This is the published version:


Available from Deakin Research Online:
http://hdl.handle.net/10536/DRO/DU:30024994

Reproduced with the kind permission of the copyright owner.

Copyright: 2009, Promaco Conventions
Raising the Profile of Depression in the Workplace

Katrina J. Lawson  
*Deakin Business School, Deakin University, Burwood, Australia*  
Email: kjla@deakin.edu.au

John J. Rodwell  
*Deakin Business School, Deakin University, Burwood, Australia*  
Email: john.rodwell@deakin.edu.au

Andrew J. Noblet  
*Deakin Business School, Deakin University, Burwood, Australia*  
Email: andrew.noblet@deakin.edu.au
ABSTRACT

The prevalence of depression in the Australian workforce is unknown. Epidemiological surveys (e.g., the National Health Survey and National Survey of Mental Health and Wellbeing) do not routinely include a depression scale and within the mental health field, few studies focus on depression and employment groups specifically. Although the inclusion of a direct measure of depression in national surveys is preferable, the prevalence of depression may be inferred from short screening scales of general mental health. In this paper, scores on the General Health Questionnaire (GHQ-12) and the Kessler psychological distress scale (K10) for a sample of employed persons were mapped onto the CES-D (Iowa) measure of depression. The results of this study indicate that the recommended GHQ-12 cut-off point is appropriate for estimating work-related depression prevalence. However, the cut-off point on the K10 (the short-scale currently used in Australian national surveys) may need to be substantially reduced if scores on the K10 are to be used to identify workers at risk of depression. The routine inclusion of a direct depression measure in national surveys is recommended, particularly considering the number of employed persons in Australia and large proportion of the sample classified as depressed in this study.

Keywords: depression, mental health, ROC curve, prevalence, workforce

Short screening scales of mental health are considered integral to epidemiological surveys such as the National Health Survey (NHS) and National Survey of Mental Health and Wellbeing (NSMHW) in Australia (Australian Bureau of Statistics 2003). Short scales are particularly attractive because they enable population-wide information about prevalence and severity of mental health disorders to be easily captured, while simultaneously increasing response rates (Kohout, Berkman et al. 1993; Gill, Butterworth et al. 2007). The scale of choice for the assessment of mental health disorders has tended to be the General Health Questionnaire, also known as the GHQ-12 (Goldberg and Williams 1988; Furukawa, Kessler et al. 2003; Gill, Butterworth et al. 2007), and the validity of this instrument has been proven in a range of samples, including a variety of working populations (Banks, Clegg et al. 1980; Whaley, Morrison et al. 2005). The GHQ-12 was last used by the Australian Bureau of Statistics (ABS) in the 1997 version of the NSMHW and has since been superseded by the Kessler Psychological Distress Scale (K10) and used in the NHS and NSMHW questionnaires (Australian Bureau of Statistics 2003). Both the GHQ-12 and the K10 scales have been used in population studies (Donath 2001; Kessler, Andrews et al. 2002) by researchers in a variety of locations around the world, however, the K10 has been found to be more suitable for epidemiological studies because of its development with a non-clinical sample and its stronger relationship with medically diagnosed depression than the GHQ-12 (Australian Bureau of
Statistics 2003; Furukawa, Kessler et al. 2003; Gill, Butterworth et al. 2007). Nevertheless, the GHQ-12 remains a valid measure, as indicated by an analysis of the 1997 NSMHW data that found scores on the GHQ-12 to be significantly related to subjective wellbeing in the expected direction (Coyne 1994). The accuracy of both the GHQ-12 and the K10 will be examined in this study. Cut-off points obtained through receiver operating characteristic (ROC) curve analysis will be used to estimate the prevalence of depression in the Australian working population. Although it is preferable to collect depression statistics directly (Coyne 1994), population-wide surveys in Australia, such as the NHS and the NSMHW, do not consistently contain a depression-specific instrument. The NHS, for example, has not included a direct measure of depression since 1995 when it investigated age-related depression and the number of recent or long-term cases (Australian Bureau of Statistics 1997). Similarly, the 2007 version of the NSMHW included information on lifetime and 12 month “depressive episodes”, with the majority of statistics presented under broader mental health categories (Australian Bureau of Statistics 2008). Further, the NHS and NSMHW questionnaires have not provided prevalence statistics specific to depression amongst employed persons. Therefore, although it was suggested five years ago that these same Australian surveys directly monitor depression prevalence amongst the wider population and within subgroups such as the employed (Mackinnon, Jorm et al. 2004), little appears to have changed since that time.

