbidities in older adults, one feasible approach is to implement education and self-initiated techniques and treatments that are effective in promoting both physical and mental

health (i.e., mind-body methods). This would be particularly impactful for older adults if implemented by primary care physicians. If comorbid anxiety and physical conditions are accurately diagnosed, effective psychotherapy and psychotropic treatments should be identified and initiated. Developing effective treatments for older adults with comorbidities is also an important area of future research. At the extreme, both Canadian and United States health care systems may require significant reform. Utilizing existing successful systems may provide a solid foundation on which to build an integrated or collaborative model to meet the multifactorial service needs of the growing older adult demographic.

References

Asmundson, G. J., Fetzner, M. G., Deboer, L. B., Powers, M. B., Otto, M. W., & Smits, J. A.

    (2013). Let's get physical: a contemporary review of the anxiolytic effects of exercise

    for anxiety and its disorders. *Depression and Anxiety, 30*(4), 362-373. doi:

    10.1002/da.22043

Astin, J. A., Shapiro, S. L., Eisenberg, D. M., & Forys, K. L. (2003). Mind-body medicine: state

    of the science, implications for practice. *The Journal of the American Board of Family*

    Practice / American Board of Family Practice, 16(2), 131-147.

Astin, J. A., Soeken, K., Sierpina, V. S., & Clarridge, B. R. (2006). Barriers to the integration of

    psychosocial factors in medicine: results of a national survey of physicians. *Journal of*

    the American Board of Family Medicine : JABFM, 19(6), 557-565.

Baicker, K., & Chandra, A. (2004). Medicare spending, the physician workforce, and

    beneficiaries' quality of care. *Health Affairs, Supplement Web Exclusives*, W4-184-197.

    doi: 10.1377/hlthaff.w4.184

Baker, D. W., Gazmararian, J. A., Sudano, J., & Patterson, M. (2000). The association between

    age and health literacy among elderly persons. *The Journals of Gerontology. Series B,*

    Psychological Sciences and Social Sciences, 55(6), S368-374.

Bartels, S. J., Coakley, E. H., Zubritsky, C., Ware, J. H., Miles, K. M., Arean, P. A., . . . Levkoff, S. E.

    (2004). Improving access to geriatric mental health services: a randomized trial

    comparing treatment engagement with integrated versus enhanced referral care for

    depression, anxiety, and at-risk alcohol use. *The American Journal of Psychiatry,*

    161(8), 1455-1462. doi: 10.1176/appi.ajp.161.8.1455

Bartels, S. J., Dums, A. R., Oxman, T. E., Schneider, L. S., Arean, P. A., Alexopoulos, G. S., &

    Jeste, D. V. (2002). Evidence-based practices in geriatric mental health care.

    Psychiatric Services, 53(11), 1419-1431.

Bartels, S. J., Dums, A. R., Oxman, T. E., Schneider, L. S., Arean, P. A., Alexopoulos, G. S., &

    Jeste, D. V. (2003). Evidence-based practices in geriatric mental health care: an

    overview of systematic reviews and meta-analyses. *The Psychiatric Clinics of North*

    America, 26(4), 971-990, x-xi.

Bartels, S. J., & Naslund, J. A. (2013). The underside of the silver tsunami--older adults and

    mental health care. *The New England Journal of Medicine, 368*(6), 493-496. doi:

    10.1056/NEJMp1211456

Becker, S. A. (2004). A study of web usability for older adults seeking online health

    resources. *ACM Transactions on Computer-Human Interaction, 11*(4), 387-406. doi:

    10.1145/1035575.1035578

Bluestein, D., & Cubic, B. A. (2009). Psychologists and primary care physicians: a training

    model for creating collaborative relationships. *Journal of Clinical Psychology in*

    Medical Settings, 16(1), 101-112. doi: 10.1007/s10880-009-9156-9

Bodenheimer, T., Wagner, E. H., & Grumbach, K. (2002). Improving primary care for patients

    with chronic illness. *JAMA, 288*(14), 1775-1779.

