Preliminary validation of a single self-report question as a screening tool for depression in older adult populations:

Analyses using the Minimum Data Set Depression Rating Scale

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

Objectives: The primary objective of this research was to inform the criterion validity of the single self-report depression screening question in the interRAI-Contact Assessment (CA) against the validated Depression Rating Scale (DRS) in the RAI-Home Care (HC) instrument. To achieve this objective, two overarching research questions were addressed: 1) What is the DRS cut-point best suited for the detection of a possible depressed mood state?; and 2) What are the consistencies in the prevalence rates of the CA's single self-report depression question and the HC's DRS detection measure? A secondary objective of this research was to explore the relationships of multiple depression-related outcomes with selected possible predictor variables to indirectly aid in the identification of a possible depressed mood state.

Methods: Four datasets were obtained from the interRAI organization to inform this research. Three datasets, which house and concurrently administer both the self-report item and the DRS, were used to determine the best-suited DRS detection threshold through both univariate and bivariate analyses. The validity of the CA's self-report item was informed through bivariate analyses with the HC's DRS measure using the phi-correlation and the c statistic from the bivariate logistic regression model. Spearman and point biserial correlations and bivariate logistic regression modeling informed the relationships of the possible predictor variables with the depression-related outcomes.

Results: The DRS one-plus threshold was determined to be the cut-point best-suited for the detection of a possible depressed mood state. Several predictor variables proved statistically significant but were not consistent across the three datasets. The CA's single question did not evidence a strong association with the HC's DRS measure.

Conclusions: According to the resulting significance of the predictor variables, the experience and expression of depression across the three explored samples differ; the results from one sample cannot be generalized to explain the experience of the other samples. The DRS one-plus threshold is supported for the detection of a possible depressed mood state. However, the validity of the single self-report question in comparison to the DRS measure cannot be supported with the study's results. However, due to recognized study limitations, the overall validity of the measure is not conclusive. Future research directions are recommended.

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1.0 Introduction

A mood or affective disturbance is a prevalent problem within the older adult population that is associated with adverse consequences in an individual's quality of life and mortality (Charney et al., 2003). As defined by the World Health Organization (WHO, 1994), mood disturbance is "a morbid change of affect extending beyond normal variation to subsume any of several states, including depression, elation, anxiety, irritability, and anger" (p.65). A disturbance can be determined when any distinct change in mood initially occurs and/or lasts for a short duration; a disturbance which persists can then elevate to a clinically defined mood disorder. According to the Diagnostic and Statistical Manual of Mental Disorders, version four (DSM-IV), a mood disorder can be diagnosed when the disturbance in mood endures for at least two consecutive weeks (APA, 1994).

Of the several types of mood disturbances that are prevalent within the older adult population – such as depressive-, bipolar-, dysthymic-, and anxiety-related disturbances - depression is the most frequently reported type of mood disturbance in late life (Blazer, 2002). There are different degrees of depressive mood disturbance, varying from the exhibition of depressive symptoms in the absence of clinical illness, to the diagnosis of major depressive disorder (APA, 1994). Notably, although the detection of depressive symptoms is often indicative of the presence of a depressive disorder, their presence does not automatically infer a clinically defined depressive episode or depression diagnosis.

The diagnosis of a depressive disorder is often difficult and complex due to its abstract nature, as it predominantly manifests itself as a collection of affective and cognitive symptoms as opposed to tangible somatic symptoms. Although there is a wide array of symptoms that are linked with depressive mood states, specific criteria are offered for the

distinction of a clinical depressive disorder. According to the DSM-IV, depression should be diagnosed when one or both of the two core symptoms are detected: depressed mood, and anhedonia – a loss of interest and pleasure in activities; with an additional presence of four or more of the following seven symptoms: significant change in appetite or weight; insomnia or hypersomnia; psychomotor agitation or retardation; decrease in energy levels; inappropriate feelings of worthlessness and guilt; impaired ability to concentrate or make decisions; and suicidal ideation (APA, 1994). Overall, at least five symptoms are required for the diagnosis of a major depressive disorder.

To date, the DSM-IV criteria, measured through an interview process by a specially trained clinician, is the gold standard assessment used to clinically diagnose depression (Gilbody, Richards, Brealey & Hewitt, 2007). However, meeting the formal DSM-IV criteria may prove problematic among older populations. Regardless of depression severity, older adults are less likely to endorse one of the DSM-IV's core diagnostic symptoms: a depressed mood (Swanwick & Wrigley, 1998); and though elderly individuals do recognize anhedonia, they do not tend to view the condition as an indicator of a depressed state (Jefford et al., 2004). To offer further complication, diagnostic services are often only available to institutionalized populations.

Apart from the DSM-IV, there are a variety of validated screening scales which are designed to detect the mere presence of depressive symptoms through self-report or observer-report measures. These scales can identify individuals who may be suffering with depression or are at risk of developing the illness, and direct them to diagnostic evaluation. The accessibility of these scales is particularly beneficial to populations that may not have ready access to the diagnostic services of specialized health professionals; specifically, to those

over the age of 65 years, as only a small minority of this population seek out or access any kind of care for mental health issues (Crabb & Hunsley, 2006).

2.0 Literature Review

2.1 Importance of Depression Screening

Affective disorders are a prevalent but often neglected problem in older adult populations. Of these disorders, depression is particularly common and disabling in late life and is projected to escalate in severity to become the second leading source of disease burden in the developing world by 2020 - inferior only to heart disease (Lopez & Murray, 1998). Numerous adult populations have reported notable prevalence rates for depressive symptoms (Licht-Strunk, van der Windt, van Marwijk, de Haan & Beekman, 2006; Steinman et al., 2007). Populations of individuals with advanced illness report rates near 30% (Gruneir, Smith, Hirdes & Cameron, 2005); palliative populations reportedly hover around a median of 15% (Wilson, Chochinov, de Faye & Breitbart, 2000); community-based populations can range anywhere from eight to 20% (Gallo & Lebowitz, 1999; Steinman et al., 2007); and nursing home populations mostly surpass rates of 25% (Achterberg, Pot, Kerkstra & Ribbe, 2006).

Regrettably, though acknowledged, the identification of depressive symptoms does not consequently imply the receipt of treatment. In a recent study of Ontario home care clients with depressive symptoms, older age was a significant predictor of both potential under-treatment and potentially inappropriate drug treatment (Dalby et al., 2008). Collins, Katona, and Orrell (1997) reaffirm that, even when in contact with medical professionals, older adults are less likely than their younger counterparts to be referred to specialized mental health services. Of those individuals who exhibit depressive symptoms, only a small

percentage are reported to take the initiative to seek out and draw upon mental health services if they are not referred by a health professional (Crabb & Hunsley, 2006).

Furthermore, if depression is present at the end of life, it is largely left undiagnosed and incorrectly accepted as a common experience of the dying process (Lloyd-Williams & Friedman, 2001). Notably, though depressive symptoms can be frequently reported among the oldest old, the higher rates are greatly attributable to age-related changes in risk factors such as a higher proportion of women, lower socioeconomic status, and also greater physical disability and cognitive impairment (Blazer, 2000; van't Veer-Tazelaar et al., 2008).Generally, depression in older adults is left largely under-detected and thus, under-treated (Stiefel, Trill, Berney, Olarte & Razavi, 2001).

2.2 Factors Associated with Depression

Depression can have a severe impact on a person's quality of life, making diagnosis and treatment critical (Charlson et al., 2008; Charney et al., 2003). Those suffering with significant depressive symptoms have an increased risk of suffering functional deterioration (Hays, Saunders, Flint & Blazer, 1997), as well as cognitive impairment and decline (Li, Meyer & Thornby, 2001). Depression can also act as a major predictor of mortality (Lawrie, Lloyd-Williams & Taylor, 2004; Yaffe et al., 2003) – even an independent predictor in certain conditions (Müller-Tasch et al., 2004).

A significant relationship has also been found between late-life depression and the development of dementia (Buntinx, Kestre, Bergers & Knottnerus, 1996). Though research has proposed that depression is a predictor for the later development of dementia, the findings related to the direction of the relationship have not been conclusive. It is not clear

whether depression contributes to causation, or if depression develops as an initial stage of dementia onset. Researchers have found late depression onset to be associated with cognitive impairment, which may represent early Alzheimer's disease (van Reekum, Simard, Clarke, Binns & Conn, 1999), and, similarly, that depressive episodes occurring before the onset of dementia symptoms appear to increase the risk of Alzheimer's disease (Speck, Kukull, Brenner, Bowen, McCormick, Teri, et al., 1995).

Alternately, there are factors that have been reported to be associated with the development of the disease, before manifestation. If recognized, the factors can be used to more readily screen for and identify at-risk individuals. Such associated factors include: worsened physical impairment (Wilson, Chochinov, de Faye & Breitbart, 2000); loss of independence and dignity, and displeasure with social support (Akechi et al., 2004); cognitive impairment and decline (Gallassi, Morreale & Pagni, 2001); high baseline depression assessment scores among those without diagnosis (Akechi et al., 2004; Martin et al., 2008); history of depressive illness (Akechi et al., 2004); and pain, especially when inadequately treated (Mystakidou et al., 2007). The pathway of pain to depression has recently been explored further, taking into consideration the mediating ability of social interactions. As a result, both pain and negative social exchanges have been found to be independently associated with and predictive of greater depressive symptomatology. Furthermore, the negative exchanges can also play a role in the relationship between pain and depressive symptoms (Mavandadi, Sorkin, Rook & Newsom, 2007). Alternately, positive psychological states understandably have both a promotion function and a protective function against depression (Murrell, Salsman & Meeks, 2003).

Setting is also a strong risk factor for the development of depression in the elderly population. A study by Ron (2004) concluded that older adults who reside in nursing homes are at a significantly higher risk of experiencing depression than a comparable population of older adults who remain within the community. Due to issues such as feelings of isolation, loss of decision making power, and general lack of life control, this population reports high rates of depression. Individuals in the early placement and adjustment phase have, specifically, been flagged as being vulnerable (Ron, 2004).

Lastly, a relationship has been reported between functional disorders of the digestive system and various mood disorders (Mayer, Craske & Naliboff, 2001). The development of gastrointestinal (GI) problems, such as irritable bowel syndrome, has been found to be associated with the onset of depression, supporting the general association of physical impairment. Ultimately, there is a common theme that is present throughout the aforementioned factors– a change in one's normal state of being.

Fortunately, though too often left not practiced, effective treatments have been identified for older adults experiencing depressive symptoms. Depression care management in a home or primary care setting as well as cognitive behaviour therapy has been proven successful and is recommended for older adults (Steinman et al., 2007), as is an assortment of psychotherapeutic techniques (Rodin & Gillies, 2000). However, it must first be recognized that depression and its symptoms can and should be differentiated from illness and grief (Block, 2000) – it is not an inevitable illness in older adults. Therefore, reliable and valid screening instruments are essential so that depression can be accurately detected and treated.

2.3 Measuring Depression with interRAI Instruments

InterRAI is an international research consortium which is committed to improving health care services for frail, disabled, and elderly populations. The organization has designed a variety of Resident Assessment Instruments (RAIs) to collect quality data about the characteristics and health-related outcomes of individuals across a range of health and social service settings (see www.interrai.org). These instruments have established reliability (Morris et al., 1997; Sgadari et al., 1997), and clinical utility (Morris et al., 1997; Phillips & Morris, 1997). The data is organized in computerized information systems, which have specialized features that enhance data quality by inhibiting the entry of and flagging attention toward extraneous data (Phillips & Morris, 1997). These clinical and administrative databases have supporting evidence which suggests their data's reliability and validity can be likened to that of the data found in research databases (Phillips & Morris, 1997).

Examples of developed RAI instruments include: interRAI-Community Health Assessment (CHA); interRAI-Community Mental Health (CMH); interRAI-Palliative Care (PC); and RAI-Home Care (HC). These instruments encompass the populations of community-dwelling adults with general health service needs, community-dwelling adults with mental health problems, adults receiving palliative care services, and adults receiving home care services, respectively.

The abovementioned RAI instruments all have a section dedicated specifically to the detection of mood disturbance – inclusive of depression. Ultimately, they offer two methods for the detection and measurement of a possible depressed mood state: an observer-rated Depression Rating Scale (DRS) and a self-reported mood measure. These measures are not diagnostic. However, diagnostic measures are provided in:

1. the CMH as a general mood disorder question that is not specific to depression. This item can be over-inclusive as it is responsible for reporting all mood disorders such as anxiety, bipolar disorder, and dysthymia. In addition, this item is only a provisional diagnosis.
2. the CHA as a diagnostic measure that exclusively questions the presence of a psychiatric diagnosis.

Although each instrument is equipped with a section where diagnostic information can be manually written-in, in many cases the medical conditions are left unreported due to: a) the open-ended nature of the question; and b) the fallible method for collecting a client's medical history, as assessors can only rely on the information that is available to them, such as reports from family members. Notably, studies have been conducted successfully using this diagnostic information section (Dalby et al., 2008), but it should be acknowledged that it does have the potential to report small numbers, which can be problematic for certain analytic approaches.

2.4 The Minimum Data Set Depression Rating Scale (DRS)

The DRS measure is an observer-rated depression scale which is nested within the mood disturbance section of the aforementioned interRAI instruments. Fully titled the Minimum Data Set Depression Rating Scale (MDSDRS) (Burrows, Morris, Simon, Hirdes & Phillips, 2000), the scale is derived from mood and behavioural items in the Minimum Data Set 2.0 (MDS) – an assessment designed for nursing home residents (Morris, Hawes & Fries, 1990). Disregarding both contextual and causal factors, the MDS items are based solely upon

observed frequency and are coded from 0-2 according to: not in the last 30 days, up to five days per week, and almost daily - 6-7 days per week, respectively.

The DRS derivation enlisted 108 participants from two nursing homes facilities for its validation. The study used correlations of the 16 MDS mood items with two validated observation-based depression scales (Burrows et al., 2000): the Hamilton Depression Rating Scale (HDRS) (Mulsant, Sweet, Rifai et al., 1994) – the gold standard for observer-rated depression scales (Endicott, Cohen, Nee, Fleiss & Sarantakos, 1981; Williams, 2001); and the Cornell Scale for Depression in Dementia (CSDD) (Alexopoulos, Abrams, Young et al., 1988). The significantly associated items were factored to identify and distinguish fundamental concepts from which a scale could be developed (Burrows et al., 2000). The resulting scale is comprised of seven summated items with a scoring range of 0-14. Analyses of potential cut-points concluded using a minimum score of 3 to represent the probable presence of mild depression, flagging the need for further attention. The DRS cannot determine a clinical diagnosis. This design, which generates correlations of 0.69 and 0.70 with the CSDD and HDRS, respectively, yields the greatest sensitivity of 91% with minimal loss of 69% to specificity, in relation to the two criteria measures (Burrows et al., 2000).

Since the publication of the DRS in 2000, both the DRS and the original set of 16 MDS mood items have been the focus of much fluctuating debate. Much of the research analyzing the MDS mood items from 2000 to date involve investigating the items' ability to accurately detect depressive symptoms in the elderly (Hendrix, Sakauya, Karabatos & Daigle, 2003; McCurren, 2002; Schnelle, Wood, Schnelle & Simmons, 2001; Simmons et al., 2004). The first question to surface is related to the ability of the staff to detect depressive symptoms (Schnelle et al., 2001). This issue is supported in a subsequent study, which also

found nursing homes reporting higher depression prevalence rates to perform better in the areas of detecting and documenting depressive symptoms (Simmons et al., 2004). Additional studies raise further concerns about the influence of staff attitudes on detection abilities as well as the reliability of observer-based assessments, particularly when conducted by non-direct caregivers (Hendrix et al., 2003; McCurren, 2002). The eye of the debate is thus redirected from the capability of the MDS mood items, to the measurement processes of the individuals who administer the assessments (Hendrix et al., 2003; McCurren, 2002; Schnelle et al., 2001; Simmons et al., 2004).

The DRS has also been the focus of uncertainty regarding its significant role in the lives of elderly health services users. But as discussed, the questions surrounding the scale may be attributable to the scoring of the items opposed to the items themselves. Conclusions cannot clearly be made about the make-up of the DRS. A follow-up validation study tested the DRS against the HDRS and the Geriatric Depression Scale (GDS), a self-report measure, which produced low correlations and sensitivity rates with only specificity holding firm (Anderson, Buckwalter, Buchanan, Maas & Imhof, 2003). Employing 145 participants of three nursing homes, the study found a lower correlation of 0.24 between the DRS and the HDRS, and sensitivity and specificity rates of 23% and 97%, respectively (Anderson et al., 2003). Furthermore, the new comparative measure, the GDS, only produced a correlation of 0.13 with the DRS. The results challenged the utility of the scale in clinical settings (Snowden, 2004).

However, the study did acknowledge its limitations (Anderson et al., 2003). Once again, the ability of staff to accurately detect depressive symptoms was questioned, as was the comparability of the Burrows (Burrows et al., 2000) and Anderson (Anderson et al.,

2003) validation samples. Both the original and follow-up validation studies recommended the use of larger and more representative samples to produce a more secure conclusion. Most notably, it is essential to recognize that the analyses and conclusions of the follow-up validation were based on one fundamental assumption: that these scales are all designed to measure depression in closely similar ways.

A noted difference between the two detection scales is the depression symptomatology that they measure. The DRS is believed to measure more anxious and dysphoric-like symptoms, whereas the GDS in thought to be tailored more towards anhedonic-like symptoms. Further, when examining both the DRS and the GDS as depression measures among nursing home residents it has been reported that the scales are, in fact, uncorrelated (Koehler et al., 2005); however, this result brings with it findings of even greater implication. Both measures have been shown to have acceptable psychometric properties; but whereas the GDS, as a self-report measure, finds a more severe depression within a better cognitive functioning population, the DRS appears to evidence a more severe depression within, and exhibits a greater sensitivity towards, a more cognitively impaired population (Koehler et al., 2005) – an unavoidable yet commonly under-diagnosed subset of the nursing home population (Magsi & Malloy, 2005). In addition, the DRS was shown to be unaffected by item non-response, which is a substantial limitation of the GDS and similar measures. The authors confirm that the DRS and GDS do, in fact, identify different elements of depression (Koehler et al., 2005).

Though widely used in elderly populations, the GDS does raise some concern for use in nursing home populations due to items such as, “Have you dropped many of your activities of interest?”, and “Do you prefer to stay home, rather than going out and doing new

things?" In reality, if an individual makes the transition from a home environment to an institutionalized care setting, he or she will have been forced to sacrifice many preferred activities, and probably does not have many opportunities to leave the institution, let alone to try new things. Although it is generally favoured across elderly populations, it is clear that the GDS should be used with caution in long-term care settings.