Our aim is to raise awareness of depression in the Australian workplace. This study seeks to establish the presence of a substantial number of working Australians with depression symptoms by examining a large, relatively high-stress occupation, namely, the police (Cooper, Cooper et al. 1988). If a notable prevalence of depression Australians is found in this occupation and/or through the examination of GHQ-12 and K10 cut-off scores based on the previous results of Australia-wide surveys, the results could underline the need to include depression scales in surveys such as the NSMHW.

Mental health disorders are the third largest contributor to the overall disease burden in Australia (Begg, Vos et al. 2007), with as many as one in five or approximately 20% of Australians found to have some form of mental illness (Beyond Blue: The National Depression Initiative 2008; Clarke and Currie 2009). The rates of depression are of particular concern with records showing that approximately 24% of [Type text]
GP patients are seeking treatment for depression (Gunn, Gilchrist et al. 2008). This figure is consistent with the rates reported in other developed countries where depression is reported to be the most common form of mental illness (LaMontagne, Keegel et al. 2008). It is also possible that the number of Australians suffering from depression may be higher than official estimates with the majority of people with mental illness, including depression, not seeking professional assistance (Australian Bureau of Statistics 2009). As a result, the most direct mechanism for detecting positive cases is circumvented, implying that national depression statistics may be at best misleading and, at worst, grossly under-estimated. The accuracy of mental health statistics has considerable practical implications, especially in terms of ensuring there are adequate resources to address the number of people experiencing depression. Hence it is critical that large-scale data provide a reasonably accurate estimation of the proportion of Australians affected by this issue. Further, there are a number of reasons why it is important to identify the percentage of employed Australians, in particular, experiencing depression, with the working environment well recognized as having a major impact on people’s psychological wellbeing (Victorian Health Promotion Foundation 2006; Begg, Vos et al. 2007; Langlieb and DePaulo 2008).

In total, workplace injuries and illnesses cost the nation approximately $34.3 billion per year, with employers, workers and the community (3%; 44%; and 53% respectively) sharing this cost (National Occupational Health and Safety Commission 2004). Depression, in particular, is responsible for a large proportion of Australia’s health care costs and is responsible for an average of 2.9 days of absenteeism per three month period (Chisholm, Diehr et al. 2003). There are approximately 10.3 million Australians in the workforce (Australian Safety and Compensation Council 2007), with more than 54% of Australians between the ages of 25 and 64 in paid employment, (Australian Institute of Health and Welfare 2008). According to 2004/2005 data, approximately 765,000 working adults aged 25 to 64 years suffer from some form of mood disorder during a one year period in Australia (Australian Institute of Health and Welfare 2008) and 15.5% are thought to be work-related (Australian Bureau of Statistics 2006). This result is consistent with other research focusing specifically on depression, where 13-17% of all reported cases of depression in the Australian state of Victoria were attributable to the workplace
(LaMontagne, Keegel et al. 2008). There is some evidence that mental health disorders are not uniformly distributed across all employment sectors however. People working within service-based industries including manufacturing, property, retail, healthcare and law enforcement have higher levels of occupational stress and are more likely to experience anxiety disorders than individuals from other industries (Nuttfield Trust 1998; Waghorn, Chant et al. 2005). Employees in service-based occupations, particularly healthcare, may be more at risk of poor psychological health due to the degree of emotional work or ‘emotional labour’ likely to be associated with their job (Bolton 2001), with level of emotional labour significantly related to increased occupational stress (Mann 1999). Due to the nature of work encountered, police work is another occupation that is generally considered to be stressful (Cooper, Cooper et al. 1988; Liberman, Best et al. 2002). However, it has been claimed that there are actually “more similarities than differences” (Brough 2004 p.228) in comparison to other non-emergency services occupations. In support of this claim, a number of studies have found that the health of police officers is more likely to be negatively affected by non-specific organisational stressors than stressors specific to police work (Gaines and Jermier 1983; Violanti and Aron 1995; Buker and Wiecko 2006; Morash, Haarr et al. 2006). In one study for example, the extent of bureaucratic practices (e.g., too much “red tape”, inadequate supervision/direction and poorly defined procedures) was found to be more predictive of occupational stress and poor mental health among police officers than stressors directly related to their work (Buker and Wiecko 2006). Further, research has demonstrated that the impact of occupational stress on psychological health is highly similar for police officers and employees from 25 other diverse occupations (Johnson, Cooper et al. 2005). Therefore, based on previous research occupational stress research, the results from the present study should largely apply to individuals from a range of occupations and allow for a reasonable estimation of work-related depression prevalence in Australia. The results could also help underline the need to include a depression scale in future
administrations of national surveys such as the NSMHW, particularly if a notable rate of depression symptomology is found.