Bohlmeijer, E., Prenger, R., Taal, E., & Cuijpers, P. (2010). The effects of mindfulness-based

    stress reduction therapy on mental health of adults with a chronic medical disease: a

    meta-analysis. *Journal of Psychosomatic Research, 68*(6), 539-544. doi:

    10.1016/j.jpsychores.2009.10.005

Bryan, S. N., & Katzmarzyk, P. T. (2009). Are Canadians meeting the guidelines for moderate and vigorous leisure-time physical activity? *Applied Physiology, Nutrition, and Metabolism, 34*(4), 707-715. doi: 10.1139/H09-060

Bryant, C., Jackson, H., & Ames, D. (2008). The prevalence of anxiety in older adults: methodological issues and a review of the literature. *Journal of Affective Disorders, 109*(3), 233-250. doi: 10.1016/j.jad.2007.11.008

Carlson, S. A., Fulton, J. E., Schoenborn, C. A., & Loustalot, F. (2010). Trend and prevalence estimates based on the 2008 Physical Activity Guidelines for Americans. *American Journal of Preventive Medicine, 39*(4), 305-313. doi: 10.1016/j.amepre.2010.06.006

Carter, N. D., Kannus, P., & Khan, K. M. (2001). Exercise in the prevention of falls in older people: a systematic literature review examining the rationale and the evidence. *Sports Medicine, 31*(6), 427-438.

Centers for Disease Control and Prevention. (2004). Prevalence of no leisure-time physical activity – 35 states and the District of Columbia, 1988-2002. *Morbidity and Mortality Weekly Report, 53*, 82-86.

Centers for Disease Control and Prevention. (2011). Arthritis Retrieved July 15, 2011, from http://www.cdc.gov/arthritis/data_statistics/faqs/cost_analysis.htm

Charles, S. T. (2010). Strength and vulnerability integration: A model of emotional well-being across adulthood. *Psychological Bulletin, 136*(6), 1068-1091.

Chen, K. W., Berger, C. C., Manheimer, E., Forde, D., Magidson, J., Dachman, L., & Lejuez, C. W. (2012). Meditative therapies for reducing anxiety: a systematic review and meta-analysis of randomized controlled trials. *Depression and Anxiety, 29*(7), 545-562. doi: 10.1002/da.21964

Cornwell, E. Y., & Waite, L. J. (2009a). Measuring social isolation among older adults using

    multiple indicators from the NSHAP study. *Journals of Gerontology B Psychological*

    Sciences and Social Sciences, 64 Suppl 1, i38-46. doi: gbp037

    [pii]10.1093/geronb/gbp037

Cornwell, E. Y., & Waite, L. J. (2009b). Social disconnectedness, perceived isolation, and

    health among older adults. *Journal of Health and Social Behavior, 50*(1), 31-48.

Cunningham, M. A., Carroll, D. D., Carlson, S. A., & Fulton, J. (2013). Awareness and

    Knowledge of the 2008 Physical Activity Guidelines for Americans. *Journal of*

    Physical Activity & Health.

Dall, T. M., Gallo, P. D., Chakrabarti, R., West, T., Semilla, A. P., & Storm, M. V. (2013). An aging

    population and growing disease burden will require a large and specialized health

    care workforce by 2025. *Health Affairs, 32*(11), 2013-2020. doi:

    10.1377/hlthaff.2013.0714

Denton, M., Prus, S., & Walters, V. (2004). Gender differences in health: a Canadian study of

    the psychosocial, structural and behavioural determinants of health. *Social Science &*

    Medicine, 58(12), 2585-2600. doi: 10.1016/j.socscimed.2003.09.008

Drossman, D. A., Creed, F. H., Olden, K. W., Svedlund, J., Toner, B. B., & Whitehead, W. E.

    (1999). Psychosocial aspects of the functional gastrointestinal disorders. *Gut, 45*

    Suppl 2, II25-30.