At this time, one evidence-based revision can be made to Anderson's study (Anderson et al., 2003): the GDS and the DRS are not correlated, are not interchangeable measures of depression (Koehler et al., 2005); thus one cannot be the determinant of the other's validity. The second contested comparison involving the HDRS can also be refuted on a similar principle. The HDRS is designed to measure the severity of depression after an individual has received a clinical diagnosis of depression (Hamilton, 1967). This can be looked upon as being greatly dissimilar to the DRS whose purpose is to detect possible depression through exhibited depressive symptoms before an official diagnosis has been made.

The DRS's viability in the realm of depression scales is further verified in a recent study involving older adults who were newly admitted to complex continuing care (Martin et al., 2008). The study found the DRS score at admission to be predictive of a new depression diagnosis at follow-up assessment. Additionally, when Diagnostic and Statistical Manual, version IV (DSM-IV) depression criteria-related items were added to the DRS measure, its predictive ability only modestly improved (Martin et al., 2008); thus affirming its most stable function as a detection scale opposed to a severity or diagnostic measure. In keeping with its detection capability, the authors propose that DRS scores of one and two also be flagged by assessors as warranting further attention since these individuals have been found to be

significantly more likely to be diagnosed with depression at follow-up than the reference group (Martin et al., 2008). To date, depression-detection studies have been conducted successfully using the DRS as the scale of choice for at-risk older adult populations (Achterberg, Pot, Kerkstra & Ribbe, 2006; Dalby et al., 2008; Gruneir, Smith, Hirdes & Cameron, 2005; Onder et al., 2007; Soldato et al., 2008). Research has not yet been conducted on the application of the DRS to dominantly younger adult population. This may be attributable to the interRAI organization's objective of targeting populations of disabled, frail and elderly adults, as these populations are mainly comprised of older adults.

2.5 The Self-Report Measure

The self-report measure is the second depression screening tool within the interRAI instruments and is expressed in the form of three questions: In the last 3 days, how often have you felt: a) Little interest or pleasure in things you normally enjoy? b) Anxious, restless, or uneasy? c) Sad, depressed, or hopeless? Though three questions are present, most influence is placed on the final question - feeling sad, depressed or hopeless - transforming the tool into a single-question screening instrument.

Essentially, there are two categories of self-report measures: scales that ask multiple questions, and a single screening question. Of the two, self-report scales have long-established their place within the realm of depression measurement whereas the use of a single question measure is a more recent development.

Within the older adult population, a variety of self-report scales, which are commonly used include: the Beck Depression Inventory (BDI) (Beck, Ward, Mendelson, Mock & Erbaugh, 1961) and its short form (BDI-SF) (Beck & Beck, 1972), the Center for

Epidemiological Studies-Depression Scale (CES-D) (Radloff, 1977), the Geriatric Depression Scale (GDS) (Yesavage et al., 1983) and its short form (GDS-S) (Burke, Roccaforte & Wengel, 1991), and the Hospital Anxiety and Depression Scale (HADS) HADS (Zigmond & Snaith, 1983). As shown in Appendix A, the type of symptom detection varies slightly across the scales, as is the case across the observer-rated scales; but, overall, the scales are fairly analogous consisting of 14-30 items taking approximately 5-15 minutes for administration.

The MDS mood items also succeeded in a trial, involving 204 nursing home residents, for use as a self-report depression screening instrument. Confirming internal consistency, the 16 items were re-structured in a self-report manner and the results were analyzed against those of the comparative measure - the GDS (Ruckdeschel, Thompson, Datto, Streim & Katz, 2004). The MDS items offered comparable results to that of the GDS and it was concluded that the MDS items can reliably and validly be administered as a self-report measure of depression, though further action is yet to be taken in such a direction (Ruckdeschel et al., 2004).

2.5.1 Single Self-Report Question versus Validated Scales

Specifically within older populations, the GDS has been branded as the "gold standard" of self-report screening scales, demonstrating solid sensitivity and specificity levels (Parmalee, Lawton & Katz, 1989; Burns, Lawlor & Craig, 2002). When the single-question screening instrument, "Do you often feel sad or depressed?" (Lachs et al., 1990), was measured against this "gold standard" it was found to be comparably accurate in predicting the presence of depression in a community-dwelling population (Mahoney et al., 1994). Both measures were noted to have low sensitivity for identifying depression; however,

the single question was recognized as having a positive predictive value of 85.4% and a negative predictive value of 90%. In comparison, the GDS had a positive predictive value of 58% and a negative predictive value of 86%.

When this single question, known as the Yale Single Question (YSQ), was further compared against the GDS-S, it was found to have a greater sensitivity in an elderly-based population at 95.8%, whereas the GDS-S reported a lower sensitivity of 79.2% (Gori et al., 1998). In addition, the YSQ achieved a sensitivity equivalent to that of the full GDS, again evidencing its strength and the potential to prevail over a method that involves more extensive resource usage as well as one that is accompanied by many full scale administration-related difficulties.

The only instance, in which research did not prove the YSQ to be more reliable than another self-report scale, was when used within a predominantly middle-aged population of chronic disease sufferers (Avasarala, Cross & Trinkaus, 2003). According to the criterion measure, the BDI, the YSQ did not identify 34.7% of patients who were depressed. However, it was credited as a question that is specific in identifying individuals who are not depressed. Four years later, a similar study was conducted with a comparable population, yet slightly different results were produced – the use of the YSQ was strongly supported as a useful tool for depression screening, reporting a sensitivity of 91% (Vahter, Kreegipuu, Talvik & Gross-Paju, 2007). Despite the transitory fluctuation, the single question secures reliability within elderly populations.

To further study the single-question debate, Chochinov, Wilson, Enns and Lander (1997) conducted a study within an elderly palliative population that compared: i) a single-item interview assessing depressed mood; ii) a two-item interview assessing depressed mood

and loss of interest or pleasure in activities; iii) a visual analog scale; and iv) the BDI-SF. The single-item interview screening method of, "Are you depressed?" outperformed its comparison measures by accurately identifying the final diagnostic outcome of every patient. Chochinov and colleagues (1997) suggested the single question to be the study's most valid depression measure. However, these conclusions should be looked upon with caution considering the single question was administered in the midst of the interview (Lloyd-Williams, Dennis, Taylor & Baker, 2008). In addition, a follow-up study conducted with a similar population reported the "Are you depressed?" question to have a sensitivity of 55% and a specificity of 74%, not reaching the 100% rates of the original study (Lloyd-Williams et al., 2008). Although further study of the single question's performance is necessary, its consistently reported screening ability has the potential to offer new perspective and insight into the issue of depression in adult populations where self-report can be administered.

To date, no study has been conducted to compare the consistency between the DRS and single question screening tool for depression. However, recent evidence does suggest that a significant consistency would result since a study that simultaneously analyzed outcomes between the YSQ self-report and the observer-rated Montgomery-Asberg Depression Rating Scale (MADRS) reported uniformity between the two measures (Watkins et al., 2007). Tested at both a two week period and a three month period, the YSQ evidenced a sensitivity of 86% and a specificity of 84%, followed by a sensitivity of 95% and a specificity of 89% at the later period. As a result, the study supported the single question method as a useful screening tool for identifying possible depression (Watkins et al., 2007).

2.5.2 Strengths and Limitations of Self-Report

The use of a single-question offers many advantages to a frail population. It is understandably less strenuous on the individual as it takes less time and effort to deliver a one word answer of, "yes" or "no"; and, to the same effect, the patient does not need to be able to read, write, or have extensive verbal communication abilities to provide a response (Watkins et al., 2007), though basic comprehension is necessary. There is also less demand placed on clinicians and staff, as minimal training is required for such an assessment. It is consequently evident that a single-question has substantial advantages for both patients and health professionals over both observer-rated and self-report scales (Watkins et al., 2007).

However, it must also be realized, especially within elderly populations, that such a screening measure can have significant limitations as well. Many older adults fail to admit, or may not even recognize the presence of a depressive mood state making the single-question ineffective (Swanwick & Wrigley, 1998). A prevalent problem within this population is that they generally recognize feelings of anhedonia but do not associate the feelings with a depression-related illness (Jefford et al., 2004). An additional issue is the presence of cognitive impairment. From the vantage point of various definitions, prevalence rates of cognitive impairment have been found to range anywhere from 3% to 19% in general elderly populations with a yearly incidence of 8-58 per 1000 (Ritchie, 2004).

Factors of ethnicity and gender must also be considered. For example, individuals of Asian culture acknowledge, report and seek help for depression significantly less frequently than those of other cultures (Parker, Chan & Tully, 2006). Males comprise another population that has consistently underreported levels of depression, which has predominantly

been explained by the influence of sex-related stereotypes (Sigmon et al., 2005). Thus, precautions must be taken.

As previously discussed, the single question screening tool has been evidenced to be at least as accurate as the "gold standard" self-report scale in its predictive abilities (Mahoney et al., 1994) and has performed better than other self-report assessments, such as the BDI-SF, in elderly populations (Chochinov et al., 1997). Therefore, it is reasonable that the YSQ, "Do you often feel sad or depressed" (Lachs et al., 1990), can be used in the place of the self-report scales, such as the GDS. Furthermore, the use of a single question over a self-report scale frees the self-report from the restrictions that often accompany full-length scales. Particularly, using a single question over the GDS could compensate for the limitation exhibited by the GDS when it was contrasted with the DRS measure - its predisposition to favour identifying depression mainly in those with better cognitive functioning (Koehler et al., 2005). Especially in the face of cognitive impairment, it has been suggested that the simpler the self-report scale, the better the quality of information (Gerritsen, Steverink, Ooms, de Vet & Ribbe, 2007); thus, the single question may prove more reliable than the GDS in certain populations.

Ultimately, the single question is significantly shorter in length than the GDS, enhancing clarity, placing less overall demand upon the client, consequently favouring the psychometric quality of the single question over a full-length scale for self-reported predictive ability (Gerritsen et al., 2007). It is thus plausible, due to its close comparability with the GDS as well as its proposed superiority, that the single question can be used independently to accurately screen for the presence of a possible depressed mood state.

2.6 The interRAI-Contact Assessment

In 2006, interRAI collaborated with the Ontario Ministry of Health and Long Term Care to develop an assessment instrument to be implemented as an initial general needs evaluation for all clients within the province's Community Care Access Centres (CCAC) (Hirdes, 2006). This Contact Assessment (CA) will be used to screen all adult CCAC clients for home care and will help determine: the need for comprehensive assessment with the RAI-Home Care (HC); the degree of urgency for initiation of services such as nursing or personal support; and the need for referral to rehabilitation services (Hirdes, 2006). Due to its status as a brief assessment instrument that can be administered in person or over the phone, the CA does not adopt the same breadth of measurement as the CHA, CMH and PC. The assessment utilizes only one item for depression screening – a self-report question, which asks: In the last 3 days, "Have you felt sad, depressed or hopeless?" This question is notably comparable to the YSQ of, "Do you often feel sad or depressed?" (Lachs et al., 1990).

The results produced by the YSQ have proven reliable and accurate, and since limited time is a recognized factor within the screening process, the single question is seen as a reasonable predictive alternative to a full-length scale assessment (Mahoney et al., 1994). Nonetheless, it is still recommended, by the Yale Task Force and subsequent studies that employed the YSQ, that a positive response be followed directly by the administration of another instrument, such as the GDS, or an in-depth clinical interview, for a more thorough evaluation (Lachs et al., 1990; Mahoney et al., 1994). This conclusion is supported by the CA since the instrument is designed solely as a screening measure to generally identify health service needs. If one of the several items are "flagged" as a potential problem, indicating the need for further evaluation, the CA redirects clients accordingly to a more comprehensive

assessment, such as the RAI-HC, which administers more thorough tools, including the DRS. Considering reported prevalence estimates of 13.5% for clinically diagnosed major depression among home care clients (Bruce et al., 2002), it is important that the CA have accurate screening ability when assessing clients to determine their health service needs.

3.0 Study Rationale and Research Objectives

3.1 Study Rationale

The overall purpose of this research was to validate the single self-report question as a screening tool for depression. Since assessments, such as the interRAI-CA, may offer the single question as their only depression measure, it was important to inform the question's ability to independently screen for a possible depressed mood state. This research speaks to the criterion validity of the single self-report question by investigating the consistency between the single question with the validated DRS.

A performance comparison of the two measures using three interRAI instruments, which all house and concurrently administer both measures, was first conducted to establish the best suited DRS cut-point for possible depression-detection in relation to the self-report measure. The criterion validity of the self-report measure was then informed by using the single question on the interRAI-CA screener and measuring its detection consistency with the DRS on the follow-up RAI-HC. These methods were necessary to first establish the DRS detection threshold best suited to detect a possible depressed mood state, and then to inform the validity of the single self-report screening question in accurately detecting a possible depressed mood state. The study was limited to those measures present within the studied assessment instruments. The self-report item and the DRS are concurrently present within three of the study assessments: the interRAI-CHA, the interRAI-CMH and the interRAI-PC; and also within the constructed matched interRAI-CA-RAI-HC dataset.

These two methods allow the consistency to be explored at a single point in time, when there is minimal opportunity for change in state and circumstance, and at two different

points in time, considering the time of administration of a follow-up assessment can vary across clients. Taking on two different approaches offers the potential for unique findings. Research has not yet been conducted with this breadth or with these particular objectives, thus great implication may be offered for researchers, practitioners, and policymakers within the field of depression screening.

A secondary endeavour of this research was to explore the relationships of the depression measures with selected possible predictor variables, which can further aid in depression recognition. To gain a greater understanding of the relationships across different populations, this research, again, employed two approaches. These approaches allowed the relationships to be explored according to different depression measures, and according to varying levels of the selected possible predictor variables. This offers more in-depth insight to the existing research on depression and its associated factors since the relationships were compared across populations and according to different measures of depression within a single study.

The RAI data is a particularly strong data source to use to meet the objectives of the proposed research. InterRAI offers instruments which concurrently administer both the single self-report question and the DRS, and also instruments which administer only one of the two depression measures of interest, but can be intrinsically linked to allow for comparison of the two measures for a single client.

3.2 Research Objectives

This research has three overarching objectives:

1. To explore the DRS cut-point best suited to detect the presence of a possible depressed mood state by comparing the performance of different DRS thresholds with the simultaneously measured self-reported "sad, depressed, and hopeless" item.
2. To explore the relationships between selected predictor variables and multiple depression-related outcome measures.
3. To explore the criterion validity of the single self-report question on the interRAI-CA screener with the follow-up DRS measure on the RAI-HC.

4.0 Methods

4.1 Data

4.1.1 Data Source

This study involves an analysis of secondary data. In an effort to achieve the proposed research objectives, data was obtained from the interRAI research organization in the form of four study populations: the interRAI-CHA, the interRAI-CMH, the interRAI-PC, and the combined interRAI-CA screener with follow-up RAI-HC.

4.1.2 Study Populations

interRAI-CHA (CHA) Sample

The interRAI-CHA sample is comprised of 987 assessments, which were collected from May 2005 to June 2006. The assessments were conducted by trained assessors of Ontario Community Support Agencies from which these individuals received services and/or supportive housing. The sample is composed primarily of elderly individuals, with more than 90% being over the age of 75 years. These individuals live in their own private residences or in supportive housing and do not receive formal home care service. The data for this sample was collected for the purpose of a pilot implementation of the CHA instrument. Although a follow-up assessment was completed for most individuals, this sample contains only those first assessments for the individuals who received two.

interRAI-CMH (CMH) Sample

The interRAI-CMH sample is comprised of 1,015 assessments, which were collected from January 2005 to July 2006. The assessments were conducted by trained assessors employed by Newfoundland and Ontario community mental health service agencies. The mean age of the sample is 47, and approximately 17% are over 65 years of age. These individuals reside in the community and were assessed either in this setting or in the offices of the community mental health service agencies for the purpose of a pilot implementation of the CMH instrument.

interRAI-PC (PC) Sample

The interRAI-PC sample is comprised of 1,539 assessments, which were collected from June 2006 to December 2007. The assessments were conducted by trained assessors in Ontario CCACs and complex continuing care (CCC) palliative units. The mean age of the sample is 71 years, with nearly 69% being over the age of 65 years. Approximately 72% of the sample is from a client's first assessment and 19% is from a client's second assessment.

interRAI-CA (CA) -RAI-HC (HC) Sample

The comparative interRAI-CA sample is comprised of 63,845 assessments, which were collected from May, 2006 to March, 2008. The interRAI-CA-RAI-HC sample is comprised of 9,611 assessments, which were collected May, 2006 to January, 2008. This dataset is comprised of individuals who have been assessed with both the CA screener and follow-up HC assessment.

4.2 RAI Instruments

The RAI instruments are a collection of standardized and comprehensive assessment tools designed by an international research consortium known as interRAI. The organization has produced a variety of instruments, which collect quality characteristic and outcome data, to address the health service needs of populations who are elderly, frail, or disabled. The overarching goal is to advocate an evidence-based foundation for clinical practice and policy decisions (see www.interrai.org). Due to copyright laws, the assessment instruments cannot be displayed within this document. Instruments may be requested through interRAI's website: www.interrai.org**.**

interRAI-Community Health Assessment (CHA)

The CHA is designed to assess the general health service needs of those community-based populations who are not receiving home care services. Those assessed with the CHA may include individuals who are receiving services from volunteer-based or other community service organizations (such as Meals-on-Wheels or Seniors Friendly Visiting) as well as individuals in supportive housing. The CHA is only in the early years of inception, thus there are no peer-reviewed publications to date that examine its specific performance.

interRAI-Community Mental Health (CMH)

The CMH is designed for use in community-based populations with a broad range of mental health needs. The instrument acts to meet the needs of organizations that serve out-patient populations as well as to complement the RAI-Mental Health instrument, which is conversely used within in-patient populations. The CMH has undergone preliminary

reliability studies, but there are no peer-reviewed publications to date that examine its performance.

interRAI-Palliative Care (PC)

The PC is designed to assess the end of life and care planning needs of individuals across the continuum of care. This assessment is specifically comprehensive for those at the end of life and has proven reliable across multiple sites of care (Steel et al., 2003).

