Research report

A trajectory-based approach to understand the factors associated with persistent depressive symptoms in primary care

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Abstract

Background: Depression screening in primary care yields high numbers. Knowledge of how depressive symptoms change over time is limited, making decisions about type, intensity, frequency and length of treatment and follow-up difficult. This study is aimed to identify depressive symptom trajectories and associated socio-demographic, co-morbidity, health service use and treatment factors to inform clinical care.

Methods: 789 people scoring 16 or more on the CES-D recruited from 30 randomly selected Australian family practices. Depressive symptoms are measured using PHQ-9 at 3, 6, 9 and 12 months.

Results: Growth mixture modelling identified a five-class trajectory model as the best fitting (lowest Bayesian Information Criterion): three groups were static (mild (n=532), moderate (n=138) and severe (n=69)) and two were dynamic (decreasing severity (n=32) and increasing severity (n=18)). The mild symptom trajectory was the most common (n=532). The severe symptom trajectory group (n=69) differed significantly from the mild symptom trajectory group on most variables. The severe and moderate groups were characterised by high levels of disadvantage, abuse, morbidity and disability. Decreasing and increasing severity trajectory classes were similar on most variables.

Limitations: Adult only cohort, self-report measures.

Conclusions: Most symptom trajectories remained static, suggesting that depression, as it presents in primary care, is not always an episodic disorder. The findings indicate future directions for building prognostic models to distinguish those who are likely to have a mild course from those who are likely to follow more severe trajectories. Determining appropriate clinical responses based upon a likely depression course requires further research.

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1. Introduction

While mortality rates from cardiovascular disease, stroke and cancer are steadily decreasing, there is no evidence of reduced morbidity or mortality rates due to depression (Insel, 2009). Studies continue to find substantial numbers of people with unmet needs (Parslow and Jorm, 2000; Kendrick et al., 2009; Prins et al., 2011; Coyne et al., 2002) and a large mismatch between individual needs and how the system responds (Gunn et al., 2010; Palmer et al., 2010; Herrman et al., 2002). This is despite the public attention that depression has received (Dumesnil and Verger, 2009) in countries such as the US (U.S. Preventive Services Task Force, 2009), the UK (Rix et al., 1999; Dunion and Gordon, 2005), Australia (Jorm et al., 2005) and New Zealand (Vaughan and Hansen, 2004); the wide scale use of antidepressants (Lockhart and Guthrie, 2011; Moore et al., 2009; Marcus and Olfson, 2010) and the increased use of screening for depression within primary care (Kessler et al., 2005; U.S. Preventive services task force, 2009; Ööpik et al., 2006).

Current screening and diagnostic approaches used for depression are limited, especially in the primary care setting, where it is most commonly managed (Brown and Barlow, 2009; Helzer et al., 2006; Katendahl et al., 2005; Klein, 2008; Lamers et al., 2010;
Two studies have recruited a primary care sample; one from a Latino population \((n=220)\) (Interian et al., 2011) and another from people aged over 65 years \((n=392)\) (Cui et al., 2008). The findings from these studies are limited by their selective population approach, modest sample sizes, length of time between follow-up intervals (6 months to 1 year) and reliance on retrospective measurement tools.

The Netherlands Study of Depression and Anxiety (NESDA) consists of a large, mixed cohort from primary care, outpatient and population samples and has demonstrated, using latent class growth analysis, that current DSM categories do not adequately represent course trajectories for those with current Major Depressive Disorder (MDD) and/or Dysthymia (Rhebergen et al., 2012). This finding highlights the need to expand the focus beyond those who reach diagnostic thresholds for MDD or Dysthymia to include those with depressive symptoms across the severity spectrum. Understanding depressive symptom trajectories, the factors associated with a particular course and how these relate to functioning and quality of life is of major clinical importance. Such knowledge would help to identify those at low and higher risk of poorer outcomes. This identification could assist in treatment decisions and service planning; especially when deciding what to do with the large numbers who screen positive for probable depression yet have symptoms at sub-syndromal level.