Druss, B. G., Zhao, L., Von Esenwein, S., Morrato, E. H., & Marcus, S. C. (2011). Understanding

    excess mortality in persons with mental illness: 17-year follow up of a nationally

    representative US survey. *Medical Care, 49*(6), 599-604. doi:

    10.1097/MLR.0b013e31820bf86e

El-Gabalawy, R., Mackenzie, C. S., Thibodeau, M. A., Asmundson, G. J., & Sareen, J. (2013).

Health anxiety disorders in older adults: conceptualizing complex conditions in late

life. *Clinical Psychology Review, 33*(8), 1096-1105. doi: 10.1016/j.cpr.2013.08.010

Exercise prescription for older adults with osteoarthritis pain: consensus practice

recommendations. A supplement to the AGS Clinical Practice Guidelines on the

management of chronic pain in older adults. (2001). *Journal of the American*

Geriatrics Society, 49(6), 808-823.

Fernandez, A., Saameno, J. A., Pinto-Meza, A., Luciano, J. V., Autonell, J., Palao, D., . . . Serrano,

A. (2010). Burden of chronic physical conditions and mental disorders in primary

care. *The British Journal of Psychiatry: the Journal of Mental Science, 196*(4), 302-309.

doi: 10.1192/bjp.bp.109.074211

Fiscella, K. (2011). Health care reform and equity: promise, pitfalls, and prescriptions.

Annals of Family Medicine, 9(1), 78-84. doi: 10.1370/afm.1213

Fletcher, G. F., Balady, G. J., Amsterdam, E. A., Chaitman, B., Eckel, R., Fleg, J., . . . Bazzarre, T.

(2001). Exercise standards for testing and training: a statement for healthcare

professionals from the American Heart Association. *Circulation, 104*(14), 1694-1740.

Flynn, K. E., Smith, M. A., & Freese, J. (2006). When do older adults turn to the internet for

health information? Findings from the Wisconsin Longitudinal Study. *Journal of*

General Internal Medicine, 21(12), 1295-1301. doi: 10.1111/j.1525-

1497.2006.00622.x

Fried, L. P., Ferrucci, L., Darer, J., Williamson, J. D., & Anderson, G. (2004). Untangling the

concepts of disability, frailty, and comorbidity: implications for improved targeting

and care. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences, 59*(3), 255-263.

Fried, L. P., Kronmal, R. A., Newman, A. B., Bild, D. E., Mittelmark, M. B., Polak, J. F., . . . Gardin, J. M. (1998). Risk factors for 5-year mortality in older adults: the Cardiovascular Health Study. *JAMA, 279*(8), 585-592.

Gallo, J. J., Zubritsky, C., Maxwell, J., Nazar, M., Bogner, H. R., Quijano, L. M., . . . Levkoff, S. E. (2004). Primary care clinicians evaluate integrated and referral models of behavioral health care for older adults: results from a multisite effectiveness trial (PRISM-e). *Annals of Family Medicine, 2*(4), 305-309.

Goodwin, R. D. (2003). Association between physical activity and mental disorders among adults in the United States. *Preventive Medicine, 36*(6), 698-703.

Goyal, M., Singh, S., Sibinga, E. M., Gould, N. F., Rowland-Seymour, A., Sharma, R., . . . Haythornthwaite, J. A. (2014). Meditation programs for psychological stress and well-being: a systematic review and meta-analysis. *JAMA Internal Medicine, 174*(3), 357-368. doi: 10.1001/jamainternmed.2013.13018

Hart, S. L., & Charles, S. T. (2013). Age-related patterns in negative affect and appraisals about colorectal cancer over time. *Health psychology : Official Journal of the Division of Health Psychology, American Psychological Association, 32*(3), 302-310. doi: 10.1037/a0028523

Hawton, A., Green, C., Dickens, A. P., Richards, S. H., Taylor, R. S., Edwards, R., . . . Campbell, J. L. (2011). The impact of social isolation on the health status and health-related quality of life of older people. *Quality of Life Research: An International Journal of*

Quality of Life Aspects of Treatment, Care and Rehabilitation, 20(1), 57-67. doi: 10.1007/s11136-010-9717-2