RAI-Home Care (HC)

The HC is designed to assess the health status and care needs of the clients of home care agencies. The HC has proven its reliability in trials conducted in five countries (Morris, Fries, Carpenter & Bernabei, 1996).

interRAI-Contact Assessment (CA)

The CA is designed to act as the initial general health needs evaluation for all clients entering into services provided by home care. In Ontario, these cases are managed by Community Care Access Centres (CCAC). This brief assessment instrument helps to determine: the need for comprehensive assessment with the RAI-HC; the severity of need for initiation of services such as nursing or personal support; and the need for referral to rehabilitation services (Hirdes, 2006). The CA has only been recently developed and implemented, thus there are no peer-reviewed publications to date that examine its performance.

4.3 Scales Embedded in the RAI Instruments

There are various outcome measures embedded within the interRAI instruments, which can be used to evaluate and monitor changes in an individual's clinical status. For the purposes of this study, the following outcome measure scales will be used:

The Depression Rating Scale (DRS)

Please see section 4.4.2 for a detailed description of the DRS.

The Cognitive Performance Scale (CPS)

The CPS is used as a measure of cognitive impairment. The scale considers measures of short-term memory, levels of consciousness, and executive function, and produces scores ranging from 0 (intact ability) to 6 (severe impairment). The CPS has proven to be highly correlated with the Mini Mental State Examination (MMSE) in validation studies (Morris et al., 1994).

The Pain Scale

The Pain Scale is used as a measure of pain severity. Using items of pain frequency and pain intensity, the scale produces scores ranging from 0 to 3, with an elevated score indicating a more severe condition (Fries, Simon, Morris, Flodstrom & Bookstein, 2001).

The Instrumental Activities of Daily Living (IADL) Involvement Scale

The IADL Involvement Scale is used as a measure of independent activity ability. There are seven activities considered for the scale: meal preparation, ordinary housework,

managing finances, managing medications, phone use, shopping, and transportation. Ranging in score from 0 to 21, a higher score is indicative of greater difficulty in performing the instrumental tasks (Landi et al., 2000).

4.4 Variables

4.4.1 Predictor Variables

The selection of variables for the proposed research was guided largely by findings encountered throughout the review of the literature, but was notably limited to those variables which are measured within the interRAI assessments. In addition, the presence of similar variables across the three datasets (CHA, CMH, and PC) influenced selection due to comparability considerations. The selected variables are identified in Appendix B by name and specific location in each respective assessment. Upon reviewing the datasets, a number of variables were collapsed for analyses purposes. The specific collapsing was guided by the research objectives but ultimately decided by the researcher. The specific collapsing is presented in Appendix C.

4.4.2 Outcome Measures

Depression Rating Scale (DRS)

The DRS is used to detect depressive symptoms and acts as an indicator of a possible depressed mood state. Seven summated items comprise the DRS and are instructed to be examined in reference to a limited time frame of three days prior to assessment. The items are:

1. negative statements;
2. persistent anger with self or others;
3. expressions of unrealistic fears;
4. repetitive health complaints;
5. repetitive anxious complaints or concerns;
6. sad, pained or worried facial expressions; and
7. crying or tearfulness.

Assessors are to answer these items as either: 0(not present); 1(present but not exhibited in last 3 days); 2(exhibited on 1-2 of last 3 days); or 3(exhibited daily in last 3 days). The scale produces a cumulative score ranging from 0-14: 0 (none), 1-2 (mild), 3-5 (moderate), and 6+ (severe). A cut-point of three-plus is reported to act as a valid indicator of the presence of a possible depressed mood state (Burrows et al., 2000). The DRS has been validated against the Hamilton Depression Rating Scale and the Cornell Scale for Depression in Dementia (Burrows et al., 2000).

The DRS is embedded within the mood, or mental state sections within each of the following RAI instruments:

- interRAI-CHA (Section E – Variables e1a-e1g)
- interRAI-CMH (Section C – Variables c1a, c1b, c1d, c1o, c1p, c1cc, c1ee)
- interRAI-PC (Section H – Variables h1a-h1g)

The DRS is also found within the RAI-HC, but does not offer identical response options as the three aforementioned instruments. The response options are: 0(indicator not exhibited in last 3 days); 1(exhibited 1-2 of last 3 days); and 2(exhibited on each of last 3 days). Instead of differentiating between the options of, “not present” and “present but not

exhibited in last 3 days", only one such option of "indicator not exhibited in last 3 days" is offered. The DRS is embedded within the mood section of the following RAI instrument:

- RAI-HC (Section E – Variables e1a-e1g)

Self-Report Measure of Depression

The self-report measure of depression is a single question tool, which is also found within the mood, or mental state sections of most RAI assessment instruments. The self-reported mood sub-section is comprised of the following three questions, which are all prefixed with, "In the last 3 days, how often have you felt…":

a) Little interest or pleasure in things you normally enjoy?

b) Anxious, restless, or uneasy?

c) Sad, depressed, or hopeless?

Clients then have the option to answer each question as: 0(not in last 3 days); 1(not in last 3 days, but often feels that way); 2(in 1-2 of last 3 days); or 3(daily in last 3 days). There is also the option of recording an '8' - "person could not (would not) respond", if applicable.

Although there are three self-report questions, only one question will be used as an indicator of possible depression: "In the last 3 days, how often have you felt sad, depressed, or hopeless?" This question has proven accurate when used independently to screen for depression (Chochinov et al., 1997; Gori et al., 1998; Mahoney et al., 1994; Vahter et al., 2007). The self-report question is present within the following interRAI instruments:

- interRAI-CHA (Section E – Variable e2c)
- interRAI-CMH (Section C – Variable c4c)
- interRAI-PC (Section H – Variable h2c)

The single question measure is also found within the interRAI-CA, but is not presented in an identical fashion to the question in the three aforementioned instruments. The question is presented in a yes/no format and asks: "In the last 3 days, have you felt sad, depressed, or hopeless?" Again, the client and/or assessor has the opportunity to answer 0(no), 1(yes), or 8(person could not (would not) respond). The single question can be found in the clinical evaluation section of the following interRAI instrument:

- interRAI-CA (Section C – Variable c16)

Since the CA only has a dichotomous yes/no response option, the self-report outcome will be collapsed into a yes/no response item in the CHA, CMH, and PC datasets for generalizability purposes. The "yes" response will be comprised of the original 1(not in last 3 days, but often feels that way), 2(exhibited on 1-2 of last 3 days), and 3(daily in last 3 days) responses. The "no" response will be comprised of the original 0(not in last 3 days) response. The 8(person could not (would not) respond) responses will be explored separately.

4.5 Analysis Plan

In an effort to meet the research objectives, three research questions have been developed. The research questions, accompanied by proposed methods and analyses, are presented in the following sections. All analyses will be conducted using the statistical software, SAS, version 9.1 (SAS Institute Inc., Cary, North Carolina).

4.5.1 Research Questions

Existing research has examined the general comparison of both self-report scales and a single-question with observer-rated scales, but no research has been conducted specifically comparing a single self-report depression question with the observer-based DRS. Through analyses of those interRAI assessments that house both the observer-rated DRS and the single question self-report measure (CHA, CMH, and PC), the DRS cut-point that is best suited for the detection of a possible depressed mood state was explored through comparison with the self-report item. The criterion validity of the self-report item was then explored by comparing the association of the single self-report question on the CA with the validated DRS measure on the follow-up HC.

It must be noted that the self-report measure within the three interRAI instruments, the CHA, CMH, and PC, is not designed as a yes/no response item. It is a multi-response item with options of 0(not in last 3 days), 1(not in last 3 days, but often feels that way), 2(exhibited on 1-2 of last 3 days), 3(daily in last 3 days), and 8(person could not (would not) respond). The item was initially explored and compared with the DRS outcomes using its multiple responses. However, the self-report item on the CA, the end focus of this research, presents a dichotomous yes/no response option. Generalizability from the aforementioned instruments to the CA is essential to form the most credible conclusion; therefore the self-report question was ultimately collapsed into a yes/no response item in the CHA, CMH, and PC datasets. The "yes" response was comprised of the original 1(not in last 3 days, but often feels that way), 2(exhibited on 1-2 of last 3 days), and 3(daily in last 3 days) responses. The "no" response was comprised of the original 0(not in last 3 days) response. The 8(person

could not (would not) respond) responses, unless otherwise specified, were left out of further analyses.

4.5.1.1 Research Question 1

By examining two simultaneously assessed indicators of depression: a) the DRS depressive symptom detection measure; and b) the self-report measure of a depressed mood state, with data from three different assessment instruments (the interRAI-CHA, the interRAI-CMH, and the interRAI-PC) the following research questions were informed:

1. What are the prevalence rates of observer-rated depressive symptoms according to the DRS as:
    a. A unitarily distributed version from 0 to 14?
    b. A categorically collapsed version of 0 (none); 1-2 (mild); 3-5 (moderate); and 6+ (severe)?

Statistical Method: Univariate Analysis – Frequency Distribution

2. What are the prevalence rates of self-reported depression as:
    a. A multi-response scale of 0 (not in last 3 days); 1 (not in last 3 days, but often feels that way); 2 (in 1-2 of last 3 days); 3 (daily in last 3 days); and 8 (person could not/would not respond)?
    b. A dichotomous yes/no scale of 0 (no (0) = not in last 3 days) and 1 (yes (1, 2, 3) = not in last 3 days, but often feels that way; in 1-2 of last 3 days; and daily in last 3 days)?

Statistical Method: Univariate Analysis – Frequency Distribution

3. What are the relationships between the two depression indicators when using:
    a. The DRS with a detection threshold of:
        i. A one-plus cut-point?
        ii. A two-plus cut-point?
        iii. A three-plus cut-point?
    b. The self-report as:
        i. A dichotomous yes/no scale of 0 (no (0) = not in last 3 days) and 1 (yes (1, 2, 3) = not in last 3 days, but often feels that way; in 1-2 of last 3 days; and daily in last 3 days)?

Statistical Method: Bivariate Analysis – Cross-Tabulations & Chi-Square Test; Phi Correlations; Logistic Regression: c Statistic

4. Following from the above analyses, when compared against the findings for the self-report measure, which DRS threshold(s) appears to be most fitting for detecting a possible depressed mood state in each population?

Datasets: CHA; CMH; PC

Implication

It is beneficial that the two depression measures of interest are able to be administered and measured simultaneously within the same instrument since the possibility of confounding, due to timing differential, is substantially lessened. This lends insight to the later comparison between the CA screener and the follow-up HC depression measures, since the CA only administers the self-report question, and the HC only administers the DRS. The outcome of this comparison between the self-report and the different DRS thresholds across three different populations will inform the DRS cut-point best suited to detect a possible depressed mood state and will provide necessary insight into the field of depression screening and detection approaches.

4.5.1.2 Research Question 2

Analyses were conducted according to both the determined DRS threshold (from question one analysis) and the "yes" responses from the collapsed yes/no self-report depression item, across three different assessment instruments (the interRAI-CHA, the interRAI-CMH, and the interRAI-PC). Two possible approaches were explored to look at the performance of the measures: a) comparing correlations of the two depression measures among strata of selected predictor variables; and b) comparing odds ratios of selected predictor variables on the depression measures.

Therefore, what are the relationships between depression and the predictor variables listed in Table 1 according to the following approaches:

1. Using the DRS and the self-report as the outcome measures of depression, do the associations differ by level of the variable and across populations?

Statistical Method: Bivariate Analysis – Spearman Correlations & Point Biserial Correlations; Confidence Intervals

2. Using the two outcome measures of depression, do the relationships between depression and the predictor variables differ according to the depression measure used, and across populations?
    a. The DRS measure
    b. The dichotomized self-report measure
    c. The DRS measure, excluding those who could not or would not respond to the self-report measure (i.e. the '8' responses of "could not (would not) respond")

Statistical Method: Bivariate Analysis – Logistic Regression: Odds Ratios; Confidence Intervals; c Statistic

Table 1. Comparison of predictor variables by interRAI Instrument

Study Variables	Data Sources		
	CHA	**CMH**	**PC**
Outcome Measures			
DRS 1+	X	X	X
Self-Reported Depression	X	X	X
Predictor Variables			
Demographic Variables			
Age	X	X	X
Gender	X	X	X
Marital Status	X	X	X
Living Status (e.g. private or group home)	X	X	X
Living Arrangement (e.g. alone)	X	X	X
Mood Variables			
Change in Mental Status		X	X
Psychiatric Diagnosis of Depression	X		
Provisional Diagnosis of Mood Disorder		X	
Number of Lifetime Psychiatric Admissions		X	
Personality Variables			
Consistent Positive Outlook		X	X
Function Variables			
ADL Status - Personal hygiene, Walking	X	X	X

Study Variables	Data Sources		
	CHA	**CMH**	**PC**
Worsened ADL Status	X	X	X
IADL Involvement Scale Score	X	X	
Cognition Variables			
Cognitive Performance Scale	X	X	X
More Impaired Decision Making	X	X	X
Health Condition/Additional Diagnoses Variables			
Diagnosis of Dementia	X	X	
Pain Scale Score	X	X	X
GI Status – Acid Reflux, Constipation, Diarrhea, Vomiting	X	X	X
Prognosis – Estimated Survival			X
Social Support			
Strong and Supportive Family Relationship	X	X	X
Conflict with family or friends	X	X	

Datasets*:* CHA; CMH; PC

Implication

The exploration of depression's associated factors has the potential to have significant implication in the field of depression screening. By identifying the associated factors within three distinct populations, people can be made more aware, and depression can be more readily detected and subsequently treated. Timely identification is especially necessary as many individuals do not have ready access to the specialized health services that have the resources to either administer an assessment to detect depressive symptoms, or to diagnose a depression disorder.

4.5.1.3 Research Question 3

By examining and comparing the depression-related outcomes of the interRAI- CA's dichotomous yes/no self-report measure with the follow-up RAI HC's DRS measure, the following prevalence rates will be informed and, consequently, the criterion validity of the self-report measure:

1. Positive self-report and positive DRS?
2. Negative self-report and negative DRS?
3. Positive self-report and negative DRS?
4. Negative self-report and positive DRS?

Statistical method: Bivariate Analysis - Cross-Tabulations & Chi-Square Test; Phi Correlations; Logistic Regression: c Statistic

Dataset: CA-HC

Implication

The CA is administered to all adult clients entering into Ontario's Community Care Access Centres for home care and has only the single self-report question as its depression measure. If this depression measure is not 'flagged', then it is possible that a client's depression will go undetected and, consequently, untreated. Therefore, it is important that the criterion validity of the single question is informed through the comparison with another validated screening/detection measure.

4.5.2 Univariate Analyses

Univariate analyses were used for descriptive purposes. Univariate analyses were performed to describe the characteristics of the study samples, both the DRS and self-report depression measures, and the potential predictor variables outlined in Table 1. Frequency distributions are presented for each descriptive analysis.

4.5.3 Bivariate Analyses

Bivariate analyses were used to measure the relationships between the depression measures, and between the outlined depression-related outcome measures and the selected possible predictor variables. Firstly, cross-tabulations and Pearson chi-square statistics, as well as phi correlations and the c statistics were used to compare DRS scores with their self-reported depression responses. Secondly, Spearman correlations and confidence intervals

were used to explore the associations between the DRS and self-report measures with selected possible predictor variables. Thirdly, bivariate logistic regression, in conjunction with odds ratios and confidence intervals, were also used to explore the relationships between the two individual depression measures with the potential predictor variables.

Both correlation analyses and logistic regression analyses were used to explore the relationships between the selected predictor variables and the depression-related outcome measures from two different approaches. The correlation coefficients expressed the strength of the variable relationships within the three datasets. This facilitated a clear comparison of the role of each variable within and between each dataset. The logistic regression's point estimates expressed the odds of each of the variables for predicting the investigated outcomes. In addition, the discriminatory predictive strength of each variable was informed through the resulting model fit.

4.6 Ethics

The data set for this research was obtained from the interRAI research organization. An application for access to the data was submitted to and approved by interRAI; an ethics application was also submitted to and approved by the University of Waterloo Office of Research Ethics.

5.0 Results

5.1 Client Characteristics

5.1.1 Characteristics of the CHA, CMH, and PC Samples

Client characteristics were first measured across the interRAI -Community Health Assessment (CHA), the interRAI-Community Mental Health (CMH) and the interRAI-Palliative Care (PC) sample populations. The presented characteristics are inclusive of missing values and were chosen primarily for comparability purposes across the three datasets (see Table 2).

The CHA sample population was the only population of the three that deviated substantially from a more even sex distribution, with 76.0% of the sample being comprised of females. The three datasets each offered a differently aged population with the mean (SD) ages being: 82.8 (6.5) years in the CHA sample; 47.3 (17.2) years in the CMH sample; and 70.9 (13.6) years in the PC sample. The dominant relationship status in each population supported this distinction as the individuals in the CHA population had a leading percentage of individuals who had been widowed and were now living alone, the CMH of those who were never married, and the PC of those who were currently married or partnered. Despite differences in age and marital situation, living in a private home was the most common living state for the majority across the three samples and institutionalized living was extremely rare in all but the CMH population, which had an institutionalized population of 18%. This institutionalized setting includes any type of hospitalization, hospice facility and long-term care facility setting.

The three sample populations proved to be fairly independent in their activities of daily living. Both the CHA and CMH populations had majorities of 90.2% and 88.6%, respectively, for independent abilities regarding personal hygiene, whereas the PC population still had a leading independent ability percentage of 45.4. The majority of all samples were able to walk independently without any assistance.

The calculated outcome measures for the populations included scores from the cognitive performance scale (CPS), the Pain Scale, the Instrumental Activities of Daily Living Involvement Scale (IADL), and the Depression Rating Scale (DRS). The PC sample proved to be the most cognitively impaired population of the three with 24.4% reporting a CPS score of two-plus; this prevalence was only marginally greater than the CMH sample, which reported 24.2%. The PC sample also reported the most daily pain within its sample at 59.7% - the highest prevalence by over 30%. The CHA sample had the slightly greater percentage with an IADL Scale score of six-plus in comparison to the CMH sample, which is indicative of greater difficulty performing instrumental tasks such as meal preparation and housework. No comparison could be drawn with the PC sample since the IADL Scale is absent within the PC assessment.

Multiple depression measures were calculated within the three populations. According to the determined one-plus DRS threshold, the CMH sample detected the highest prevalence of a possible depressed mood state at 55.9%, followed by the PC sample at 24.9%, and then closely by the CHA sample at 24.4%. Further, according to the dichotomized self-reported depression item, 51.0% of the CMH sample reported the presence of a depressive mood state, as did 23.7% of the PC and 20.2% of the CHA. The CHA sample

was the only population, which had an assessment with a depression diagnosis item. Of this sample, 16.8% were reported to have a medical diagnosis of depression.