Our main objectives were to (1) identify depressive symptom trajectories in a large cohort of primary care attendees participating in the diamond longitudinal study (Gunn et al., 2008) and (2) examine associations between depressive symptom trajectories and a wide range of factors related to socio-demography, morbidity, health service use and treatment which could be used to inform clinical care. We document how we have used latent class growth mixture modelling (GMM) to identify naturally occurring groups based upon depressive symptoms and classify individuals into subgroups based on the similarity of symptom levels over time (Mathén and Mathén, 2000).

2. Methods

2.1. Design

Data were collected as part of the diamond prospective longitudinal cohort study investigating what happens to people with depressive symptoms over time. It is one of the largest primary care depression cohort studies worldwide. Diamond is informed by a social model of health and full details of study methods are published elsewhere (Gunn et al., 2008; Potiriasidis et al., 2008; Boardman et al., 2011). Diamond seeks to investigate in-depth and over time how primary care responds to people with depressive symptoms. In particular, we are investigating how many people with depressive symptoms go on to receive a depression diagnosis, the factors associated with their depressive symptoms, their treatment choices, their health and functional outcomes and experience of health care services. The diamond study was approved by the University of Melbourne’s Human Research Ethics Committee (Reference number: 030613X).

2.2. Clinical settings

Participants were recruited from 30 randomly selected family practices in Victoria, Australia, in 2005, from rural and urban locations (Gunn et al., 2008). Practices varied from privately owned medical practices to multidisciplinary community health centres.
2.3. Subjects

Postal surveys inviting feedback about the care they received from their family practitioner were sent to a random sample of 600 people (per practitioner) aged 18–75 years who had visited the enrolled family practitioner at least once in the past year. Surveys were not sent to those residing in nursing homes or to those who were terminally ill. The survey explained that the practitioner was collaborating with the researchers to work out ways to improve primary care, particularly in relation to emotional well-being. Patients were eligible to enter the cohort if they scored 16 or more on the CES-D (Radloff, 1977) and were able to read English (Gunn et al., 2008).

2.4. Enrolment and retention

7667 patients completed a screening survey. 1793 (23.9%) scored 16 or more on the CES-D and 1007 (56.2%) provided an o r m a lw e e k(Armstrong et al., 2000), social participation (Baum and Gunn, 2007). Importantly, LTFU was not related to depression status but it was more common among those who were never married, lived alone and could not manage on available income. No other factors were associated. For this analysis we include data from all 789 participants using GMM as described below.

2.5. Assessments

Data were collected by postal survey and structured computer assisted telephone interview (CATIs). Postal surveys were completed at screening, baseline, 3, 6, 9 and 12 months. CATIs were completed at baseline and 12 months. Assessments were made of age, gender, socio-economic status, marital status, employment, health status (Ware et al., 1996), quality of life (Skevington et al., 2004), experience of violence (Hegarty et al., 1999; MacMillan et al., 1997), social support (Sarason et al., 1987), physical activity which asked about the frequency of vigorous and less vigorous exercise in a normal week (Armstrong et al., 2000), social participation (Baum et al., 2000), life events (Norbeck, 1984) adapted from the Life Experiences Scale (Sarason et al., 1978), and specific items related to treatment and service use. DSM-IV and ICD-10 diagnostic assessments of depression and substance use were conducted using the Composite International Diagnostic Interview (CIDI) Auto version 2.1 (World Health Organization, 1997). The PRIME-MD Patient Health Questionnaire (PHQ) was used to assess participant’s anxiety levels (Spitzer et al., 1999).

Depression symptom severity was measured using the Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PHQ-9) (Spitzer et al., 1999). The PHQ-9 has been validated for use in primary care and is used widely in the USA and UK in routine primary care clinical settings to both to aid diagnosis and to monitor symptoms over time.