There is disagreement within the literature as to the categorisation of psychological distress, although, a cut-off score of 30 has been used to indicate the highest, most severe, level of distress (Australian Bureau of Statistics 2003). Within Australia, results from the NSMHW indicate that approximately 4% of citizens suffer from severe distress with a score of 30 or more on the K10 psychological distress scale (Australian Bureau of Statistics 2006). Research based on NSMHW data has also been used to establish a cut-off point for the GHQ-12. Based on the Likert scoring method, the appropriate cut-off point for the GHQ-12 scale is 10/11 (Donath 2001). The last version of the NSMHW to include the GHQ-12 was in 1997 (Australian Bureau of Statistics 2003). The lower cut-off score for the GHQ-12 is reflective of the narrower score range (0-36) in the GHQ-12, compared to the larger score range (0-50) on the K10. The recommended optimal cut-off points of 30 for the K10 and 10/11 for the GHQ-12 will be used in the present study. In particular, the optimal cut-off points obtained through this investigation with a sample of working Australians will be compared to the recommended optimal cut-off points that have been established through population-wide Australian research. Implications for the mental health-specific questionnaire, the NSMHW, will also be discussed in this paper. In particular, using the obtained cut-off point for the K10 measure, which has been proven as more accurate than the GHQ-12 in past studies (Australian Bureau of Statistics 2003; Furukawa, Kessler et al. 2003; Gill, Butterworth et al. 2007), the likely percentage of Australians suffering from concerning levels of psychological distress will be updated using results from the 2004-2005 NSMHW. Gender differences in the obtained cut-off points will also be investigated in this study in light of previous research findings that suggest mental health disorders, including psychological distress and depression, are more likely to be experienced by females (Australian Bureau of Statistics 2002; Gunn, Gilchrist et al. 2008). It has been reported that 571,000 women compared to 246,000 men experience very high levels of psychological distress (Australian Bureau of Statistics 2006). Similarly, the largest national
longitudinal study of depressive symptoms (known as diamond) recently reported that a substantially larger number of female respondents met the criteria for a diagnosis of depression at baseline in comparison to male respondents, at 72.8% and 27.2% respectively (Gunn, Gilchrist et al. 2008). In the present study, the cut-off point for females may therefore be lower.

METHODS

Sample

The sample came from a larger longitudinal study (2005-2008) of sworn and unsworn members of a state-based police force in Australia. The present study uses 2006 data for sworn members only (n = 631) of one particular region, including both males (n = 479) and females (n = 152). The response rate for this region was approximately 36%. The self-report questionnaires were distributed to each work location within the region from a central mail centre. According to the demographic data, the largest sub-group of the sample (42.9%) had been working for the police force for more than 20 years at the time of the survey, although a substantial proportion (52.6%) had only been working in their current position for 1-4 years. The most common rank was Senior Constable (57.8%), followed by Sergeant (20%), Constable (11.7%), Senior Sergeant (7.8%), Inspector (2.1%), VPS2 (.3%) and Superintendent-Chief Commissioner (.2%).