Table 2. Client characteristics for the CHA, CMH, and PC sample populations separated according to those who did respond to the single self-report depression item, and those who did not respond to the single self-report depression item.

Characteristic	Study Sample					
	CHA		CMH		PC	
	Self-Report Respondents (n=979)	Self-Report Non-Respondents (n=8)	Self-Report Respondents (n=943)	Self-Report Non-Respondents (n=72)	Self-Report Respondents (n=1250)	Self-Report Non-Respondents (n=151)
Age (years): mean (SD)	82.8 (6.5)	83.6 (5.7)	46.9 (17.0)	52.5 (18.7)	70.4 (13.3)	73.7 (14.8)
Missing (%)	0.0	0.0	0.0	0.0	3.8	0.0
Sex (%)						
Male	23.6	50.0	50.8	41.7	48.1	53.8
Female	76.2	50.0	45.4	55.5	51.8	46.2
Missing	0.2	0.0	3.8	2.8	0.2	0.0
Marital Status (%)						
Never Married	3.8	0.0	46.9	26.4	6.7	5.8
Married/Partnered	27.0	50.0	20.9	48.6	56.7	57.7
Separated/Divorced	64.5	37.5	5.4	8.3	26.8	29.5
Widowed	4.3	12.5	25.3	16.7	8.2	5.8
Missing	0.5	0.0	1.5	0.0	1.5	1.3
Living Status (%)						
Private Home	76.9	87.5	65.5	77.8	90.1	85.3
Specialized Home	23.0	12.5	7.5	2.8	2.0	4.5
Institution	0.0	0.0	18.4	13.9	2.6	9.0
Missing	0.1	0.0	7.6	4.2	4.9	0.6
Living Arrangement (%)						
Alone	64.3	50.0	31.4	27.8	22.4	13.5
With Spouse/Partner	23.9	50.0	21.0	47.2	50.2	54.5
With Other Relative	9.4	0.0	21.5	6.9	17.3	21.8

Characteristic	Study Sample					
	CHA		CMH		PC	
	Self-Report Respondents (n=979)	Self-Report Non-Respondents (n=8)	Self-Report Respondents (n=943)	Self-Report Non-Respondents (n=72)	Self-Report Respondents (n=1250)	Self-Report Non-Respondents (n=151)
With Non-Relative	2.4	0.0	26.0	18.1	3.6	7.1
Missing	0.1	0.0	0.1	0.0	6.6	3.2
ADL Self-Performance (%)						
Personal Hygiene						
Independent	90.5	50.0	89.5	76.4	49.5	26.3
Set-up Help/Supervision	4.9	25.0	6.2	12.5	19.7	7.7
Assistance	3.7	12.5	3.3	2.8	19.9	16.0
Total Dependence	0.7	12.5	1.0	5.6	9.5	47.4
Missing/Did Not Occur	0.2	0.0	0.1	2.8	1.4	2.6
Walking						
Independent	86.6	37.5	95.8	90.3	55.9	30.8
Set-up Help/Supervision	7.9	25.0	2.0	2.8	17.9	9.6
Assistance	3.5	12.5	1.6	2.8	12.3	16.7
Total Dependence	0.8	12.5	0.3	1.4	2.4	4.5
Missing/Did Not Occur	1.2	12.5	0.3	2.8	11.4	38.5
Diagnosis of Dementia (%)	5.7	37.5	8.4	12.5	N/A[a]	N/A[a]
Diagnosis of Alzheimer's (%)	4.7	37.5	N/A[a]	N/A[a]	N/A[a]	N/A[a]
Diagnosis of Mood Disorder (%)	N/A[a]	N/A[a]	54.5	66.7	N/A[a]	N/A[a]
Diagnosis of Depression (%)	16.8	75.0	N/A[a]	N/A[a]	N/A[a]	N/A[a]
Outcome Measures						
DRS 1+	24.1	62.5	55.3	63.9	24.6	30.8
CPS 2+	13.2	62.5	23.5	33.3	18.9	50.0
Pain Scale 2+	28.7	50.0	15.5	13.9	60.0	73.1
IADL Scale 6+	40.8	62.5	32.9	36.1	N/A[a]	N/A[a]

Characteristic	Study Sample					
	CHA		CMH		PC	
	Self-Report Respondents (n=979)	Self-Report Non-Respondents (n=8)	Self-Report Respondents (n=943)	Self-Report Non-Respondents (n=72)	Self-Report Respondents (n=1250)	Self-Report Non-Respondents (n=151)
Supportive Family Relationship (%)	92.0	75.0	64.7	51.4	90.2	90.4
Experiencing Family Conflict (%)	20.3	37.5	32.0	12.5	N/A[a]	N/A[a]

[a]N/A = Measure not available within instrument

5.1.1.1 Characteristics of the Self-Report's "Could Not (Would Not) Respond" Item in the CHA, CMH, and PC Samples

Additional descriptive characteristics were explored for the self-report item's "could not (would not) respond" response option within the CHA, CMH, and PC samples (see Table 2). These client characteristics were explored because one of the analytic approaches to the measurement of the relationships between possible predictor variables and depression-related outcomes specifically excludes the "could not/would not" self-report responses within one of its DRS outcome measures. Excluding the clients with the "could not/would not" response option specifically withdrew eight clients from the CHA analysis, 72 clients from the CMH analysis, and 156 clients from the PC analysis.

The eight-client CHA sample had an average age of 83.6 years and was divided by sex into four females and four males. Seven of the eight were living in their private homes and, overall, four lived alone and four lived with a spouse or partner. Of the recorded diagnoses, there were two diagnoses of depression, three diagnoses of Alzheimer's disease, and three diagnoses of dementia. The eight diagnoses belonged to only five of the eight clients. Six clients did not have a worsened ADL status, and seven were not experiencing more impairment in decision making within the last 90 days. It was noted that three of the eight did record the highest possible score of 21 on the IADL Involvement Scale, indicating a severe difficulty in completing instrumental tasks.

The 72 CMH clients had an average age of 52.5 years, and the majority, 57%, were female. Approximately 78% of the clients reported their usual residence to be their private home. A provisional diagnosis of a mood disorder was recorded for 67% of this subset of the

CMH sample. However, 67% scored a zero on the CPS, indicating no cognitive impairment; and 87% did not have a dementia diagnosis.

The 156 PC clients had an average age of 73.7 years. Approximately 48% reported being completely dependent on others for help with the ADL of personal hygiene and 39% of clients' assessments reported that walking did not occur. In addition, 73% expressed experiencing daily or severe daily pain.

5.1.2 Characteristics of the CA and CA-HC Samples

Client characteristics were then measured for the final two study populations – the general interRAI-Contact Assessment (CA), and the client-matched CA and RAI-Home Care (HC) (CA-HC) sample populations. Client characteristics were taken for a general CA population to include both individuals who did and individuals who did not receive a follow-up HC assessment. The presented characteristics are inclusive of missing values and were chosen primarily for comparability purposes across the two datasets (see Table 3).

The majority of both populations were female. The mean (SD) ages of the CA and the CA-HC sample populations were 69.4 (16.9) and 77.2 (12.8) years, respectively. The highest percentage of individuals in the CA and CA-HC populations were residing within their private home. Of those living at home, 20.7% lived alone and 38.6% lived with a spouse or partner within the CA sample, and 30.6% lived alone and 39.0% lived with a spouse or partner in the CA-HC sample. The private living arrangement was also indicative of the level of independence these populations were able to maintain as the majority of both could perform such activities of daily living (ADLs) as personal hygiene and general mobility without needing any supervision or assistance.

The cognitive abilities of both populations were reported to be mostly intact, with only 15.7% of the CA, and 36.7% of the CA-HC sample reported as having modified or impaired cognitive skills. However, whereas 42.3% of the CA sample were said to have unstable cognitive, ADL, mood, or behaviour patterns, a greater 71.8% were said to have similar unstable patterns in the CA-HC sample.

The self-rated health item was similar across the CA and CA-HC samples, as 53.6% and 57.3%, respectively, described their health as being fair to good. Consistency deviated when asked the self-reported depression item, as 16.0% on the CA sample reported feelings of depression whereas 27.1% of the CA-HC sample confirmed the same mood state. Further, when using the one-plus detection threshold for the DRS, 40.9% of the CA-HC sample evidenced a possible depressed mood state.

Table 3. Client characteristics for the general CA sample population and the CA-HC matched assessment sample population

Characteristic	Study Sample	
	General CA Population (n=63845)	CA-HC Matched Assessments (n=9611)
Age (years): mean (SD)	69.4 (16.9)	77.2 (12.8)
Missing	0.0	0.0
Sex (%)		
Male	42.0	37.7
Female	58.0	62.3
Missing	0.0	0.0
Living Status (%)		
Private Home	91.1	88.3
Specialized Home	5.0	8.4
Institution	3.1	2.4
Missing	0.2	0.2
Living Arrangement (%)		
Alone	25.9	30.6
With Spouse/Partner	48.4	39.1
With Other Relative	18.0	21.1
With Non-Relative	7.5	9.0
Missing	0.2	0.2
ADL Self-Performance (%)		
Personal Hygiene		
Independent/Set-up Help	79.8	66.9
Supervision/Assistance	19.9	32.9
Missing	0.3	0.2
Locomotion		
Independent/Set-up Help	77.5	67.6
Supervision/Assistance	22.2	32.2
Missing	0.3	0.2
Cognitive Skills (%)		
Independent	79.6	63.1
Modified or Impaired	20.1	36.7
Missing	0.3	0.2
Unstable Cognitive, ADL, Mood, or Behaviour Patterns (%)	54.1	71.7
Missing	0.3	0.3
Self-Reported Health (%)		
Excellent	5.8	2.0
Good	40.2	26.4
Fair	28.5	30.8
Poor	10.5	15.9
Missing/Could Not/Would		

Characteristic	Study Sample	
	General CA Population (n=63845)	CA-HC Matched Assessments (n=9611)
Not Respond	15.0	24.6
Self-Reported Depression (%)	16.0	27.1
DRS 1+ (%)	N/A [a]	40.9

[a] N/A = Measure is not available within the instrument

5.2 Research Question 1. DRS Threshold

The DRS threshold was explored, across the CHA, CMH, and PC populations, to determine the threshold of best-fit for the detection of a possible depressed mood state. There were few extreme high DRS scores across the three populations (see Table 4), and the highest reported frequency across all was a score of zero, indicating no detection of a possible depressed mood state.

Table 4. Frequency distributions of unitary DRS scores across the CHA, CMH, and PC populations

DRS Score	CHA	CMH	PC
0	75.5%	44.1%	70.8%
1	7.5%	10.9%	9.4%
2	7.0%	10.9%	10.3%
3	2.2%	6.9%	3.1%
4	2.4%	8.2%	4.0%
5	1.9%	4.2%	1.3%
6	1.3%	4.4%	0.5%
7	0.4%	3.0%	0.2%
8	0.5%	2.6%	0.2%
9	0.1%	1.6%	0.0%
10	0.5%	1.3%	0.0%
11	0.1%	0.3%	0.1%
12	0.0%	1.2%	0.1%
13	0.1%	0.2%	0.0%
14	0.3%	0.2%	0.0%

When collapsed categorically, according to severity of the possible depressed mood state, the three populations followed the same distribution pattern with the greatest percentage reporting no depressed mood state, followed by a mild, a moderate, and a severe possible depressed mood state, respectively (see Table 5). The distributions are notably similar between the CHA and the PC samples, with over 90.0% reporting either no or mild scores; however, the CMH sample evidences a more even distribution across its mild, moderate, and severe categories at 21.9%, 19.3%, and 14.7%, respectively. Consequently, a greater proportion of the CMH population reports the presence of a possible depressed state.

Table 5. Frequency distributions of categorically collapsed DRS scores across the CHA, CMH, and PC populations

DRS Score	CHA	CMH	PC
0 (none)	75.5%	44.1%	70.8%
1-2 (mild)	14.6%	21.9%	19.7%
3-5 (moderate)	6.6%	19.3%	8.4%
6+ (severe)	3.3%	14.7%	1.1%

To compare different cut-points in detecting a possible depressed mood state, three thresholds were explored across the CHA, CMH, and PC populations: one-plus, two-plus, and three-plus (see Table 6).

Table 6. Detection of possible depressive symptoms according to different DRS thresholds across the CHA, CMH, and PC populations

Population	DRS Threshold		
	DRS 1+	DRS 2+	DRS 3+
CHA	24.5%	17.0%	10.0%
CMH	55.9%	44.9%	34.0%
PC	29.2%	19.8%	9.5%

The alternate depression measure across the CHA, CMH, and PC assessments is the self-reported depression item. As a multi-response item (see Table 7), the majority of

individuals in both the CHA and PC samples reported no depression–related feelings. Of the CMH sample, 43.4% also reported the absence; however, of the three samples, the CMH sample reported the highest percentage of the presence of daily depression-related feelings with 22.7%. In addition, the PC sample had the highest percentage of those who could not or would not respond to the self-report question. When dichotomized to a yes/no response item, which excludes the "could not/would not respond" responses, the CHA sample had a self-reported depression percentage of 20.2, the CMH of 49.6, and the PC of 23.8.

Table 7. Frequency distribution of the multi-response self-reported depression item across the CHA, CMH, and PC populations

Self-Report Response	CHA	CMH	PC
0 (not in last 3 days)	79.0%	43.4%	57.5%
1 (not in last 3 days, but often)	7.1%	14.1%	6.7%
2 (1-2 of last 3 days)	7.3%	12.8%	9.0%
3 (daily in last 3 days)	5.8%	22.7%	8.1%
8 (could not/would not respond)	0.8%	7.1%	10.1%

To further measure the performance of the aforementioned DRS thresholds in detecting a possible depressed mood state, each threshold was compared against the dichotomized yes/no self-report measure across each of the three populations. Taking the two depression-related outcome measures, chi-square analyses were conducted as were phi correlation analyses and logistic regression analyses. The detection ability of each threshold was then determined by the strength and significance of the resulting correlation, and the model fit presented by the c statistic from the logistic regression model. Tables 8, 13 and 14 present the DRS measure as the disease measure, whereas tables 9, 10, 11, and 12 present a clinical diagnosis of depression as the disease measure.

When comparing the dichotomized self-report measure against multiple DRS thresholds in the CHA population (see Table 8), the performance of the three measured

thresholds varied. Though both the two-plus cut-point and the three-plus cut-point evidenced the highest correlation at 0.45, the one-plus cut-point proved to have the model of best-fit with the self-report at a level of 0.72. To further verify the most fitting threshold, similar analyses were conducted between the three DRS thresholds and the clinical diagnosis of depression variable – the only variable of its kind across the CHA, CMH, and PC assessments. Upon reviewing the performance of the three thresholds, one-plus was found, again, to be the cut-point of best-fit with a c statistic of 0.63, demonstrating the greatest sensitivity at 47% (see Table 9). The two-plus threshold saw a decrease in sensitivity to 38% (see Table 10), and three-plus to 25% (see Table 11).

Table 8. Frequencies, correlation and model-fit analyses conducted between the dichotomized self-report item and multiple DRS thresholds in the CHA population

Self-Report	DRS 1+		DRS 2+		DRS 3+		Total
	No	Yes	No	Yes	No	Yes	
No	67.7%	12.1%	73.3%	6.5%	77.3%	2.5%	79.8%
Yes	8.1%	12.1%	10.1%	10.2%	12.9%	7.3%	20.2%
Total	75.8%	24.2%	83.4%	16.6%	90.3%	9.8%	
Correlation[a]	0.42*		0.45*		0.45*		
c Statistic	0.72		0.71		0.67		
Sensitivity	50%		61%		75%		
Specificity	89%		88%		86%		

*p<.0001
[a]phi Correlation

Table 9. Frequency distribution of depression diagnosis with the DRS 1+ threshold, including tests of association, measurement and model fit in the CHA population

	Depression Diagnosis		
DRS 1+	**Not Present**	**Present**	**Total**
Not Flagged	66.3%	9.0%	75.4%
Flagged	16.7%	7.9%	24.6%
Total	83.2%	16.8%	100.0%
Correlation[a]		0.23*	
c statistic		0.63	
Sensitivity		47%	
Specificity		80%	

* p<.0001
[a]phi Correlation

Table 10. Frequency distribution of depression diagnosis with the DRS 2+ threshold, including tests of association, measurement and model fit in the CHA population

	Depression Diagnosis		
DRS 2+	**Not Present**	**Present**	**Total**
Not Flagged	72.5%	10.5%	83.0%
Flagged	10.7%	6.3%	17.0%
Total	83.2%	16.8%	100.0%
Correlation[a]		0.25*	
c statistic		0.62	
Sensitivity		38%	
Specificity		87%	

* p<.0001
[a]phi Correlation

Table 11. Frequency distribution of depression diagnosis with the DRS 3+ threshold, including tests of association, measurement and model fit in the CHA population

	Depression Diagnosis		
DRS 3+	**Not Present**	**Present**	**Total**
Not Flagged	77.5%	12.5%	90.0%
Flagged	5.7%	4.3%	10.0%
Total	83.2%	16.8%	100.0%
Correlation[a]		0.23*	
c statistic		0.59	
Sensitivity		25%	
Specificity		93%	

* p<.0001
[a]phi Correlation

To justify the measurement and determination of the best-fitted DRS threshold for the detection of possible depression through analysis with the self-report item, a final analysis was conducted involving the self-report item and the clinical diagnosis of depression (see Table 12). The self-report reported similar results as the one-plus DRS threshold with a sensitivity of 47%. It further reported a stronger correlation of 0.30 and a more accurate model-fit of 0.66.

Table 12. Frequency distribution of depression diagnosis with the self-report item, including tests of association, measurement and model fit in the CHA population

	Depression Diagnosis		
Self-Report	**Not Present**	**Present**	**Total**
No	70.7%	8.9%	79.6%
Yes	12.5%	7.9%	20.4%
Total	83.2%	16.8%	100.0%
Correlation[a]		0.30*	
c statistic		0.66	
Sensitivity		47%	
Specificity		85%	

* p<.0001
[a]phi Correlation

When analyzed within the CMH population, the one-plus DRS threshold evidenced the strongest correlation with the self-report item and also the most accurate model-fit (see Table 13). The one-plus cut-point reported an equal correlation to the two-plus at 0.51, however, one-plus further held the best model-fit with a c statistic of 0.76 in comparison to the 0.75 of the two-plus and the 0.73 of the three-plus. In addition, the frequencies of reported depression are most consistent between the dichotomized self-report item and the DRS one-plus threshold.