Horgan, S., LeClair, K., Donnelly, M., Hinton, G., MacCourt, P., & Krieger-Frost, S. (2009). Developing a national consensus on the accessibility needs of older adults with concurrent and chronic, mental and physical health issues: a preliminary framework informing collaborative mental health care planning. *Canadian Journal on Aging = La Revue Canadienne du Vieillissement, 28*(2), 97-105. doi: 10.1017/S0714980809090175

Johannesson, E., Simren, M., Strid, H., Bajor, A., & Sadik, R. (2011). Physical activity improves symptoms in irritable bowel syndrome: a randomized controlled trial. *The American Journal of Gastroenterology, 106*(5), 915-922. doi: 10.1038/ajg.2010.480

Karel, M. J., Gatz, M., & Smyer, M. A. (2012). Aging and mental health in the decade ahead: what psychologists need to know. *The American Psychologist, 67*(3), 184-198. doi: 10.1037/a0025393

Karlin, B. E., & Cross, G. (2014). From the laboratory to the therapy room: National dissemination and implementation of evidence-based psychotherapies in the U.S. Department of Veterans Affairs Health Care System. *The American Psychologist, 69*(1), 19-33. doi: 10.1037/a0033888

Karlin, B. E., Duffy, M., Gleaves, D. H. (2008). Patterns and predictors of mental health service use and mental illness among older and younger adults in the United States. *Psychological Services, 5*(3), 275-294.

Karlin, B. E., & Karel, M. J. (2014). National integration of mental health providers in VA home-based primary care: an innovative model for mental health care delivery with older adults. *The Gerontologist, 54*(5), 868-879. doi: 10.1093/geront/gnt142

Kessler, R. C., Soukup, J., Davis, R. B., Foster, D. F., Wilkey, S. A., Van Rompay, M. I., & Eisenberg, D. M. (2001). The use of complementary and alternative therapies to treat anxiety and depression in the United States. *The American Journal of Psychiatry, 158*(2), 289-294.

Keysor, J. J. (2003). Does late-life physical activity or exercise prevent or minimize disablement? A critical review of the scientific evidence. *American Journal of Preventive Medicine, 25*(3 Suppl 2), 129-136.

Knight, B. G., & Sayegh, P. (2011). Mental health and aging in the 21st century. *Journal of Aging & Social Policy, 23*(3), 228-243. doi: 10.1080/08959420.2011.579494

Lee, D. S., Chiu, M., Manuel, D. G., Tu, K., Wang, X., Austin, P. C., . . . Tu, J. V. (2009). Trends in risk factors for cardiovascular disease in Canada: temporal, socio-demographic and geographic factors. *CMAJ : Canadian Medical Association Journal, 181*(3-4), E55-66. doi: 10.1503/cmaj.081629

Levenstein, S. (1999). Peptic ulcer at the end of the 20th century: biological and psychological risk factors. *Canadian Journal of Gastroenterology, 13*(9), 753-759.

Lin, N., Ye, X., & Ensel, W. M. (1999). Social support and depressed mood: a structural analysis. *Journal of Health and Social Behavior, 40*(4), 344-359.

Martin, J. C., Avant, R. F., Bowman, M. A., Bucholtz, J. R., Dickinson, J. R., Evans, K. L., . . . Weber, C. W. (2004). The Future of Family Medicine: a collaborative project of the family medicine community. *Annals of Family Medicine, 2 Suppl 1*, S3-32.

Martinson, B. C., Crain, A. L., Pronk, N. P., O'Connor, P. J., & Maciosek, M. V. (2003). Changes in physical activity and short-term changes in health care charges: a prospective cohort study of older adults. *Preventive Medicine, 37*(4), 319-326.

McNeil, J., & Binette, J., U.S. Department of Commerce, Centers for Disease Control and Prevention. (1999). Prevalence of disabilities and associated health conditions among adults. *MMWR 2001, 50*(7), 120-125.