Instruments

Psychological wellbeing was assessed with the 12 item GHQ-12 (Goldberg and Williams 1988). Respondents were asked to think about their health over the past month and whether they had “been able to enjoy their normal day-to-day activities?” or “lost much sleep over worry?”, for example. The Likert scoring method was used, where each item was given a value from 0-3 and higher scores indicated poor wellbeing (Donath 2001). The Cronbach’s alpha for the GHQ-12 in the present study was .92. Psychological distress was measured with the K10, giving a possible score range of 10-50, with lower
scores indicating greater distress (Kessler, Andrews et al. 2002). Respondents were asked to think about the past 30 days and report, for example, the extent to which they had felt “nervous”, “depressed”, “hopeless” or “worthless”. The Cronbach’s alpha was .93 for K10 in the present study and similarly high internal reliabilities have been found in previous studies (Kessler, Barker et al. 2003). The nine-item Iowa short form of the CES-D scale was used to assess indicators of depression, based on feelings experienced in the past week (Radloff 1977; Kohout, Berkman et al. 1993; Santor and Coyne 1997). Example items from the CES-D (Iowa) include; “I had trouble keeping my mind on what I was doing”; “my sleep was restless”; “I was bothered by things that usually don’t bother me”. The psychometric properties of the CES-D (Iowa) have been found to be highly similar, if not superior, to the full version of the CES-D (Santor and Coyne 1997). In the present study, the CES-D (Iowa) was used as the standard against which the concurrent validity of the GHQ-12 and the K10 were compared. Similar methodology to the current study (e.g., mapping a shortened mental health measure onto a depression scale) has been used in past studies (Goldberg, Oldehinkel et al. 1998; Donath 2001; Kessler, Andrews et al. 2002; Gill, Butterworth et al. 2007). Based on previous research, scores of four or more on the short form of the CES-D (Iowa) were used to discriminate between depressed and non-depressed individuals (Santor and Coyne 1997). The Cronbach’s alpha for the CES-D (Iowa) scale in the present study was .93.

**Data Preparation and Analyses**

Data analyses were conducted using version 15.0.1 of SPSS and Microsoft Excel. Receiver operating characteristic (ROC) curves were generated for the GHQ-12 and the K10 onto depression for the total sample, as well as by sex (per Donath 2001). These analyses resulted in a total of six curves and associated statistics. ROC curves stem from signal detection theory (Peterson, Birdsell et al. 1954) and are used to depict the accuracy with which a test discriminates between two alternatives, such as diseased or non-diseased (Peterson, Birdsell et al. 1954; Fawcett 2006). ROC curve analysis seeks to maximize the chances of making a correct prediction or ‘hit’, while minimizing the number of ‘misses’ (Peterson, Birdsell et al. 1954; Swets 1988). The number of ‘hits’ or true-positive (TP) decisions are plotted on the
y-axis, against the number of ‘misses’ or false-positive (FP) decisions on the x-axis, with each point on
the curve referring to a particular sensitivity (TP) and specificity (FP) value (Peterson, Birdsall et al.
1954; Fawcett 2006; Akobeng 2007). ROC curves that are no more accurate than chance have an area
under the curve (AUC) of .50, while curves with perfect accuracy have an AUC of 1.00 (Peterson,
Birdsall et al. 1954; Fawcett 2006). Sensitivity and specificity values can be used to calculate the Youden
index = max, [sensitivity(t) + specificity(t)], which identifies the optimal cut-off point for a test, or point
at which the ROC curve is farthest from the chance line on the diagonal (Hsieh and Turnbull 1996; Fluss,
Faraggi et al. 2006). Provided that the accuracy of the curve is reasonably high, the cut-off point can then
be determined based on the sensitivity and specificity values for the various points of the curve.
Sensitivity and specificity by default have the same weighting (1:1) in the Youden index (Hsieh and
Turnbull 1996), however, these weightings can be adjusted. For example, if it is more important to
identify positive cases (e.g., depression) sensitivity values could be given greater weight, but this
weighting creates more false-positive diagnoses (Peterson, Birdsall et al. 1954; Santor and Coyne 1997).
False-positive diagnoses can result in unnecessary shock to the individual and may result in inappropriate
treatment and needless use of resources and the reverse situation is also applicable where a false-negative
diagnosis may mean that an individual may not receive treatment because their illness is unrecognized
(Youden 1950). The task is to find the cut-off point, or threshold value, at which the trade-off between
sensitivity and specificity is most appropriate for the phenomenon under investigation (Akobeng 2007).

RESULTS

Based on the CES-D (Iowa) scale, 65.6% of the sample in the present study (n = 414) was
classified as depressed, scoring four or more (Santor and Coyne 1997). The mean score on the CES-D
(Iowa) was 7.56 (95% CI = 7.06 – 8.07). Testing the boundary score using the highest cut-off point
considered for the CES-D (Iowa) (Santor and Coyne 1997), a score of nine, resulted in 37.2% of the
present sample (n = 235) being classified as depressed.
For the overall sample, the mean of the GHQ-12 was 13.63 (95% CI = 13.10 – 14.14), with mean scores of 13.75 for males and 13.24 for females. The mean score on the K10 for the overall sample was 17.91 (95% CI = 3.48 – 32.34), with mean scores of 17.98 for males and 17.70 for females. The AUC values and their respective 95% confidence intervals for each of the three samples are in Table One.