Table 13. Frequencies, correlation and model-fit analyses conducted between the dichotomized self-report item and multiple DRS thresholds in the CMH population

Self-Report	DRS 1+		DRS 2+		DRS 3+		Total
	No	Yes	No	Yes	No	Yes	
No	33.6%	13.0%	38.4%	8.3%	42.5%	4.1%	46.7%
Yes	11.1%	42.2%	17.9%	36.4%	23.7%	29.7%	53.3%
Total	44.8%	55.3%	55.4%	44.6%	66.2%	33.8%	
Correlation[a]	0.51*		0.51*		0.49*		
c Statistic	0.76		0.75		0.73		
Sensitivity	76%		81%		88%		
Specificity	75%		69%		64%		

* $p<.0001$
[a]phi Correlation

The PC sample revealed the greatest differentiation between the three DRS thresholds when compared against the dichotomized self-report measure (see Table 14). In both the strength of association and accuracy of model-fit, the one-plus threshold reported a correlation of 0.55, the two-plus of 0.50, and the three-plus of 0.40. Further, the c statistic was distributed across the three at 0.77, 0.71, and 0.62, respectively.

Table 14. Frequencies, correlation and model-fit analyses conducted between the dichotomized self-report item and multiple DRS thresholds in the PC population

Self-Report	DRS 1+		DRS 2+		DRS 3+		Total
	No	Yes	No	Yes	No	Yes	
No	63.8%	8.5%	68.0%	4.2%	71.3%	1.0%	72.2%
Yes	9.4%	18.4%	14.3%	13.5%	20.6%	7.2%	27.8%
Total	73.2%	26.8%	82.3%	17.7%	91.8%	8.2%	
Correlation[a]	0.55*		0.50*		0.40*		
c Statistic	0.77		0.71		0.62		
Sensitivity	69%		76%		88%		
Specificity	87%		83%		78%		

*p<.0001
[a]phi Correlation

The analyses, across all three populations – the CHA, the CMH, and the PC – revealed the DRS threshold of one-plus to be the cut-point that performed best against the dichotomous self-report item. In addition, the clinical diagnosis of depression item within the CHA assessment, confirmed the DRS one-plus threshold to be the best performing cut-point in correspondence with a formal diagnosis. Together, as the combined measure of possible depression detection, the one-plus DRS threshold, and the positive self-report response were in agreement regarding the presence of a possible depressed mood state in 12.1% of the CHA sample (see Table 8), 42.2% of the CMH sample (see Table 13), and 18.4% of the PC sample (see Table 14).

Purely for exploratory purposes, the prevalence of an existing depression diagnosis, according to the written-in item for diagnoses, was investigated across the three assessments. The CHA sample reported 12 depression diagnoses, the CMH reported 26, and the PC reported 12. In comparison to the CHA assessment's alternate depression diagnosis variable, the written-in variable does not perform well. Whereas this section reports only 12 clients with a depression diagnosis, the alternate variable reports 166 diagnosed clients.

5.3 Research Question 2. Risk Factors for Depression

5.3.1 Correlation Associations with a Possible Depressed Mood State

To further understand depression in these data, the relationships of several potential risk factors with different depression outcome measures were explored. The relationships were first explored for direction and strength of association through correlation analyses and confidence intervals, obtained through Fisher's z-transformation, across the CHA, CMH, and PC sample populations. The correlations served to express the general strength of the relationships between each selected variable and the depression-related outcome measures and allowed for the comparability of the role of each variable within and between datasets.. The depression outcome measures used were the DRS one-plus detection threshold and the self-report depression item.

In the CHA sample, 17 of the 18 selected possible risk factors were found to be significantly associated with at least one of the two depression outcome measures (see Table 15), with 14 of them at the $p < 0.0001$ significance level. Sixteen held significance across both outcome measures, nine of which were significant at the $p < 0.0001$ level.

The most strongly associated factor was, correspondingly, an existing clinical diagnosis of depression for both the self-reported depressed mood state item and the DRS. Further, having a diagnosis of dementia was also found to be significant across both as was having a higher score of the CPS and experiencing an increased impairment in decision making ability. Having a diagnosis of Alzheimer's disease was of greater significance with the DRS measure, but also proved significant with the self-report measure.

Although the levels of significance differed for both ADL abilities of personal hygiene and walking across the two outcome measures, worsening ADL status was

significant with both the self-report item and the DRS at the $p < 0.0001$ level. Further, in comparison to the ADL items, the continuous IADL Involvement Scale, which is indicative of independent activity ability, suggests an even stronger association with both outcome measures.

Physical symptoms such as pain, and some elements of gastrointestinal (GI) status were significantly related to a depressed mood state; acid reflux was the exception. The element of support and the presence of conflict were both analyzed and found to play a significant role. The strength and supportiveness of family was found to be associated with a negative self-report response and a lower DRS score. Alternately, reported conflict with family and friends was found to be indicative of self-reported depression and positive DRS detection.

Age was found to be weakly associated with only the DRS measure, expressing a lower age to be associated with an increased detection of a possible depressed mood state. The female sex also evidenced a weak association with detection, but solely according to the self-report measure.

Table 15. Correlation associations with both the dichotomous self-report measure of depression and the DRS in the CHA population

Variable	Self-Report Correlation (95% CIs)	DRS 1+ Correlation (95% CIs)
Age	-0.04 (-0.11-0.02)	-0.09 (-0.15- -0.02)*
Sex (Female)	0.10 (0.03-0.16)*	0.04 (-0.3-0.10)
Diagnosis of Depression	0.30 (0.24-0.35)**	0.23 (0.17-0.29)**
Personal Hygiene	0.12 (0.05-0.18)*	0.18 (0.12-0.24)**
Walking	0.10 (0.04-0.16)*	0.22 (0.16-0.28)**
Worsened ADL Status	0.13 (0.07-0.19)**	0.18 (0.12-0.24)**
IADL Involvement Scale	0.18 (0.12-0.24)**	0.22 (0.16-0.28)**
Cognitive Performance Scale	0.16 (0.10-0.22)**	0.17 (0.11-0.23)**
More Impaired Decision Making	0.13 (0.07-0.20)**	0.18 (0.12-0.24)**
Diagnosis of Alzheimer's Disease	0.10 (0.04-0.17)*	0.14 (0.08-0.20)**
Diagnosis of Dementia	0.14 (0.08-0.20)**	0.15 (0.09-0.21)**
Pain Scale Score	0.11 (0.05-0.17)*	0.13 (0.06-0.19)**
Acid Reflux	0.03 (-0.03-0.09)	0.03 (-0.03-0.10)
Constipation	0.12 (0.06-0.18)*	0.06 (0.00-0.13)
Diarrhea	0.17 (0.11-0.23)**	0.12 (0.06-0.18)**
Vomiting	0.09 (0.03-0.16)*	0.12 (0.06-0.18)**
Strong and Supportive Family Relationship	-0.15 (-0.21- -0.09)**	-0.17 (-0.23- -0.11)**
Conflict with Family or Friends	0.16 (0.10-0.22)**	0.22 (0.16-0.28)**

*$0.0001<p<0.05$ **$p<0.0001$

The CMH sample found significance at the 0.05 level among all of its selected predictor variables (see Table 16). Of the three, the CMH was the only sample to report significance of both age and sex across both outcome measures. Younger age was found to have significant association with the self-report and with the DRS, and being female was shown to be strongly associated with self-reported depression and DRS detection.

In accordance with its connotation with depression, having a provisional diagnosis of a mood disorder was significantly associated with both outcome measures, as was the

number of lifetime psychiatric admissions, with a trend of stronger association with the DRS. A provisional diagnosis of dementia was associated with a self-reported depressed mood state but not with the DRS measure. In this community mental health population, the CPS variable proved significantly but quite weakly associated with only the DRS outcome measure. Experiencing a change in mental status and an increased impairment in decision making were more significant according to both outcome measures.

By means of physical symptoms and activity ability, inconsistency in the association with the outcome measures was prevalent throughout. The IADL Involvement Scale proved significant across both measures; however ADL abilities and ADL status fluctuated. All explored components of GI status – acid reflux, constipation, diarrhea, and vomiting – evidenced small but significant associations in a consistent direction across the two outcomes. Pain proved to be the physical symptom, which reported relatively strong positive associations with both the self-reported depressed mood state and the DRS measure.

Strength of familial supportiveness and conflict with family and friends were both significantly related with both self-reported depressed mood and DRS detection in the expected directions, respectively. Overall, the strongest predictor of a depressed mood state, based on point estimate correlations, resulted to be having a consistent positive outlook, an increase of which inspired a decrease in both a self-reported depressed mood state and lower DRS detection.

Table 16. Correlation associations with both the dichotomous self-report measure of depression and the DRS in the CMH population

Variable	Self-Report Correlation (95% CIs)	DRS 1+ Correlation (95% CIs)
Age	-0.21 (-0.27- -0.15)**	-0.13 (-0.19- -0.07)**
Sex (Female)	0.21 (0.14-0.27)**	0.20 (0.14-0.26)**
Change in Mental Status	0.19 (0.12-0.25)**	0.18 (0.12-0.24)**
Provisional Diagnosis of Mood Disorder	0.22 (0.15-0.28)**	0.19 (0.13-0.25)**
Number of Lifetime Psychiatric Admissions	-0.09 (-0.15- -0.02)*	-0.19 (-0.25- -0.13)**
Consistent Positive Outlook	-0.39 (-0.44- -0.33)**	-0.30 (-0.35- -0.24)**
Personal Hygiene	-0.13 (-0.19- -0.07)**	-0.05 (-0.11-0.02)
Walking	-0.02 (-0.08-0.04)	0.00 (-0.06-0.07)
Worsened ADL Status	0.12 (0.05-0.18)*	0.13 (0.06-0.19)*
IADL Involvement Scale	-0.21 (-0.27- -0.15)**	-0.13 (-0.19- -0.07)**
Cognitive Performance Scale	0.02 (-0.04-0.09)	0.07 (0.01-0.13)*
More Impaired Decision Making	0.14 (0.08-0.21)**	0.17 (0.10-0.23)**
Provisional Diagnosis of Dementia	-0.22 (-0.28- -0.16)**	-0.07 (-0.13- -0.00)
Pain Scale Score	0.24 (0.18-0.30)**	0.28 (0.22-0.34)**
Acid Reflux	0.11 (0.04-0.17)*	0.14 (0.08-0.20)**
Constipation	0.09 (0.03-0.15)*	0.13 (0.07-0.19)**
Diarrhea	0.14 (0.08-0.20)**	0.11 (0.05-0.17)*
Vomiting	0.09 (0.03-0.15)*	0.18 (0.12-0.24)**
Strong and Supportive Family Relationship	-0.13(-0.19- -0.07)**	-0.09 (-0.15- -0.03)*
Conflict with Family or Friends	0.24 (0.18-0.30)**	0.23 (0.17-0.29)**

*0.0001<p<0.05 **p<0.0001

The PC sample reported the lowest proportion of significant variables among those variables which were explored for associations, with seven of 16 items showing some significant association with both depression measures (see Table 17). As with the CMH, the PC sample also reported age to be of significance, showing younger age to be associated with decreased self-reported depression and decreased DRS-detected possible depression. Further,

the PC sample echoed the CMH again in its most strongly associated reported variable – having a consistent positive outlook. Evidencing strong and closely similar correlations, having the positive appraisal was associated with a negative self-reported depressed mood state response and a score of zero on the DRS. Having a strong and supportive family proved significantly protective across both measures.

Increasing severity of pain was associated with positive detection in both depression measures. The four selected elements of GI status did not behave consistently. Acid reflux showed significance across both outcome measures of interest, as did constipation. Diarrhea showed no significant association, and vomiting was only very weakly associated with the DRS measure alone. Of note, prognosis was not significantly associated either any depression-related outcome measure.

Table 17. Correlation associations with both the dichotomous self-report measure of depression and the DRS in the PC population

Variable	Self-Report Correlation (95% CIs)	DRS 1+ Correlation (95% CIs)
Age	-0.10 (-0.16- -0.05)**	-0.14 (-0.19- -0.08)**
Sex (Female)	0.05 (-0.00-0.11)	-0.00 (-0.06-0.05)
Change in Mental Status	0.07 (0.01-0.13)*	0.08 (0.02-0.13)*
Consistent Positive Outlook	-0.36 (-0.41- -0.31)**	-0.35 (-0.40- -0.30)**
Personal Hygiene	-0.04 (-0.10-0.01)	-0.01 (-0.06-0.04)
Walking	-0.01 (-0.07-0.05)	0.03 (-0.03-0.08)
Worsened ADL Status	0.03 (-0.04-0.09)	0.04 (-0.02-0.10)
Cognitive Performance Scale	0.03 (-0.02-0.09)	0.04 (-0.02-0.09)
More Impaired Decision Making	-0.07 (-0.13- -0.01)*	0.01 (-0.05-0.07)
Pain Scale Score	0.11 (0.05-0.16)**	0.20 (0.15-0.25)**
Acid Reflux	0.13 (0.07-0.18)**	0.14 (0.09-0.20)**
Constipation	0.13 (0.07-0.18)**	0.10 (0.05-0.16)*
Diarrhea	0.05 (-0.01-0.11)	0.04 (-0.02-0.09)
Vomiting	0.04 (-0.02-0.09)	0.06 (0.01-0.12)*
Prognosis – Estimated Survival	0.03 (-0.03-0.09)	0.01 (-0.05-0.07)
Strong and Supportive Family Relationship	-0.09 (-0.15- -0.04)*	-0.10 (-0.15- -0.04)*

*0.0001<p<0.05 **p<0.0001

5.3.2 Odds Ratios for Experiencing a Possible Depressed Mood State

In addition to correlation analyses, bivariate logistic regression models were used to further assess the relationships between the selected predictor variables and different depression-related outcome measures. The logistic regression analyses informed the probable odds and predictive strength of each variable with three outcome measures within each dataset. In addition to the depression-related outcome measures of the self-report item and the DRS used in the correlation analyses, the logistic regression models also involved a third outcome of a modified DRS measure, which exempted those who could not or would not

respond to the self-report mood item. This subset allowed a more direct comparison of the DRS and self-report depression measures among those individuals for whom a depression measure was consistently available. The relationship between the variables was expressed through odds ratios, with corresponding 95% confidence intervals, and the fit of each model was reported through the 'c' statistic. A level of $p<0.0001$ and an encompassing level of $0.0001<p<0.05$ were used to measure the significance of the variables with the depression-related outcome measures.

Across the three outcome measures in the CHA sample, the age groups of 80-84 and 85+ were protective in reference to the less than 75 years of age group (see Table 18). The female sex reported increased odds of experiencing a depression mood state, but only according to the self-report measure.

The CHA sample revealed significant odds ratios of experiencing depressive symptoms across all three outcome measures for variables such as having a diagnosis of depression, dementia, or Alzheimer's disease, not having a strong and supportive family relationship, and experiencing familial conflict. According to the c statistic, the clinical diagnosis of depression variable was evidenced to have the strongest model-fit, which resulted to be with the self-report measure at 0.64 opposed to both DRS measures at 0.60.

Experiencing worsening ADL status was also found to be significant across all outcome measures, with the point estimates of odds ratios for a possible depressed mood state consistently between two and three. The two measured elements of ADL status, personal hygiene and walking, generally showed higher odds ratios with physical dependence across outcome measures. The model of best fit across a single variable, as determined by the c statistic, proved to be the full IADL Involvement Scale.

The categorically collapsed CPS was also shown to be significant across the three depression-related outcome measures. As "intact" was used as the reference category, having mild impairment was the only level able to be analyzed since the severe-status did not have a high enough sample size for analysis within this population. Also an indicator of cognitive status, experiencing impairment in decision making was recognized as significantly increasing the odds of experiencing depression across all outcome measures as well. The four indicators of GI status varied in strength of relationship. All but the acid reflux variable reported significant positive associations across at least two outcome measures.

The CMH sample evidenced consistent significant results across all three depression-related outcome measures for many of the selected possible predictor variables (see Table 19). Referencing the less than 35 years of age group, both the 55-65 year category and the 65+ age category were associated with decreased odds of experiencing a possible depressed mood state at the $0.0001<p<0.05$ level of significance. Females were also found to have an odds ratio over two for experiencing a possible depressed mood state across all outcome measures in comparison to their male counterparts.

Having a provisional diagnosis of a mood disorder was significant across all three outcomes, the DRS, the self-report and the modified DRS measures, indicating increased odds of a depressed mood state. The number of lifetime psychiatric admissions also reported significance across all three measures and suggests that higher lifetime admissions is associated with lower odds of the depression outcomes. Although cognitive status did not prove significant by means of the CPS, a change in mental status and, similarly, being more impaired in decision making ability were significantly related to an increase in the odds of experiencing a depressed mood state across all three outcome measures.

Physically, the experience of any level of pain, from less than daily to severe daily, proved to be significant with all measures in increasing the odds of experiencing a possible depressed state. Across GI status, having any of the four indicators of acid reflux, constipation, diarrhea, and vomiting was a significant predictor of the experience of possible depression.

The condition, which was reported to most accurately predict the presence of a possible depressed mood state, according to the c statistic was not having a consistent positive outlook. Not having the positive outlook was associated with odds ratios of three or greater of experiencing a possible depressed mood state. The variable proved significant across the three outcome measures, reporting the strongest fit with the self-reported depression outcome. In addition, undergoing conflict with family or friends showed similar odds ratios

The PC sample did not yield as many significant findings between the selected possible predictor variables and the three depression-related outcome measures in comparison to the first two samples (see Table 20). In reference to the less than 55 years of age group, those in the 65-74, 75-84, and 85+ age groups reported to be at significantly decreased odds of experiencing a possible depressed mood state. In addition, increasing age group suggests a pattern of increasing protection against the depressive state.

The most notable finding was evidenced through the absence of a consistent positive outlook. Also representing the model of best-fit for predicting possible depression of the selected variables within the PC sample, the absence of a positive outlook meant an odds ratio of experiencing possible depression by at least five. In addition, having a strong and supportive family protected the individuals with decreased odds.

Within the palliative sample, reporting either daily or severe daily pain was significantly related to increased odds of experiencing possible depression according to all of the outcome measures. Experiencing a decline in mental status was also significant across all measures. Further, of the four selected GI status indicators, the presence of acid reflux and constipation were the only indicators to reach significance across all outcome measures, increasing the likelihood of a possible depressed mood state.