Medicine, I. o. (2012). The mental health and substance use workforce for older adults: In whose hands? Washington D.C.

Metsios, G. S., Stavropoulos-Kalinoglou, A., Veldhuijzen van Zanten, J. J., Treharne, G. J., Panoulas, V. F., Douglas, K. M., . . . Kitas, G. D. (2008). Rheumatoid arthritis, cardiovascular disease and physical exercise: a systematic review. *Rheumatology, 47*(3), 239-248. doi: 10.1093/rheumatology/kem260

Nelson, M. E., Layne, J. E., Bernstein, M. J., Nuernberger, A., Castaneda, C., Kaliton, D., . . . Fiatarone Singh, M. A. (2004). The effects of multidimensional home-based exercise on functional performance in elderly people. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences, 59*(2), 154-160.

Nelson, M. E., Rejeski, W. J., Blair, S. N., Duncan, P. W., Judge, J. O., King, A. C., . . . Castaneda-Sceppa, C. (2007). Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. *Medicine and Science in Sports and Exercise, 39*(8), 1435-1445. doi: 10.1249/mss.0b013e3180616aa2

Pachana, N. A., Emery, E., Konnert, C. A., Woodhead, E., & Edelstein, B. A. (2010). Geropsychology content in clinical training programs: a comparison of Australian,

Canadian and U.S. data. *International Psychogeriatrics / IPA, 22*(6), 909-918. doi: 10.1017/S1041610210000803

Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry, 18*(2), 189-193.

Piazza, J. R., Charles, S. T., Stawski, R. S., & Almeida, D. M. (2013). Age and the association between negative affective states and diurnal cortisol. *Psychology and Aging, 28*(1), 47-56. doi: 10.1037/a0029983

Pollock, M. L., Franklin, B. A., Balady, G. J., Chaitman, B. L., Fleg, J. L., Fletcher, B., . . . Bazzarre, T. (2000). AHA Science Advisory. Resistance exercise in individuals with and without cardiovascular disease: benefits, rationale, safety, and prescription: An advisory from the Committee on Exercise, Rehabilitation, and Prevention, Council on Clinical Cardiology, American Heart Association; Position paper endorsed by the American College of Sports Medicine. *Circulation, 101*(7), 828-833.

Rainforth, M. V., Schneider, R. H., Nidich, S. I., Gaylord-King, C., Salerno, J. W., & Anderson, J. W. (2007). Stress reduction programs in patients with elevated blood pressure: a systematic review and meta-analysis. *Current hypertension reports, 9*(6), 520-528.

Robertson, M. C., & Campbell, A. J. (2001). Falls prevention and the role of home exercise programmes. *The journal of the Royal Society for the Promotion of Health, 121*(3), 143.

Robinette, J. W., & Charles, S. T. (2014). Age, Rumination, and Emotional Recovery From a Psychosocial Stressor. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences.* doi: 10.1093/geronb/gbu097

Ross, J. S., & Detsky, A. S. (2008). Comparison of the US and Canadian health care systems: a

    tale of 2 Mount Sinai's. *JAMA, 300*(16), 1934-1936. doi: 10.1001/jama.300.16.1934

Sanmartin, C., Berthelot, J. M., Ng, E., Murphy, K., Blackwell, D. L., Gentleman, J. F., . . . Simile,

    C. M. (2006). Comparing health and health care use in Canada and the United States.

    Health affairs, 25(4), 1133-1142. doi: 10.1377/hlthaff.25.4.1133

Shay, C. M., Ning, H., Allen, N. B., Carnethon, M. R., Chiuve, S. E., Greenlund, K. J., . . . Lloyd-

    Jones, D. M. (2012). Status of Cardiovascular Health in US Adults: Prevalence

    Estimates From the National Health and Nutrition Examination Surveys (NHANES)

    2003-2008. *Circulation, 125*(1), 45-56. doi: 10.1161/CIRCULATIONAHA.111.035733

Speer, D. C., Schneider, M. G. (2003). Mental Health Needs of Older Adults and Primary Care:

    Opportunity for Interdisciplinary Geriatric Team Practice. *Clinical Psychology:*

    Science and Practice, 10, 85-101. doi: 10.1093/clipsy.10.1.85

Stone, J., Evandrou, M., & Falkingham, J. (2013). The transition to living alone and

    psychological distress in later life. *Age and Ageing, 42*(3), 366-372. doi:

    10.1093/ageing/aft006

Strate, L. L., Liu, Y. L., Aldoori, W. H., & Giovannucci, E. L. (2009). Physical activity decreases

    diverticular complications. *The American Journal of Gastroenterology, 104*(5), 1221-

    1230. doi: 10.1038/ajg.2009.121

Tai-Seale, M., Bramson, R., Drukker, D., Hurwicz, M. L., Ory, M., Tai-Seale, T., . . . Cook, M. A.

    (2005). Understanding primary care physicians' propensity to assess elderly

    patients for depression using interaction and survey data. *Medical Care, 43*(12),

    1217-1224.

Taylor, A. H., Cable, N. T., Faulkner, G., Hillsdon, M., Narici, M., & Van Der Bij, A. K. (2004).

    Physical activity and older adults: a review of health benefits and the effectiveness of

    interventions. *Journal of Sports Sciences, 22*(8), 703-725. doi:

    10.1080/02640410410001712421

Thielke, S., Thompson, A., & Stuart, R. (2011). Health psychology in primary care: recent

    research and future directions. *Psychology Research and Behavior Management, 4*,

    59-68. doi: 10.2147/PRBM.S12996

Thompson, P. D., Buchner, D., Pina, I. L., Balady, G. J., Williams, M. A., Marcus, B. H., . . .

    Wenger, N. K. (2003). Exercise and physical activity in the prevention and treatment

    of atherosclerotic cardiovascular disease: a statement from the Council on Clinical

    Cardiology (Subcommittee on Exercise, Rehabilitation, and Prevention) and the

    Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical

    Activity). *Circulation, 107*(24), 3109-3116. doi:

    10.1161/01.CIR.0000075572.40158.77

Tucker, J. M., Welk, G. J., & Beyler, N. K. (2011). Physical activity in U.S.: adults compliance

    with the Physical Activity Guidelines for Americans. *American Journal of Preventive*

    Medicine, 40(4), 454-461. doi: 10.1016/j.amepre.2010.12.016

Vreeland, B. (2007a). Bridging the gap between mental and physical health: a

    multidisciplinary approach. *The Journal of Clinical Psychiatry, 68 Suppl 4*, 26-33.

Vreeland, B. (2007b). Treatment decisions in major mental illness: weighing the outcomes.

    The Journal of Clinical Psychiatry, 68 Suppl 12, 5-11.

Wagner, N., Hassanein, K., Head, M. . (2010). Computer use by older adults: A multi-

    disciplinary review. *Computers in Human Behavior, 26*(5), 870-882.

Wang, C., Collet, J. P., & Lau, J. (2004). The effect of Tai Chi on health outcomes in patients

with chronic conditions: a systematic review. *Archives of Internal Medicine, 164*(5),

493-501. doi: 10.1001/archinte.164.5.493

Wolsko, P. M., Eisenberg, D. M., Davis, R. B., & Phillips, R. S. (2004). Use of mind-body

medical therapies. *Journal of General Internal Medicine, 19*(1), 43-50.

Zeiss, A. M., & Karlin, B. E. (2008). Integrating mental health and primary care services in

the Department of Veterans Affairs health care system. *Journal of Clinical Psychology

in Medical Settings, 15*(1), 73-78. doi: 10.1007/s10880-008-9100-4

Zivin, K., Pfeiffer, P.N., McCammon, R.J., Kavanagh, J.S., Walters, H., Welsh, D.E., Difranco, D.J.,

Brown, M.M., Valenstein, M. (2009). "No shows": Who fails to follow up with initial

behavioral health treatment? *The American Journal of Managed Care, 15*(2), 105-112.