--- Insert Table 1 about here ---

The cut-off points for both the GHQ-12 and the K10 were identified through the calculation of the Youden index (Hsieh and Turnbull 1996). Table Two presents the sensitivity and specificity values for each of the cut-off points respectively. For the present study, the cut-off point for the overall sample was calculated to be 11.5 for the GHQ-12 and 15.5 for the K10 (emphasized in bold font).

--- Insert Table 2 about here ---

In addition to calculating the above cut-off points based on a 1:1 ratio, the sensitivity and specificity values were given differential weightings to check the effects this would have on the cut-off points identified above (see Table Three). These checks were done for the overall sample, and for males and females respectively, in order to identify any gender differences in the cut-off points.

--- Insert Table 3 about here ---

Relative to the default 1:1 weighting, the cut-off points for both the GHQ-12 and the K10 scales tended to increase when specificity (FP rate) was given twice the weighting of sensitivity (TP rate) under the 1:2 weighting condition. Further, an inspection of the 1:1 weighting condition compared to the 2:1 weighting condition revealed that the cut-off points tended to decrease slightly when sensitivity was given twice the weighting of specificity. The pattern of relative increases in cut-off points for the overall sample...
when specificity was given more weight, and the relative decreases in the cut-off points when sensitivity was given more weight, were in the expected directions (Peterson, Birdsell et al. 1954).

Males and the overall sample shared identical cut-off points for both the GHQ-12 and the K10 in all instances, except when specificity (FP rate) was given greater weighting on the K10. The cut-off points for the female sample differed from the cut-off points for the overall sample for the 1:1 and 1:2 weightings. However, under the 2:1 weighting condition, the cut-off points for males, females and the overall sample were identical for both the GHQ-12 and the K10 (10.5 and 13.5 respectively).

**DISCUSSION**

It has been suggested that in Australia approximately 20% of the population suffers from depression (Beyond Blue: The National Depression Initiative 2008). The prevalence of depression within the workforce, however, is unknown, because population surveys have not investigated the workforce specifically. Population surveys such as the NHS and the NSMHW instead tend to include depression along with other mental health disorders under banners such as “mental and behavioural problems” and “mood (affective) disorders” (Australian Bureau of Statistics 2002; Australian Bureau of Statistics 2006). The present study sought to estimate the prevalence of depression among working Australians through the investigation of one particular sample of public sector employees using a measure of depression that is appropriate for use in non-clinical groups (Radloff 1977).

The finding that between one-third (37.2%) and two-thirds (65.5%) of participants in the present study were classified as depressed is relatively high in comparison to the 20% reported in other Australian research. Respondents in the present study were classified as depressed depending on whether their score exceeded the recommended cut-off point (of four, or an extreme boundary cut-off of nine) on the CES-D (Iowa) instrument (Santor and Coyne 1997). In comparison to previous Australian-based research, where the focus was on depression across the lifespan, the CES-D instrument asks respondents to rate how they “have been feeling over the past week” and, therefore, refers to a recent, relatively short, time period (Santor and Coyne 1997). Subsequently, it is possible that the difference between the reported depression...
prevalence for the Australian population of 20% and the obtained depression prevalence in the current study (of 37 to 65%) is due, at least in part, to temporal emphases. In particular, the higher depression prevalence in this study may be due to the salience of negative events in the preceding week, which research suggests are more cognitively accessible to individuals than positive occurrences due to a “negative memory bias” (Pyszczynski, Hamilton et al. 1989). Further, the number of negative life events experienced by individuals has been shown to be associated with diagnosis of depression (Radloff 1977). Therefore, the tendency for individuals to recall negative events rather than positive events, and the use of a short reference period in the CES-D (Iowa) scale, may have inflated the number of individuals in the current study being classified as depressed.