Table 18. Estimated odds ratios for potential independent variables using logistic regression in the CHA population

Depression Outcome		DRS 1+ (N=982)		Self-Report (N=979)		DRS 1+ (SR 8 Excl.) (N=974)	
Variable Name	**Explanation**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**
Age (years)	0=<75	1.00 (Ref.)	0.56	1.00 (Ref.)	0.55	1.00 (ref.)	0.56
	1=75-79	0.67 (0.38-1.18)		0.48 (0.27-0.86)*		0.67 (0.38-1.17)	
	2=80-84	0.57 (0.33-0.98)*		0.42 (0.24-0.75)*		0.56 (0.33-0.97)*	
	3=85+	0.46 (0.27-0.79)*		0.54 (0.31-0.93)*		0.44 (0.25-0.76)*	
Sex	1=Male	1.23 (0.86-1.74)	0.52	1.88 (1.24-2.84)*	0.55	1.33 (0.93-1.91)	0.53
	2=Female						
Depression Diagnosis	0=No	3.47 (2.45-4.93)**	0.60	5.01 (3.49-7.20)**	0.64	3.43 (2.41-4.88)**	0.60
	1=Yes						
Personal Hygiene	0=Independent	1.00 (Ref.)	0.56	1.00 (Ref.)	0.54	1.00 (Ref.)	0.56
	1=Supervised	4.15 (2.33-7.41)**		3.08 (1.69-5.59)*		3.85 (2.14-6.93)**	
	2=Assisted	2.41 (1.23-4.74)*		1.66 (0.78-3.50)		2.25 (1.13-4.49)*	
	3=Dependent	3.54 (0.88-14.28)		1.72 (0.33-8.95)		2.66 (0.59-11.97)	
Walking	0=Independent	1.00 (Ref.)	0.59	1.00 (Ref.)	0.54	1.00 (Ref.)	0.58
	1=Supervised	3.35 (2.09-5.38)**		1.72 (1.02-2.90)*		3.18 (1.97-5.13)**	
	2=Assisted	4.03 (2.04-7.98)**		2.35 (1.14-4.84)*		3.82 (1.91-7.63)*	
	3=Dependent	7.61 (1.89-30.73)*		2.58 (0.61-10.91)		6.36 (1.51-26.87)*	
Worsened ADL Status	0=No	1.00 (Ref.)	0.57	1.00 (Ref.)	0.56	1.00 (Ref.)	0.57
	1=Yes	2.94 (1.98-4.36)**		2.32 (1.53-3.52)**		2.87 (1.92-4.27)**	
	8=Uncertain	1.56 (0.70-3.47)		1.65 (0.72-3.77)		1.58 (0.71-3.52)	
IADL Scale		1.09 (1.06-1.12)**	0.65	1.07 (1.05-1.10)**	0.63	1.08 (1.06-1.11)**	0.64
CPS	0=Intact	1.00 (Ref.)	0.57	1.00 (Ref.)	0.57	1.00 (Ref.)	0.56
	1=Mild	2.62 (1.78-3.86)**		2.61 (1.74-3.90)**		2.46 (1.67-3.64)**	
	2=Severe	N/A[a]		N/A[a]		N/A[a]	
More Impaired	0=No	1.00 (Ref.)	0.56	1.00 (Ref.)	0.55	1.00 (Ref.)	0.56

Depression Outcome		DRS 1+ (N=982)		Self-Report (N=979)		DRS 1+ (SR 8 Excl.) (N=974)	
Variable Name	**Explanation**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**
Decision Making	1=Yes 8=Uncertain	3.91 (2.37-6.46)** 1.43 (0.59-3.50)		2.81 (1.68-4.70)** 0.41 (0.09-1.75)		3.97 (2.40-6.57)** 1.25 (0.49-3.21)	
Alzheimer's Disease Diagnosis	0=No 1=Yes	3.45 (1.93-6.16)**	0.54	2.66 (1.44-4.92)*	0.53	3.05 (1.68-5.55)*	0.53
Dementia Diagnosis	0=No 1=Yes	3.48 (2.04-5.92)**	0.54	3.19 (1.83-5.56)**	0.54	3.15 (1.82-5.43)**	0.54
Pain Scale	0=No Pain 1=< Daily 2=Daily 3=Daily Severe	1.00 (Ref.) 1.42 (0.97-2.08) 1.57 (1.05-2.34)* 2.43 (1.56-3.76)**	0.58	1.00 (Ref.) 1.21 (0.80-1.83) 1.72 (1.13-2.63)* 2.16 (1.35-3.44)*	0.58	1.00 (Ref.) 1.46 (1.00-2.14) 1.53 (1.01-2.30)* 2.45 (1.57-3.81)**	0.58
Acid Reflux	0=No 1=Yes	1.19 (0.86-1.64)	0.52	1.16 (0.83-1.64)	0.52	1.21 (0.87-1.66)	0.52
Constipation	0=No 1=Yes	1.41 (1.01-1.96)*	0.53	1.89 (1.34-2.66)*	0.56	1.38 (0.99-1.93)	0.53
Diarrhea	0=No 1=Yes	2.33 (1.50-3.60)*	0.54	3.17 (2.04-4.94)**	0.56	2.31 (1.48-3.58)*	0.54
Vomiting	0=No 1=Yes	4.63 (1.95-10.97)*	0.52	3.39 (1.44-7.96)*	0.52	4.72 (1.99-11.19)*	0.52
Supportive Family	0=No 1=Yes	0.30 (0.19-0.48)**	0.55	0.33 (0.20-0.53)**	0.55	0.32 (0.20-0.51)**	0.55
Family Conflict	0=No 1=Yes	3.00 (2.15-4.20)**	0.61	2.37 (1.66-3.38)**	0.58	2.93 (2.08-4.10)**	0.60

*0.0001<p<0.05 **p<0.0001

[a] N/A = Sample size too small to report

Table 19. Estimated odds ratios for potential independent variables using logistic regression in the CMH population

Depression Outcome		DRS 1+ (N=1015)		Self-Report (N=943)		DRS 1+ (SR 8 Excl.) (N=943)	
Variable Name	**Explanation**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**
Age (years)	0=<35	1.00 (Ref.)	0.58	1.00 (Ref.)	0.62	1.00 (Ref.)	0.59
	1=35-44	0.68 (0.47-0.97)*		0.81 (0.56-1.17)		0.63 (0.43-0.91)*	
	2=45-54	0.73 (0.51-1.05)		0.99 (0.68-1.42)		0.72 (0.50-1.04)	
	3=55-64	0.58 (0.37-0.93)*		0.57 (0.35-0.93)*		0.58 (0.36-0.95)*	
	4=65+	0.43 (0.29-0.64)*		0.24 (0.15-0.37)*		0.35 (0.23-0.53)*	
Sex	1=Male 2=Female	2.24 (1.73-2.91)*	0.60	2.33 (1.79-3.05)*	0.60	2.14 (1.64-2.80)*	0.59
Change in Mental Status	0=No 1=Yes	3.42 (2.19-5.33)**	0.56	3.43 (2.20-5.34)**	0.56	3.48 (2.21-5.49)**	0.56
Mood Disorder	0=No 1=Yes	2.19 (1.68-2.85)**	0.59	2.43 (1.85-3.19)**	0.61	2.31 (1.76-3.03)**	0.60
Psychiatric Admissions	0	1.00 (Ref.)	0.61	1.00 (Ref)	0.55	1.00 (Ref)	0.61
	1-3	0.57 (0.41-0.81)*		0.70 (0.49-0.99)*		0.56 (0.39-0.80)*	
	4-5	0.36 (0.23-0.55)**		0.59 (0.38-0.92)*		0.33 (0.21-0.52)**	
	6+	0.36 (0.25-0.52)**		0.61 (0.42-0.88)*		0.35 (0.24-0.51)**	
Consistent Pos. Outlook	0=No 1=Yes	3.45 (2.66-4.48)**	0.65	5.14 (3.89-6.79)**	0.69	3.70 (2.82-4.86)**	0.66
Personal Hygiene	0=Independent	1.00 (Ref.)	0.52	1.00 (Ref.)	0.54	1.00 (Ref.)	0.51
	1=Supervised	0.83 (0.51-1.37)		0.57 (0.33-0.97)*		0.91 (0.53-1.54)	
	2=Assisted	0.56 (0.28-1.14)		0.28 (0.12-0.63)*		0.57 (0.28-1.18)	
	3=Dependent	0.89 (0.30-2.67)		0.23 (0.05-1.11)		0.63 (0.17-2.36)	
Walking	0=Independent	1.00 (Ref.)	0.50	1.00 (Ref.)	0.51	1.00 (Ref.)	0.50
	1=Supervised	1.05 (0.44-2.51)		1.48 (0.58-3.79)		1.11 (0.44-2.79)	
	2=Assisted	1.12 (0.42-2.97)		0.43 (0.15-1.27)		0.93 (0.33-2.57)	

Depression Outcome		DRS 1+ (N=1015)		Self-Report (N=943)		DRS 1+ (SR 8 Excl.) (N=943)	
Variable Name	**Explanation**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**
	3=Dependent	0.79 (0.11-5.60)		0.43 (0.04-4.77)		1.62 (0.15-17.92)	
Worsened ADL Status	0=No	1.00 (Ref.)	0.55	1.00 (Ref.)	0.55	1.00 (Ref.)	0.53
	1=Yes	3.75 (1.86-7.56)*		3.41 (1.67-6.98)*		5.02 (2.22-11.36)**	
	8=Uncertain	3.03 (1.68-5.48)*		2.85 (1.53-5.31)*		4.16 (2.07-8.37)**	
IADL Scale		0.96 (0.94-0.98)**	0.57	0.93 (0.91-0.95)**	0.62	0.96 (0.94-0.98)**	0.58
CPS	0=Intact	1.00 (Ref.)	0.52	1.00 (Ref.)	0.52	1.00 (Ref.)	0.52
	1=Mild	1.26 (0.93-1.72)		1.07 (0.78-1.46)		1.22 (0.89-1.67)	
	2=Severe	0.83 (0.38-1.81)		0.31 (0.11-0.87)		0.94 (0.38-2.34)	
More Impaired Decision Making	0=No	1.00 (Ref.)	0.57	1.00 (Ref.)	0.56	1.00 (Ref.)	0.58
	1=Yes	3.60 (2.14-6.07)**		2.74 (1.68-4.46)**		4.09 (2.37-7.06)**	
	8=Uncertain	2.16 (1.31-3.55)*		2.20 (1.31-3.72)*		2.41 (1.41-4.13)*	
Dementia Diagnosis	0=No	0.63 (0.40-0.97)*	0.52	0.17 (0.10-0.31)**	0.56	0.64 (0.40-1.02)	0.52
	1=Yes						
Pain Scale	0=No Pain	1.00 (Ref.)	0.64	1.00 (Ref.)	0.62	1.00 (Ref.)	0.64
	1=< Daily	2.37 (1.70-3.31)**		2.43 (1.73-3.42)**		2.42 (1.72-3.41)**	
	2=Daily	5.76 (3.24-10.24)**		2.94 (1.79-4.81)**		5.57 (3.12-9.96)**	
	3=Daily Severe	5.35 (2.81-10.18)**		4.26 (2.30-7.90)**		5.61 (2.87-10.98)**	
Acid Reflux	0=No	1.93 (1.44-2.59)**	0.56	1.64 (1.22-2.21)*	0.55	2.10 (1.55-2.85)**	0.57
	1=Yes						
Constipation	0=No	2.04 (1.46-2.85)**	0.55	1.59 (1.15-2.22)*	0.54	2.00 (1.42-2.82)**	0.55
	1=Yes						
Diarrhea	0=No	1.90 (1.33-2.71)*	0.54	2.18 (1.52-3.14)**	0.55	1.92 (1.34-2.76)*	0.54
	1=Yes						
Vomiting	0=No	4.44 (2.55-7.70)**	0.55	1.89 (1.20-2.96)*	0.53	4.47 (2.57-7.78)**	0.56
	1=Yes						

Depression Outcome		DRS 1+ (N=1015)		Self-Report (N=943)		DRS 1+ (SR 8 Excl.) (N=943)	
Variable Name	**Explanation**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**
Supportive Family	0=No 1=Yes	0.69 (0.53-0.90)*	0.54	0.57 (0.44-0.75)**	0.56	0.67 (0.51-0.89)*	0.55
Family Conflict	0=No 1=Yes	2.90 (2.17-3.88)**	0.61	2.95 (2.20-3.96)**	0.61	2.97 (2.21-4.00)**	0.61

*0.0001<p<0.05 **p<0.0001

Table 20. Estimated odds ratios for potential independent variables using logistic regression in the PC population

Depression Outcome		DRS 1+ (N=1313)		Self-Report (N=1250)		DRS 1+ (SR 8 Excl.) (N=1148)	
Variable Name	**Explanation**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**
Age (years)	0=<55	1.00 (Ref.)	0.59	1.00 (Ref.)	0.57	1.00 (Ref.)	0.61
	1=55-64	0.71 (0.48-1.07)		0.81 (0.53-1.24)		0.69 (0.45-1.07)	
	2=65-74	0.50 (0.34-0.74)*		0.65 (0.43-0.97)*		0.43 (0.28-0.66)*	
	3=75-84	0.44 (0.30-0.64)*		0.58 (0.39-0.85)*		0.40 (0.27-0.61)*	
	4=85+	0.33 (0.20-0.53)*		0.39 (0.24-0.66)*		0.25 (0.14-0.44)*	
Sex	1=Male 2=Female	0.99 (0.78-1.26)	0.50	1.27 (0.99-1.62)	0.53	1.04 (0.80-1.35)	0.50
Change in Mental Status	0=No 1=Yes	1.72 (1.13-2.60)*	0.52	1.74 (1.10-2.75)*	0.52	1.73 (1.06-2.84)*	0.52
Consistent Positive Outlook	0=No 1=Yes	5.54 (4.14-7.43)**	0.66	6.07 (4.47-8.26)**	0.66	6.37 (4.61-8.80)**	0.66
Personal Hygiene	0=Independent	1.00 (Ref.)	0.51	1.00 (Ref.)	0.53	1.00 (Ref.)	0.53
	1=Supervised	1.01 (0.73-1.40)		0.93 (0.68-1.29)		1.07 (0.76-1.50)	
	2=Assisted	1.06 (0.77-1.44)		0.94 (0.68-1.29)		0.94 (0.66-1.32)	
	3=Dependent	0.86 (0.59-1.25)		0.60 (0.37-0.96)*		0.57 (0.34-0.95)*	
Walking	0=Independent	1.00 (Ref.)	0.54	1.00 (Ref.)	0.52	1.00 (Ref.)	0.54
	1=Supervised	1.28 (0.92-1.77)		1.03 (0.74-1.43)		1.23 (0.88-1.74)	
	2=Assisted	1.25 (0.87-1.79)		1.13 (0.77-1.64)		1.11 (0.75-1.66)	
	3=Dependent	0.47 (0.19-1.13)		0.27 (0.08-0.89)*		0.20 (0.05-0.83)*	
Worsened ADL Status	0=No	1.00 (Ref.)	0.55	1.00 (Ref.)	0.56	1.00 (Ref.)	0.55
	1=Yes	1.23 (0.89-1.69)		1.14 (0.83-1.57)		1.18 (0.84-1.66)	
	8=Uncertain	0.40 (0.21-0.75)*		0.20 (0.09-0.43)**		0.29 (0.14-0.61)*	
CPS	0=Intact	1.00 (Ref.)	0.54	1.00 (Ref.)	0.53	1.00 (Ref.)	0.53

Depression Outcome		DRS 1+ (N=1313)		Self-Report (N=1250)		DRS 1+ (SR 8 Excl.) (N=1148)	
Variable Name	**Explanation**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**	**Odds Ratio (95% CI)**	**c Stat.**
	1=Mild	1.39 (1.03-1.87)*		1.32 (0.96-1.82)		1.24 (0.89-1.74)	
	2=Severe	0.43 (0.21-0.89)*		0.20 (0.05-0.85)*		0.11 (0.02-0.80)*	
More Impaired	0=No	1.00 (Ref.)	0.53	1.00 (Ref.)	0.58	1.00 (Ref.)	0.55
Decision	1=Yes	1.03 (0.78-1.36)		0.71 (0.53-0.96)*		0.91 (0.67-1.25)	
Making	8=Uncertain	0.40 (0.23-0.69)*		0.13 (0.06-0.30)**		0.19 (0.09-0.42)**	
Pain Scale	0=No Pain	1.00 (Ref.)	0.62	1.00 (Ref.)	0.57	1.00 (Ref.)	0.61
	1=< Daily	0.96 (0.46-1.98)		2.10 (1.16-3.83)*		1.00 (0.45-2.24)	
	2=Daily	1.99 (1.48-2.68)**		1.58 (1.18-2.11)*		1.92 (1.39-2.65)**	
	3=Daily Severe	3.42 (2.42-4.84)**		1.96 (1.37-2.78)*		3.15 (2.16-4.61)**	
Acid Reflux	0=No	1.99 (1.52-2.59)**	0.57	1.88 (1.43-2.48)**	0.56	2.09 (1.56-2.79)**	0.57
	1=Yes						
Constipation	0=No	1.58 (1.23-2.02)*	0.55	1.77 (1.38-2.28)**	0.57	1.58 (1.21-2.07)*	0.55
	1=Yes						
Diarrhea	0=No	1.27 (0.89-1.83)	0.51	1.40 (0.96-2.03)	0.52	1.49 (1.01-2.20)*	0.52
	1=Yes						
Vomiting	0=No	1.41 (1.03-1.92)*	0.53	1.24 (0.90-1.72)	0.52	1.32 (0.94-1.86)	0.52
	1=Yes						
Supportive	0=No	0.49 (0.33-0.74)*	0.53	0.50 (0.33-0.77)*	0.53	0.41 (0.27-0.64)**	0.54
Family	1=Yes						
Prognosis	2=>6 Months	1.00 (Ref.)	0.51	1.00 (Ref.)	0.52	1.00 (Ref.)	0.53
	1=<6 Months	0.96 (0.74-1.24)		0.89 (0.68-1.17)		0.84 (0.63-1.11)	
	0=Death Imminent	1.08 (0.46-2.59)		0.16 (0.02-1.19)		0.56 (0.16-2.03)	

*0.0001<p<0.05 **p<0.0001

5.4 Research Question 3. Performance of Depression Outcome Measures in the CA-HC Sample

The DRS one-plus threshold was determined to be the cut-point best suited to detect a possible depressed mood state in the analyses for the first research question. The one-plus threshold was used to explore the relationship between the CA's dichotomous self-report screening item, and the HC follow-up DRS assessment. Tests of strength of association, model-fit, and detection ability were conducted to inform the criterion validity of the self-report question, relative to the DRS measure. A correlation of 0.25 was evidenced between the two depression-related outcomes, and a c statistic of 0.63 resulted from the analysis of the model-fit. An odds ratio of 2.96 with 95% confidence intervals of 2.68-3.26 also proved significant at the <.0001 level, indicating an individual self-reporting the presence of a depressed mood state had a 2.96 increased odds of obtaining a follow-up DRS score of one or greater then an individual self-reporting the absence of the same state.