2.6. Data analysis

Initial data analyses were conducted using STATA Version 12 (StataCorp, 2011) to describe the participant characteristics at baseline. To deal with the problems that may be introduced due to missing data in longitudinal studies further data analyses comprised two distinct steps using the Mplus statistical software (Muthen and Muthen, 2010), first, to conduct GMM and second, to test for differences between sub-groups (referred to as ‘mixtures’ or ‘classes’) on a number of socio–demographic, physical and psychopathological baseline measures. We used GMM as it offers analysis techniques for modelling longitudinal data (Elliott et al., 2005) by classifying individuals into subgroups based upon scores on one or more variables over time (Muthen et al., 2011). Rather than use an analytical technique which reports symptom means, GMM provides information about individual symptom trajectories which can then be explored to identify whether people with particular characteristics are more or less likely to follow a particular trajectory. This information is useful for tailoring and optimising treatment (Elliott et al., 2005). A further advantage of GMM, as performed by Mplus, is that all available data are utilised for any particular analysis. Hence, cases with missing data are still included in the estimation of model parameters. Mplus employs full information maximum likelihood estimation of parameters.

The GMM strategy used here follows the approach suggested by Muthen et al. (2011). We used GMM to identify latent trajectory classes based on the PHQ scale used as a continuous measure. GMM utilises all of the available PHQ-9 scores from each of the participants at each time point to determine sub-groups of individuals that have relatively similar trajectories. We modelled the PHQ-9 score as a continuous measure (lower numbers mean fewer depressive symptoms). The GMM assumes that there are sub-groupings of patients that are more similar to each other than they are to other sub-groupings of patients on the patients’ PHQ scores at five time points (baseline, 3, 6, 9 and 12 months).

For each relatively heterogeneous sub-group, two latent parameters are estimated to describe a trajectory for changes in outcome measures over time, conceptually the same as a simple regression line. These parameters represent the intercept (i.e., the estimated baseline score) and slope (i.e., the estimated change over time) of the trajectory for each sub-group.

One key advantage of GMM is that non-linear, as well as linear, trajectories can be modelled. For our modelling purposes, we investigated standard quadratic trajectories, where the form of the trajectory for each sub-group is defined as:

\[ PHQ = I + b_1X + b_2X^2 \]

where:

- \( PHQ \) is the predicted PHQ,
- \( I \) is the predicted intercept,
- \( X \) is the time in months, and
- \( b_1 \) and \( b_2 \) are model parameter for the linear and quadratic components, respectively.

The Mplus software produces several model fit statistics including the model loglikelihood, the Akaike Information Criterion (Akaike, 1974) and the Bayesian Information Criterion (BIC) (Kass and Raftery, 1995). However, as all fit statistics moved in concert, we report only the BIC. A lower BIC is indicative of a better fitting model. Models comprising one–six sub-groups were tested as the inflection point (i.e., lowest BIC) was reached with a model that specified five sub-groups. In addition to model fit statistics we imposed a further criterion that models with very small number of patients (< 10) in one or more sub-groups were unacceptable. Models with small sub-group numbers tend to be unreliable and sample-dependent.

For each participant, Mplus estimates the probability of being in each of the groups. A probability of 1.00 indicates perfect differentiation and would occur if an individual had 100% chance of being in one group and 0% chance of being in any other group (Elliott et al., 2005).
Baseline means (for continuous measures) and percentages (for categorical measure) were compared with each other for the identified sub-groups in the best fitting model. In line with usual practice in GMM and where it made practical sense we treated ordinal variables as if they were continuous. Using smoking as an example, we asked: “Which of the following best describes your cigarette smoking?” and response categories were: never smoked, used to smoke, now smoke occasionally, and now smoke regularly (scored 0–3, see Table 3).