The depression prevalence rate obtained in this study should not be discounted, however, and may genuinely reflect the number of depressed individuals in the working sample investigated in this study, particularly due to the nature of their job. For example, a study of trained police officers found that they were at an increased risk of psychiatric morbidity compared to the general population (Hodgins, Creamer et al. 2001). The depression prevalence rate in this study of one particular occupation may not apply to the majority of Australian workers, but it does make the case that there are a substantial number of depression cases in the workforce. Further, it is worth noting that a depression prevalence rate very similar to the statistic obtained in the current study has been found in another study (63.6%, using the full 20-item CES-D) of primary care patients from community clinics (Santor and Coyne 1997).

The AUC values for the K10 were consistently higher than the AUC values for the GHQ-12 for the overall sample, as well as for males and females separately. This result builds upon previous research suggesting that the K10 is a better screening scale than the GHQ-12 (Furukawa, Kessler et al. 2003; Gill, Butterworth et al. 2007), although the differences between the AUC values for the scales in the present study were minimal.

In the present study of a working population the cut-off point for the GHQ-12 was 11.5 (sensitivity = 75.6%, specificity = 86.6%) and is similar to that obtained through the 1997 NSMHW questionnaire (Donath 2001). Taken together, the cut-off points from these two studies suggest that the
point at which Australians tend to experience poor psychological wellbeing is also the point at which depression becomes likely.

Within the more recent NSMHW, a classification of ‘high’ or ‘very high’ psychological distress is applied when individuals score above the cut-off point of 30 on the K10 (Australian Bureau of Statistics 2003). These persons may require professional assistance (Australian Bureau of Statistics 2006) and, using this cut-off point, the most recent NSMHW data suggests that 4% of the Australian population are suffering from high levels of distress at the time of the survey with a consequent need for mental health services (Australian Bureau of Statistics 2006). However, the cut-off point obtained in the present study was 15.5. The difference between the cut-off point obtained here and the recommended cut-off point for the K10 has implications for the number of Australians who are at risk of depression. In particular, using the classification scheme employed by the NSMHW, individuals scoring 16 or more are classified as experiencing ‘moderate’ psychological distress (Australian Bureau of Statistics 2003) and their mental health status appears to be subsequently interpreted as ‘satisfactory’. The results of the present study, however, indicate that individuals who are suffering from moderate to very high levels of psychological distress are at risk of depression. Adjusting the consideration of significant psychological distress to include those in the moderate to very high range (i.e., ≥16) indicates that 37% of the Australian population, rather than 4%, are suffering from concerning levels of psychological distress (Australian Bureau of Statistics 2006), a percentage prevalence that is more comparable to this study’s results and the prevalence rates from sources such as beyondblue (Beyond Blue: The National Depression Initiative 2008).

The following limitations of this study need to be acknowledged. First, the prevalence rate of depression in the current study was based on the recommended cut-off point of four on the CES-D (Iowa) scale (Santor and Coyne 1997), although the highest cut-off previously considered (nine) was also used as an extreme boundary indicator. Adjusting the CES-D (Iowa) cut-off point substantially alters the prevalence rate (i.e., from 65.6% to 37.2%) in this study, implying the need for further research to ascertain the appropriateness of these cut-off points. Similarly, although the present study appears to
indicate that the K10 cut-off point could be reduced to 15.5 in order to estimate the prevalence of depression in the workplace, the K10, as employed by the ABS, is used to screen for psychological distress severity (Kessler, Andrews et al. 2002) and, for that purpose, the recommended cut-off points may remain appropriate. However, if researchers or practitioners wish to determine at what point psychological distress is indicative of depression, or want to better understand depression and depression rates, we need depression-specific data from surveys, such as the NHS and the NSMHW, in order to understand more fully the mental health of the population, particularly in key groups such as the employed.

The lack of research within the mental health literature that focuses on employment groups and depression specifically was the impetus for this study (Griffiths, Jorm et al. 2002). Short screening scales of general mental health, such as the GHQ-12 and the K10, may not be adequate proxies for identifying individuals who are depressed (Coyne 1994). Therefore, the prevalence of depression in the Australian workforce will remain unknown unless population-wide surveys such as the NHS and the NSMHW routinely include a direct measure of depression.