The resulting positive predictive value (PPV) of the single self-report question was 58%, and the negative predictive value (NPV) was 69%. Together, using the one-plus threshold for the DRS and the positive self-report, the measures agreed on the detection of a possible depressed mood state in 19.3% of the CA-HC sample. The likelihood ratio for obtaining a DRS score of one or greater was 2.0, meaning an individual with a self-reported depressed mood state is twice as likely to obtain a score of one or greater on the follow-up DRS measure. Alternately, individuals self-reporting an absence of a depressed mood state on the CA are 0.7 times as likely to obtain the score of one or greater on the follow-up DRS.

Table 21. Frequency distribution of the DRS 1+ threshold with the dichotomous self-report item, including tests of association, and model fit in the CA-HC population

Self-Report	DRS 1+ Threshold		
	No	Yes	Total
No	45.7%	20.3%	66.0%
Yes	14.7%	19.3%	34.0%
Total	60.4%	39.6%	100.0%
Correlation[a]		0.25*	
c statistic		0.62	
Sensitivity		49%	
Specificity		76%	

*p<.0001

[a]phi Correlation

6.0 Discussion

6.1 Study Sample

This research involved the analysis of four datasets, which encompassed a total of five RAI assessment populations – the Community Health Assessment (CHA); the Community Mental Health (CMH); the Palliative Care (PC); and the joint Contact Assessment (CA) and Home Care (HC). The mental instability of the CMH sample, and the chronic illness and subsequent high levels of physical pain and functional impairment of the PC sample individualized and limited the direct comparability of these samples to the more elderly, home-dwelling CHA and CA-HC samples.

The CHA sample can be looked upon as being closely comparable to the CA-HC validation population. Both samples are composed primarily of frail, elderly individuals, over 75% of whom are still dwelling within private home, community settings. The two samples report closely comparable mean ages with the CHA at 82.8 years and the CA-HC at 77.2 years. Even the CHA and CA-HC's male to female sex ratios are similar at approximately 1:4 and 1:3, respectively; whereas, both the CMH and PC samples report a nearly equal ratio of 2:2. In addition, the majority of both populations are independent in relation to physical and functional status. A predominant reason for forming a comparative link between the two samples is because of the more extensive exploration undergone within the CHA sample for this research. The compatibility of the determined DRS threshold (Section 5.2) and the relationships of various predictor variables with multiple depression-related outcomes (Section 5.3) can provide further description of the validation sample.

6.2 Research Question 1. The DRS Threshold

The original derivation and validation study for the DRS concluded upon a three-plus cut-point as an indicator of a possible depressed mood state (Burrows, Morris, Simon, Hirdes & Phillips, 2000). A score of three or greater was found to maximize sensitivity with minimal loss of specificity. The use of this cut-point was explored across numerous follow-up studies, some of which supported the use of the recommended threshold (Achterberg, Pot, Kerkstra & Ribbe, 2006; Gruneir, Smith, Hirdes & Cameron, 2005; Soldato, Liperoti, Landi, Carpenter, Bernabei & Onder, 2008), and others of which called it into question (Anderson, Buckwalter, Buchanan, Maas & Imhof, 2003; Snowden, 2004). The fluctuating debate inspired this study's exploration of the DRS threshold and its ability to detect a possible depressed mood state across a range of populations.

Across the first three analyzed datasets, involving the Community Health Assessment (CHA), and Community Mental Health (CMH), and Palliative Care (PC) assessments, the single self-report item of, "in the past three days, how often have you felt sad, depressed, or hopeless?", was the comparative measure, which was used to determine the DRS cut-point of best-fit for the detection of a possible depressed mood state. The single self-report question has been reported to be an accurate (Gori et al., 1998; Lachs et al., 1990; Mahoney et al., 1994; Watkins et al., 2007), and reliable (Chochinov, Wilson, Enns & Lander, 1997) tool for depression screening. Both the self-report item and the DRS measure are present within each of the three datasets and can be concurrently measured in a single assessment.

The selection of the one-plus threshold for the purposes of this study was a deviation from the original validation's recommendation of the three-plus threshold (Burrows et al., 2000). However, the analyses of fit and association between the two depression-related

outcome measures supported the use of the one-plus cut-point across the three populations. The CHA sample offered the only deviation from the one-plus threshold, as it evidenced the strongest c statistic, but the weakest correlation with the self-report item. Yet, the CHA also has a diagnostic measure available within its assessment, which reports a high response rate within its dataset. The exploration of this diagnostic depression measure, against the three DRS thresholds, supported the use of the one-plus, again through the strength of model fit, and also by supporting the principle of the Burrows' derivation in selecting the threshold that maximized sensitivity at 47%, with minimal loss of specificity at 80%, in comparison to the three-plus specificity of 93%.

In addition to the current analyses, the use of the DRS one-plus threshold for the detection of a possible depressed mood state is supported through interRAI's published Clinical Assessment Protocols (CAPs) manual (Morris et al., 2008). The interRAI organization's CAP manual iterates that only a DRS score of zero will not trigger the Mood CAP – a score of one or two will trigger a medium-level risk, and a score of three or greater will trigger a high-level risk (Morris et al., 2008). If a score of one-plus triggers the need for further evaluation in a clinical setting, it is only acceptable that this threshold be used as an indicator of a possible depressed mood state when screening for depression in a research context. Also, though not formally acknowledged, the DRS can be and has been categorically collapsed within a number of studies. A DRS score of 1-2 is paralleled with the possible presence of a mild depressed mood state, 3-5 with moderate, and 6-plus with severe. This categorization, again, supports a score of one or greater as being indicative of some level of possible depressed mood state.

A recent study, which explored the ability of the DRS to predict a new depression diagnosis at follow-up assessment, also supported the screening ability of the one-plus threshold (Martin et al., 2008). Results showed that, along with those who scored three or greater, individuals with DRS scores of one and two were significantly more likely to obtain a new depression diagnosis at follow-up assessment in comparison to those who recorded an intake DRS score of zero. The authors conclude that there is evidence to support the use of a lower DRS threshold for preliminary screening purposes. Further, it has been proposed that the screening ability of the DRS could also act towards prevention interventions (Dalby et al., 2008). This would, again, support the use of the one-plus threshold.

Depressive mood states can be severe in nature, having adverse impacts on an individual's overall quality of life and mortality (Charney et al., 2003). Such disorders are reported to be particularly common and disabling in late life, yet are often neglected in older adult populations (Lopez & Murray, 1998). The DRS is a screening tool which flags individuals who are reported to be experiencing a possible depressed mood state. Although using a one-plus threshold might seem over-inclusive in the context of a 14 point scale, it is important to recognize that even a score of one is indicative of the presence of some level of depression-related symptom. As Greenhalgh (1997) supports, in the face of such a debilitating illness, it is important to detect every individual who would otherwise suffer under the weight of the disorder than to only attend to those individuals who meet a pre-determined cut-point, such as the three-plus threshold for the DRS. Furthermore, the use of the one-plus threshold over the three-plus could be looked upon as taking a more preventative approach in depression screening, as individuals could be flagged by the DRS

measure before the condition has the opportunity to manifest itself or escalate in severity (Dalby et al., 2008).

6.3 Research Question 2. Risk Factors

The severe impact that depression can have on an individual's quality of life makes detection, diagnosis and treatment critical (Charlson et al., 2008; Charney et al., 2003). Exploring the relationships between selected possible predictor variables and different depression-related outcome measures can aid in depression screening by indirectly assisting with detection. When compared within each respective sample, the three depression-related outcome measures did not prove largely distinct from one another across the same variable level. Overall, many of the same variables proved significant across the samples, but this is not to imply that the experience of these variables are generalizable across the three, since the respective point estimates and confidence intervals indicate otherwise.

Depression and the expression of depressive symptoms in older adult populations have commonly been found to be associated with increasing age (Blazer, 2000). Conversely, the bivariate analyses conducted within this study found increasing age to actually be a protective factor in the experience of a possible depressed mood state across all three study samples. The CHA sample reported the 80-84 and 85+ age groups to be at decreased odds of experiencing a possible depressed mood state in comparison to the reference group of those less than 75 years of age. A similar pattern was present within the CMH's 55-64 and 65+ age groups in reference to the less than 35 years age group, and also within the PC sample's categories of 65-74, 75-84, and 85+ in reference to its less than 55 age group. Particularly in the terminally ill, palliative population, younger individuals have been reported to experience

higher rates of depression (Lloyd-Williams & Friedman, 2001). This could be due to their early disease state and their dealing with their recent change in state since changes in state have been found to dominate the depression risk-factor literature.

Having an existing diagnosis of depression or mood disorder was consistent with increased odds of experiencing a possible depressed mood state. In addition, having a diagnosis of either Alzheimer's disease or general dementia also proved significant across all depression-related outcome measures. An association between dementias and depression has been confirmed within the literature, but the direction of the relationship is unclear. Some have proposed that depression could be representative of early-stage onset of a dementia-related disorder (Buntinx, Kestre, Bergers & Knottnerus, 1996; van Reekum, Simard, Clarke, Binns & Conn, 1999). Additional indicators of cognitive status including change in mental state and more impaired decision making ability were commonly reported as significant supporting a depression-related association with cognitive impairment and decline (Gallassi, Morreale & Pagni, 2001).

Older adults with depressive symptoms have been reported to be at an increased risk of suffering functional deterioration (Hays, Saunders, Flint & Blazer, 1997). Both community-dwelling samples reported significant relationships with functional variables such as the IADL Involvement Scale and the worsened ADL status measure. Further, both daily, and severe daily pain were reported as being significant to some degree across the CHA, CMH, and PC. In comparison to no pain, less than daily pain also significantly increased the odds of experiencing a possible depressed mood state in the CMH sample, whose point estimates prove the largest throughout the pain levels among the three samples. These measures of varying physical ability indicate the overarching relationship of worsened

physical impairment with a depressive state (Wilson, Chochinov, de Faye & Breitbart, 2000). Pain has particularly been supported as a severe condition that significantly affects an individual's mood state (Mystakidou et al., 2007).

Generally, the presence of a strong, supportive family was a significant predictor across all three datasets. The exact nature of the relationship cannot be generalized across the three distinct study samples, considering that their respective point estimates and confidence intervals differ. The possession of a consistent positive outlook reported strong, significant associations and model fit in both the CMH and PC samples. Generally, among older adults, positive psychological states have been proven to serve both a promotion function for vitality and a protective function against health symptoms such as those of depression (Murrel, Salsman & Meeks, 2003).

Overall, a number of the current findings support what has been previously found within the literature. There was no overarching theme in the significance of the predictor variables when compared across the three different datasets. The reported differences in significance between the depression-related outcome measures and the selected variables support the differentiation of the three samples, and the individual expression or experience of depression that is indicative of the unique state of each. The CHA sample is composed of frail elderly who are beginning to experience some functional impairment and gradual loss of independence; the CMH sample contains those with some form of mental illness, who do not suffer from much physical impairment, but do require support based on their impaired cognitive ability; and the PC sample holds those with chronic disease who can be said to be subservient to the nature of their illness, in terms of independence and ability. These dominant differences prevent the three populations from being integrated into a single study

sample for analyses purposes, and from allowing one sample's respective results to be generalized to the others. However, the fact that many factors, such as pain, a positive outlook, and a change in mental status, do show consistent associations with the depression-related outcome measures, despite the fundamental differences in these three samples, does suggest some validity of both the data and the measures.

6.4 Research Question 3. Validation of the Single Self-Report Question

The development or validation of a new measure, for which a gold standard or other measure exists that can be administered concurrently with the new measure, incites the question of why a new measure is needed (Streiner, 1993). As Streiner (1993) suggests, the only reason for exploring a new measure is the possibility that it has some facet of superiority. It could be that it is cheaper, faster, less invasive, more accurate or easier to use. In the case of a single self-report question for depression screening, its expediency, efficiency, and low invasiveness has already been highlighted within the screening literature (Chochinov et al., 1997; Gori et al., 1998; Mahoney et al., 1994; Vahter, Kreegipuu, Talvik& Gross-Paju, 2007; Watkins et al., 2007).

The DRS one-plus measure was used as the standard measure in the proposed criterion validation of the single self-report question. The DRS has been validated (Burrows et al., 2000) and was thus able to act as the standard baseline measure, informing the performance of the self-report item. Both the self-report item and the DRS measure are screening items, which inform the need for further attention and possibly diagnostic

evaluation, making the validation of the self-report item solely a validation of the item's screening detection abilities, drawing no diagnostic-related conclusions.

The validation analyses resulted in a correlation of only 0.25 between the single self-report question on the CA screener and the DRS measure on the follow-up HC assessment. As two measures that are supposed to be measuring the same thing, a stronger correlation was expected (Streiner, 1993). Below 0.30 is generally looked upon as being too low and gives credence to the possibility that the two measures are measuring different things (Streiner, 1993). However, the limitation offered by the design of the administration protocol of the two assessment instruments must be considered. This study's CA-HC dataset reported up to a 90 day time lapse between the administration of the CA screener and the follow-up HC assessment. This time period offers increased opportunity for change to have occurred, including the possibility of a change in state, between the administrations of the two assessments. This could offer explanation to the weaker performance of the single self-report question with the DRS in the CA-HC sample when compared with the analyses of the concurrently administered measures in the first three datasets.

When the single self-report question was measured against the DRS in the CHA sample, which has been proposed to be closely comparable to the CA-HC sample, a stronger correlation of 0.42 resulted. Further, when analyses were conducted for the self-report item and the DRS against the diagnostic depression measure, the self-report item evidenced a stronger relationship with the diagnostic measure than the DRS. It did achieve a correlation of 0.30, and also reported a stronger model-fit with the diagnostic measure. This offers support to the self-report item's capability as a depression screening tool.

Despite the weaker association, the validation-related analyses do offer promising insight. The likelihood ratio of 2.0 offers credibility to the self-report measure in that there is a small increase in the likelihood of obtaining a DRS score of one or greater if an individual self-reports the presence of a depressed mood state. The likelihood ratio has much practical value and is the favoured and, arguably, best means of expressing the usefulness of different tests (Sackett, Haynes, Guyatt & Tugwell, 1991). The positive predictive (PPV) and negative predictive values (NPV) were 58% and 69%, respectively. The predictive values are highly dependent on the prevalence of the disease, thus the representativeness of the sample to the general population is imperative. The dataset samples involved in this research were randomly selected and are believed to be representative. However, it is concluded that a test is valid on three principles: if it detects most individuals with the target outcome; if it excludes most individuals without the target outcome; and if a positive test is indicative of the presence of the target outcome (Greenhalgh, 1997). Therefore, the lower predictive values, along with the sensitivity of 49% and the specificity of 76%, do not lend strong support to the validity of the self report measure when validated against the DRS in the CA-HC population.

The lower sensitivity and specificity levels are not novel to the screening literature. Lloyd-Williams and colleagues (2008) reported sensitivity and specificity levels of 55% and 74%, respectively, when using the DSM gold standard diagnostic interview as the comparative measure with a single self-report question and encourage the need for further evaluation. In addition, the lower correlation of 0.25 reported between the DRS and the single-question is not unheard of. When Anderson and colleagues (2003) conducted a correlation analysis between the self-report GDS and the observer-rated DRS the resulting

correlation was 0.13. Both of these scales are validated and continue to be used within a variety of adult populations. Though lower than ideal, these results cannot be disregarded as inconsequential.

In the context of a validation study, Greenhalgh (1997) proposes several aspects, which should be addressed when critically evaluating the quality of the validation. To the credit of this validation, the subject matter is seen to be of great importance to the study populations, and the samples that comprised each dataset are believed to be representative of the populations of interest. Also, the methodology of the validation has minimized workup bias (Greenhalgh, 1997) and criterion contamination. Though an individual might not flag the depression screener on the CA it does not mean that he or she will definitely not be administered the follow-up RAI-HC assessment. There is always the possibility that the individual will flag the need for attention in another health service area and will consequently obtain the follow-up assessment containing the DRS measure. This is highly probable since many factors have been shown to be associated with and act as predictors of a possible depressed mood state (see Section 5.3).

Alternately, this validation study did not meet all of Greenhalgh's (1997) recommendations. The reproducibility of the measures is not mandatorily tested. The normal protocol is for the measures to be administered and assessed once. Possibly of greatest concern is the difficulty of attempting to validate a test against a "gold standard". Particularly, there is a critical methodological feature to which a validation study must adhere: the test being validated must not be used to define the gold standard (Greenhalgh, 1997). Unfortunately, because of the limited measures available within the RAI assessments, and this study's use of secondary data, this directive could not be accommodated.

It is possible that the weak association of the self-report with the DRS is not indicative of the incapability of the item but is, instead, representative of a difference in detection ability between the two measures. Across four of the study populations, it is evident that the two screening measures are not entirely similar, but are possibly complementary. For example, of those flagged by a screener in the CHA population, 20.2% were flagged by the self-report and 24.2% by the DRS. Between the two, 12.1% were flagged in agreement of both. In the CA-HC sample, 34.0% were flagged by the self-report, 39.6% by the DRS, and 19.3% by both. This indicates that, if the self-report was used as the sole screening measure in the CA-HC sample, approximately 20.3% of the clients who scored a one or greater on the DRS would not be flagged for the presence of a possible depressed mood state. As a result, it is not reasonable for both to be accused of being over-inclusive. As proposed in the context of the DRS and GDS scales in Section 2.4 of this study, it may be more plausible to propose that each measure is catering to a unique facet within the same population. Without having specifically explored the descriptors for both flagged populations, no definitive conclusions can be drawn.