3. Results

Sample characteristics: Table 1 presents the baseline characteristics of the cohort and for the entire screening sample. The cohort was similar in age to those screened yet cohort participants were more likely to be female, not married, to live alone and to report increased levels of social disadvantage and poor health. The cohort had a mean age of 48 years (range from 18 to 75 years; median=48). More than two-thirds of the participants were female and most were born in Australia. The mean CES-D score measured at baseline indicated moderate depression symptom severity. The mean CES-D score was two points higher for those consenting to participate and participants were more likely to report being diagnosed with depression and to self-report depression and anxiety. More than two-thirds of the participants had been told by a doctor or psychologist that they had depression and less than half were currently taking antidepressant medication. Estimated sample means for the PHQ-9 over the five time points from baseline to 12 months were: 10.57; 9.54; 9.40; 9.03 and 9.13.

Table 2 presents possible models of depression trajectories (from a one to a six group model) with the number of patients in each class, the BIC statistics and the model parameter estimates. Parameter estimates and standard errors are provided for the intercept (£), linear slope (>) and quadratic slope (Q). Models comprising one–six specified PHQ patient sub-groups were tested as the inference point (i.e., lowest BIC) was reached with a model that specified five sub-groups.

We selected the five-class model as the best fitting model with the lowest BIC (19746.20). The next best fitting model had four classes (BIC 19752.09), following Nagin’s (1999) approach we compared BIC values. The five-class model had a probability of 0.997 of being correct compared with the four-class model, which had a probability of 0.003 of being correct.

The trajectories for the five-class model are shown in Fig. 1. Two out of three participants (n=532) were most likely to belong to the mild group with an essentially flat trajectory of what might be considered mild or ‘sub-syndromal’ depression. Seventeen percent (n=138) and 9% (n=69) of participants had static moderate and severe depressive symptom trajectories. A further 4% (n=32), who had the ‘decreasing severity’ trajectory, had mild depression by the end of the follow-up; conversely, the remaining

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Cohort (N=789) Mean (SD)</th>
<th>Screening sample (N=7667) Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td>48.0 (13.1)</td>
<td>50.9 (14.2)</td>
</tr>
<tr>
<td>Self-reported depression in past 12 months</td>
<td>6.8 (2.4)</td>
<td>5.0 (2.6)</td>
</tr>
<tr>
<td>Physical component summary (SF-12 MCS)</td>
<td>35.2 (10.4)</td>
<td>36.1 (10.5)</td>
</tr>
<tr>
<td>CES-D score (Baseline)</td>
<td>27.2 (9.4)</td>
<td>27.5 (9.4)</td>
</tr>
<tr>
<td>Location of general practice</td>
<td>249 (31.6)</td>
<td>45.2 (12.4)</td>
</tr>
<tr>
<td>Sex (Female)</td>
<td>563 (71.4)</td>
<td>5081 (68.5)</td>
</tr>
<tr>
<td>Marital status</td>
<td>184 (23.5)</td>
<td>1356 (17.9)</td>
</tr>
<tr>
<td>Lives alone</td>
<td>228 (29.1)</td>
<td>1358 (17.9)</td>
</tr>
<tr>
<td>Born in Australia</td>
<td>653 (82.7)</td>
<td>6193 (81.0)</td>
</tr>
<tr>
<td>English first language</td>
<td>754 (95.8)</td>
<td>7229 (94.8)</td>
</tr>
<tr>
<td>Highest level of education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left school before year 10</td>
<td>134 (17.0)</td>
<td>1304 (17.1)</td>
</tr>
<tr>
<td>Completed year 10, 11 or 12</td>
<td>300 (38.0)</td>
<td>3009 (38.5)</td>
</tr>
<tr>
<td>Certificate or diploma</td>
<td>190 (24.1)</td>
<td>1383 (20.8)</td>
</tr>
<tr>
<td>Bachelor degree or higher</td>
<td>163 (20.7)</td>
<td>1724 (22.6)</td>
</tr>
<tr>
<td>Pension/benefit main source of income</td>
<td>281 (36.0)</td>
<td>1986 (26.2)</td>
</tr>
<tr>
<td>Has healthcare card</td>
<td>334 (43.7)</td>
<td>1083 (14.6)</td>
</tr>
<tr>
<td>Employment</td>
<td>475 (60.2)</td>
<td>4852 (63.5)</td>
</tr>
<tr>
<td>Unable to work due to sickness/disability</td>
<td>111 (14.1)</td>
<td>414 (5.4)</td>
</tr>
<tr>
<td>Hazardous drinking in past 12 months</td>
<td>180 (23.0)</td>
<td>1245 (16.4)</td>
</tr>
<tr>
<td>Current smoker</td>
<td>248 (31.7)</td>
<td>1377 (18.1)</td>
</tr>
<tr>
<td>Long term illness/health problem/disability</td>
<td>405 (52.5)</td>
<td>2431 (32.5)</td>
</tr>
<tr>
<td>At least one chronic physical condition in past 12 months</td>
<td>542 (68.8)</td>
<td>4733 (57.4)</td>
</tr>
<tr>
<td>Self-assessed health status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent/very good</td>
<td>171 (21.7)</td>
<td>3599 (47.5)</td>
</tr>
<tr>
<td>Good</td>
<td>295 (37.5)</td>
<td>2713 (35.8)</td>
</tr>
<tr>
<td>Fair/poor</td>
<td>322 (40.8)</td>
<td>1257 (16.6)</td>
</tr>
<tr>
<td>Ever told by doctor had depression</td>
<td>530 (70.5)</td>
<td>2196 (31.1)</td>
</tr>
<tr>
<td>Self reported depression in past 12 months</td>
<td>424 (53.8)</td>
<td>1370 (18.0)</td>
</tr>
<tr>
<td>Self reported anxiety in past 12 months</td>
<td>353 (44.8)</td>
<td>1268 (16.6)</td>
</tr>
<tr>
<td>Currently taking depression medication</td>
<td>317 (40.2)</td>
<td>1054 (13.9)</td>
</tr>
<tr>
<td>Currently taking anti-anger medication</td>
<td>77 (9.8)</td>
<td>3599 (47.5)</td>
</tr>
</tbody>
</table>