ACKNOWLEDGEMENTS

This project was part-funded by the Australian Research Council.
REFERENCES


Table 1: Area under the curve (AUC) comparison for General Health Questionnaire (GHQ-12) and Kessler psychological distress scale (K10)

<table>
<thead>
<tr>
<th></th>
<th>GHQ-12</th>
<th>K-10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(95% CI)</td>
<td>(95% CI)</td>
</tr>
<tr>
<td>Total Sample</td>
<td>.89 (.86 - .91)</td>
<td>.91 (.89 - .93)</td>
</tr>
<tr>
<td>Males</td>
<td>.90 (.87 - .92)</td>
<td>.92 (.89 - .94)</td>
</tr>
<tr>
<td>Females</td>
<td>.87 (.82 - .93)</td>
<td>.89 (.83 - .94)</td>
</tr>
</tbody>
</table>
Table 2: Sensitivity and specificity values for different cut-off points on the General Health Questionnaire (GHQ-12) and Kessler psychological distress scale (K10) for the overall sample (excluding latter values where specificity equals 1)

<table>
<thead>
<tr>
<th>Cutoff</th>
<th>GHQ-12 Sensitivity</th>
<th>GHQ-12 Specificity</th>
<th>K10 Cutoff</th>
<th>K10 Sensitivity</th>
<th>K10 Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2.5</td>
<td>1</td>
<td>0.9</td>
<td>10.5</td>
<td>99.8</td>
<td>22.6</td>
</tr>
<tr>
<td>3.5</td>
<td>99.8</td>
<td>1.8</td>
<td>11.5</td>
<td>97.1</td>
<td>37.3</td>
</tr>
<tr>
<td>4.5</td>
<td>99.8</td>
<td>2.3</td>
<td>12.5</td>
<td>92.9</td>
<td>59.9</td>
</tr>
<tr>
<td>5.5</td>
<td>99.5</td>
<td>6.0</td>
<td>13.5</td>
<td>89.2</td>
<td>73.7</td>
</tr>
<tr>
<td>6.5</td>
<td>98.8</td>
<td>19.4</td>
<td>14.5</td>
<td>82.4</td>
<td>82.0</td>
</tr>
<tr>
<td>7.5</td>
<td>97.8</td>
<td>33.2</td>
<td>15.5</td>
<td>74.3</td>
<td>90.8</td>
</tr>
<tr>
<td>8.5</td>
<td>95.1</td>
<td>49.3</td>
<td>16.5</td>
<td>68.2</td>
<td>93.1</td>
</tr>
<tr>
<td>9.5</td>
<td>90.7</td>
<td>61.8</td>
<td>17.5</td>
<td>61.6</td>
<td>97.2</td>
</tr>
<tr>
<td>10.5</td>
<td>84.6</td>
<td>76.5</td>
<td>18.5</td>
<td>54.2</td>
<td>99.1</td>
</tr>
<tr>
<td><strong>11.5</strong></td>
<td><strong>75.6</strong></td>
<td><strong>86.6</strong></td>
<td><strong>19.5</strong></td>
<td><strong>48.7</strong></td>
<td><strong>99.5</strong></td>
</tr>
<tr>
<td>12.5</td>
<td>65.8</td>
<td>92.2</td>
<td>20.5</td>
<td>42.3</td>
<td>99.5</td>
</tr>
<tr>
<td>13.5</td>
<td>56.0</td>
<td>96.0</td>
<td>21.5</td>
<td>36.0</td>
<td>99.5</td>
</tr>
<tr>
<td>14.5</td>
<td>50.1</td>
<td>97.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.5</td>
<td>41.6</td>
<td>97.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.5</td>
<td>36.2</td>
<td>98.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.5</td>
<td>33.0</td>
<td>99.1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Cut-off points for the General Health Questionnaire (GHQ-12) and Kessler psychological distress scale (K10) for men, women and the overall sample using differential sensitivity and specificity weightings

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Overall Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GHQ-12</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:1</td>
<td>11.5</td>
<td>10.5</td>
<td>11.5</td>
</tr>
<tr>
<td>1:2</td>
<td>12.5</td>
<td>14.5</td>
<td>12.5</td>
</tr>
<tr>
<td>2:1</td>
<td>10.5</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td><strong>K10</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:1</td>
<td>15.5</td>
<td>14.5</td>
<td>15.5</td>
</tr>
<tr>
<td>1:2</td>
<td>17.5</td>
<td>15.5</td>
<td>15.5</td>
</tr>
<tr>
<td>2:1</td>
<td>13.5</td>
<td>13.5</td>
<td>13.5</td>
</tr>
</tbody>
</table>

Note: 1:1 sensitivity and specificity have an equal weighting; 1:2 specificity (FP) a greater weighting; 2:1 sensitivity (TP) has a greater weighting.