If the measures are, in fact, catering to unique groups, it could be argued that the tools are complementary, and are thus both needed when screening for a possible depressed mood state. This would further support the design of the many RAI assessments that house both screening measures. In addition, the protocol followed by the CA screener and follow-up HC could also be supported, as those who receive both assessments are being administered the two screening tools; however, not all clients receive the follow-up assessment. This has the potential to act as a detriment to the population who does not flag the self-report, but would potentially flag the DRS. However those who do receive both assessments are the more

complex, longer-served home care clients, indicating that depression is most likely more prevalent within this population. Thus, the loss of the follow-up DRS measure might be occurring within the lower risk population.

When using the DRS as the comparative criterion measure, the self-report does not perform strongly in detecting a possible depressed mood state within the CA-HC study sample. Consequently, in conjunction with the aforementioned validation-related limitations, it is concluded that the single self-report question does not express strong validity within the CA-HC population; however, it should not be disregarded. It should be studied further for greater understanding of its ability as the results do have parallels with existing literature. The validity of the question within the CHA, CMH, and PC populations cannot be informed by this research since, as previously addressed, the populations exhibit dominant differences in both composition and in their respective expression of a possible depressed mood state.

6.5 Strengths and Limitations

6.5.1 Strengths

A predominant strength of this study is its use of interRAI data. The organization's instruments facilitate the standardized collection of characteristic and clinical information from a range of adult populations such as those comprised of elderly, frail and disabled individuals; the reliability (Morris et al., 1997; Sgadari et al., 1997) and clinical utility (Morris et al., 1997; Phillips & Morris, 1997) of the set of instruments have previously been established. In addition, when delivered as directed, the administration protocol can be seen as a strength of the interRAI data since specific instruction is provided to the assessors. This

use of secondary data is particularly conducive to research at the Master's degree level since it evades the resource burden that can accompany primary data collection.

Exploring the performance of multiple DRS thresholds before continuing further into the analysis offered strength to the methodology and subsequent findings of the current research and also to the validation of the DRS as a depressive symptom detection measure. Researchers have questioned the current three-plus threshold and have suggested that alternate, possibly more encompassing scores be explored (Martin et al., 2008). Using and supporting the use of the one-plus threshold ensures that more individuals, who are suffering with the disorder, are detected and then treated. In addition, the comparison of the DRS measure to the single self-report question has not yet been considered in the field, nor has the validation of the single question against the DRS measure.

The exploration of possible associated variables with various depression-related outcomes across three different populations aids further in the recognition of a possible depressed mood state. The knowledge and recognition of depression's associated factors can facilitate the screening process before formal scales are administered, and expedite the detection and subsequent treatment of the debilitating disorder. It is evident that this research has contributed to the field of depression screening on multiple levels.

6.5.2 Limitations

The limitations of the proposed research must also be recognized. First and foremost, the limitation of secondary data analysis will be encountered. Though the interRAI data provides credibility, the data was not specifically collected to meet the objectives of this research. This limitation must be addressed because of the possibility of expectation, or

assessor bias. A single assessor is responsible for recording the self-report response and evaluating the DRS measure. It has been recognized that if the self-report is completed first, the assessor's appraisal of the DRS items might be influenced accordingly (Watkins et al., 2007).

The approach of the RAI instruments might bestow another limitation on the DRS as a detection tool. In an attempt to lessen the impact of recall bias, the instruments limit many of their measures to the three days prior to assessment – inclusive of the self-reported depression and DRS items. Notably, the measures do try to compensate by including an optional response of, "not in last 3 days, but often feels that way". However, the time restriction has the potential to be problematic if an individual has experienced depressive symptoms intermittently but not within the fixed time frame.

This research is further limited by the data since the capacity to measure all desired variables is compromised both in the presence and absence of particular variables. For example, a measure of education level is an absent variable within the assessments. High educational attainment has been associated with increased levels of happiness and healthiness in late life (Murrell, Salsman & Meeks, 2003), and absolutely no formal education has been associated with depression (Mohd Sidik, Mohd Zulkefli & Shah, 2003). Therefore, the absence of an education variable within the analysis could mean the absence of a risk factor, though a definitive conclusion cannot be drawn. Similarly, the RAI ADL Hierarchy Scale, which is a cumulated scale measure of functional self-performance, is not present across all assessments. Since the selection of variables was guided largely by the objective of measuring identical variables across the three assessments for comparability purposes, the ADL Hierarchy Scale was not considered for a measure of functional capacity. Instead, the

two variables of personal hygiene and walking, which were consistent across the CHA, CMH, and PC assessments, were used as the only ADL measures.

Similarly, the existing diagnosis of depression variable is only present within the CHA. Although the other assessments have a section which allows assessors to write-in existing diagnoses, low numbers are reported for a depression diagnosis, affecting the ability to use the variable as a "gold standard" measure within the analyses. This deprives the study of a common comparative diagnostic measure across the CHA, CMH, PC and HC instruments, making the DRS, a detection tool, the only viable comparative criterion measure for the validation of the self-reported depression item.

A limitation exists within the composition of the matched CA-HC dataset, which must be acknowledged. One exclusion criteria existed: clients must have had both a completed CA and a completed follow-up HC assessment. Those who completed a CA screener but not a follow-up HC assessment could not be included within the study sample. Thus, the data is not representative of a general CA population, though characteristics of a general population are provided in Table 3. Using only those with matched assessments could be indicative of a more disabled study sample since the clients who are receiving the matching HC assessments are those with longer term needs, and are generally facing chronic illness or disability for a longer period. This is certainly a risk factor for depression. This hypothesis is supported by the descriptors reported in Table 3 as less independence as well as more physical and cognitive impairment is evidenced within the matched CA-HC sample when compared with the general CA sample.

There are a few validation-related limitations, which must be addressed. As mentioned above, the self-report item and the DRS are the only two depression-related

outcome measures that are consistently present across all four datasets. The exploration of the DRS threshold was an essential element of this research, but the evaluation of its performance was only possible through the comparison with another depression-related outcome measure. Therefore, it was necessary to use the screening results of the single self-report item as a tool to inform the best-suited detection cut-point for the DRS measure. However, a similar argument must be proposed within the attempted validation of the single self-report question.

To conduct a criterion validation study for the screening ability of the single self-report question on the CA, a validated screening measure had to be used as the comparative criterion measure. Again, the only such available measure was the DRS on the follow-up RAI-HC assessment. Thus, to inform the validity of the self-report item, the DRS one-plus threshold was used. These cyclical methods suggest caution be exercised regarding this study's results. But, as acknowledged, the methods were limited by the available measures within the assessment instruments. It has also been recognized that the two screening measures, the self-report item and the DRS, have limited overlap in agreement in their respective positive detection populations. It is possible that the measures might have different screening sensitivities since they do appear to cater to unique populations, which could possibly explain the weaker associations between the two.

Lastly, the criterion validation of the single self-report question involved the validation of one screening tool with another. A predictive validation would have involved an anticipated diagnosis at follow-up by those who flagged the self-report question, but the anticipated results, in this case, was simply for a consistently flagged screener. However, the time lapse that is present between the administration of the CA screener and the follow-up

HC assessment allows the possibility of a change in state to be occurring within the up to 90 day period before follow-up assessment time-window. This possibility could be considered and controlled-for in the future.

6.6 Future Directions

Taking the above-mentioned limitations into consideration, this research can inform several future research directions. Firstly, the resulting limited overlap between the detection of a possible depressed mood state according to the single self-report item and the DRS one-plus threshold needs to be explored further. These two screening tools are each detecting something the other is not. Therefore, it is recommended that the differences between the flagged populations be investigated further in an effort to gain further understanding of the detection abilities of the screening measures.

If the measures are definitively found to have differences in detection ability, the CA depression screener could be strengthened by adding a depression screening algorithm to the assessment, which could assist in identifying at-risk individuals. The bivariate exploration of possible predictor variables within the comparable CHA sample of this study could help to inform future multivariate analyses, contributing to the development of such an algorithm. Closely comparable CHA predictor variables found within the CA include: the status of cognitive skills for daily decision making; change in decision making ability; change in ADL status; pain symptoms; and informal helper status.

It is also recommended that the possible changes, which might be taking place within the up-to 90 day time lapse between the administration of the CA screener and follow-up HC assessment be further explored. For example, within this time frame, it is common for a

client to have changed locations (e.g. hospital to home). The DRS and self-report were the most weakly correlated in the CA-HC analysis, when compared with the correlations between the two measures in the analysis for the first research question. Thus, the further exploration of this issue could offer a more accurate explanation into the performance of the self-report question in the validation population. The use of a larger dataset would allow for the stratification of variables, such as the place of initial assessment.

In terms of assessment, it is recommended that a mandatory administration protocol be implemented into the already existing administration protocol of the interRAI assessments instruments. Previous research has acknowledged the potential bias involved with having a single assessor administer and record responses to both a self-report item and an observer-rated item that are measuring the same outcome (Watkins at al., 2007). To avoid this expectation, or assessor bias, the interRAI organization needs to ensure that the DRS items are completed before the client is administered and responds to the self-report item. This could be ensured through drawing explicit awareness of this issue to the assessors before the assessment takes place, implementing a stricter assessment protocol, or relocating the items to different sections within the instruments. Although, by design, the DRS is already physically presented before the self-report item within the instruments, the measures are still located directly within the same section, and sometimes on the same page.

Lastly, to conclusively inform the validity of the single self-report question, a stronger validation, without cyclical methods, needs to be conducted. In the context of the interRAI assessments, it may be possible to conduct a predictive validation of the self-report screening tool, using a depression diagnosis as the comparative criterion measure.

A predictive validation can be conducted if the attribute being measured will occur sometime after the test is administered (Streiner, 1993). Using a new clinical diagnosis of depression as the comparative measure in the HC (the CA does have a section for the reporting of existing diagnoses) will allow the screening ability of the single self-report question in the CA to be more strongly informed, since it has been proposed that the self-report item and DRS have differences in their screening abilities.

Notably, there are considerations which accompany this type of approach to the single self-report validation. As previously addressed, depression is commonly under-reported so additional indicators of depression should be considered, such as the prescription of anti-depressant medication. Existing prescriptions are assessed and recorded within the HC instrument. There would also be factors to be controlled such as timing between screening and follow-up assessment, as well as possible changes in a range of health statuses. However, limitations considered, it is still recommended that a predictive validation would be worth conducting to further inform the screening ability of the single self-report depression question.

6.7 Implications

This research can offer implication to the many domains that are associated with depression in adult populations, extending into the fields of clinical practice, policy implementation, and health research. In essence, the findings from this study have the potential to improve the quality of life of the researched populations through identification, management, and treatment of the disorder.

As discussed, depression in elderly populations is commonly under-recognized, under-diagnosed, and under-treated (Stiefel, Trill, Berney, Olarte & Razavi, 2001). However, research in the field has been growing in recent years and knowledge is disseminating into practice, and policy. It is hoped that the research at-hand will support this maturation and promote the importance of depression recognition through the identification of associated factors. The identification of depression-related predictor variables can act to enhance screening expediency in both clinical and research fields. There is also the potential to inform screening-related policies through these factors.

This research also promotes the need for and use of effective screening procedures for older adults. Advocating for the use of the one-plus DRS threshold for depression screening can contribute to this cause as it has the potential to offer further strength and validation to the DRS as a depressive symptom detection measure in the studied populations. Also, though another validation study is recommended for the single self-report item within the CA-HC population, the potential advantages of the single question have been highlighted and this preliminary validation study works toward directing the future validation of the item.

This study adds to current knowledge in the fields of depression recognition, depression screening, and self-report measures, and provides direction for future research. Overall, it is hoped that with the increased awareness and recognition offered by research, such as the study at-hand, the quality of life of older adults who experience depression and its symptoms can be improved.

6.8 Conclusions

In summary, the current research offers a number of important implications and conclusions. The variables that were selected to be explored and measured against the multiple depression-related outcomes did not convey a common theme in general significance across the three study samples of the CHA, the CMH, and the PC. The findings from one of the three populations cannot be generalized to explain the findings for the other two. It is thus concluded that each assessment population exhibits unique characteristics and, consequently, experiences and expresses a possible depressed mood state in a unique way.

Primarily, it must be recognized that this is considered to be a preliminary validation study of the single self-report question within the interRAI assessment instruments. Due to the acknowledged methodological limitations and subsequent results, this study cannot conclusively inform practice and policy, but it can inform future research directions. This research acts to direct and encourage a future validation study within the studied population. To this effect, it must also be reiterated that this validation study was conducted solely within the CA-HC sample, and therefore can only apply the results to this population, though generalizability to the CHA population could be supported.

The use of a one-plus detection threshold is proposed for the DRS to act as the best suited cut-point to determine the presence of a possible depressed mood state. Since the DRS is a depression screening measure, it is safer to err on the side of inclusion than to risk neglecting an individual who may be suffering with or may be at risk of developing the debilitating disorder, as disease manifestation is associated with adverse effects such as functional deterioration (Hays, Saunders, Flint & Blazer, 1997) and can act as an independent predictor of mortality (Müller-Tasch et al., 2004).

As for the compatibility between the screening abilities of the single self-report question and the DRS, the weaker relationship and low agreement between the two is proposed to be indicative of a difference in detection ability. It is plausible that each measure might be detecting a possible depressed mood state in a unique sub-section of the same assessment sample. This is additional evidence to support the completion of a predictive validation study of the screening ability of the single self-report question using a depression diagnosis as the comparative criterion measure.

Further, although the validity of the single self-report question has not yet been established, its use is still encouraged as it has shown to be detecting a possible depressed mood state in a unique population. As mentioned, it could be beneficial to explore the possibility of creating a screening algorithm to assist the single question in the identification of those at-risk of developing the disorder on the CA screener. Evidence from the explored bivariate associations between predictor variables and depression-related outcomes of the CHA sample within this study could inform the first-steps in this process.

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Appendices

Appendix A: Summary of Common Self-Report Measures of Depression

Scale	Content	Number of Items	Response Format	(Approximate) Time for Administration
BDI Beck Depression Inventory	Cognitive, affective, and somatic items	21	0-3 Rating Scale	5-10 Minutes
BDI-SF Beck Depression Inventory-Short Form	Cognitive, and affective items	13	0-3 Rating Scale	< 5 Minutes
CES-D Center for Epidemiological Studies – Depression Scale	Cognitive, and affective items	20	4-Point Likert Scale	< 10 Minutes
GDS Geriatric Depression Scale	Cognitive, and affective items	30	Yes/No	10-15 Minutes
GDS-S Geriatric Depression Scale - Short Form	Cognitive, and affective items	15	Yes/No	5-7 Minutes
HADS Hospital Anxiety and Depression Scale	Depression and anxiety items	14	4-Point Likert Scale	5-10 Minutes

Adapted from Smarr, K. L. (2003). Measure of depression and depressive symptoms. *Journal of Arthritis and Rheumatism, 49*(5S), S134-S146.

Appendix B: Location of Explanatory Variables in RAI Assessments

Name of Variable	Type of Variable	Location in Dataset		
		CHA	CMH	PC
Age (in years)	Continuous	a3a-a3c	a3a-a3c	a3a-a3c
Gender	Categorical	a2	a2	a2
Marital Status	Categorical	a4	a4	a4
Living Status	Categorical	a11	a12	a15
Living Arrangement	Categorical	a12	a14	a16
Change in Mental Status	Categorical		g4	f5
Psychiatric Diagnosis of Depression	Categorical	i1j		
Provisional Diagnosis of Mood Disorder	Categorical		r1f	
Number of Lifetime Psychiatric Admissions	Categorical		b6d	
Consistent Positive Outlook	Categorical		o6b	i1e
ADL Status - Personal hygiene, Walking	Categorical	g2b, g2c	h1a, h1b	j2b, j2c
Worsened ADL Status	Categorical	g5	h3	j5
IADL Involvement Scale Score	Continuous	Embedded scale-see section 4.3		
Cognitive Performance Scale Score	Categorical	Embedded scale-see section 4.3		
More Impaired Decision Making	Categorical	c3	g5	f6

Name of Variable	Type of Variable	Location in Dataset		
		CHA	CMH	PC
Diagnosis of Dementia	Categorical	i1c, i1d	r1b	
Pain Scale Score	Categorical	Embedded scale-see section 4.3		
GI Status–Acid Reflux, Constipation, Diarrhea, Vomiting	Categorical	j2g, j2h, j2i, j2j	j1d, j1e, j1f, j1k	c6b, c6d, c6e, c6h
Prognosis-Estimated Survival	Categorical			a12a
Strong and Supportive Family Relationship	Categorical	n1	o7	o4a
Conflict with Family or Friends	Categorical	f1d	o5a	

Appendix C: Method for Collapsing Predictor Variables

Variable	Code		
Age	CHA	CMH	PC
	0 = <75	0 = <35	0 = <555
	1 = 75-79	1 = 35-44	1 = 55-64
	2 = 80-84	2 = 45-54	2 = 65-74
	3 = >85	3 = 55-64	3 = 75-84
		4= 65+	4 = >85
Gender	1 = Male 2 = Female		
Marital Status	0 = Never Married 1 = Married/Partnered 2 = Widowed 3 = Separated or Divorced		
Living Status	0 = Private Home 1 = Specialized Service Home (Assisted living; Home for disabilities; Correctional facility) 2 = Institutionalized Living (Hospital; Long-term care facility) 3 = Homeless 4 = Other		
Living Arrangement	0 = Alone 1 = With Spouse or Partner 2 = With Relative other than Spouse or Partner 3 = With Non-Relative		
Change in Mental Status	0 = No 1 = Yes		
Psychiatric Diagnosis of Depression	0 = Not Present 1 = Present		
Provisional Diagnosis of Mood Disorder	0 = Not Present 1 = Present		
Number of Lifetime Psychiatric Admissions	0 = None 1 = 1-3 2 = 4-5 3 = 6+		
Consistent Positive Outlook	0 = No 1 = Yes		
Worsened ADL Status	0 = No 1 = Yes 2 = Uncertain		
IADL Involvement Scale Score	0-21: Continuous		
Cognitive Performance Scale Score	0 = Intact Ability 1 = Mild-Moderate Impairment 2 = Severe Impairment		

Variable	Code
More Impaired Decision Making	0 = No 1 = Yes 2 = Uncertain
Diagnosis of Dementia	0 = Not Present 1 = Present
Pain Scale Score	0 = No Pain 1 = Less Than Daily Pain 2 = Daily Pain but not Severe 3 = Severe Daily Pain
GI Status	0 = Not Present 1 = Present
Prognosis – Estimated Survival	0 = Death Imminent 1 = Less than 6 Months 2 = Longer than 6 months
Strong and Supportive Family Relationship	0 = No 1 = Yes
Conflict with Family or Friends	0 = No 1 = Yes