Note: Table 1 presents the baseline characteristics of the cohort and for the entire screening sample.

4 Denominators vary owing to missing data.
6 Physical conditions in past 12 months based on top 12 conditions seen in general practice: asthma, emphysema, diabetes, arthritis, back problems, hypertension, chronic sinusitis, lipid disorder, heart disease, cancer, stroke and dermatitis.

BIC = Bayesian Information Criterion; SE = Standard error.
2% (n=18) of participants with the ‘increasing severity’ trajectory had severe depression at 12 months.

Differences between the five sub-groups in terms of baseline measures are presented in Tables 3 and 4 for continuous and categorical variables, respectively. No significant differences were found between the trajectory groups in terms of participant age, sex or GP location. At baseline, substantial numbers of participants in every group satisfied criteria for Major Depressive Disorder (MDD) according to the CIDI with MDD increasing in prevalence as severity increased. Anxiety was also common and increased with increasing severity grouping. Dysthymia, whilst present in every group, was less common. Antidepressant use was common at baseline with almost one-third of the mild group reporting use rising to two-thirds of the severe group. Antidepressant users reported Selective Serotonin Reuptake Inhibitors (SSRIs) as the most commonly used antidepressant: 65% of the mild group; 63% of the decreasing severity; 62% of the increasing severity; and 65% of the moderate group. The type of antidepressant used varied more for the severe group, with only 43% reporting use of SSRIs.

The most striking differences can be seen between the severe and the mild trajectory groups which, apart from age, differ on all major demographic factors (education, ability to work and manage on income). The severe trajectory group also have significantly lower levels of social participation, employment, self-rated health, physical activity and significantly higher levels of smoking, partner abuse, days out of role, health service use, disability, chronic illness, childhood abuse, substance abuse and living alone. The moderate group were also significantly different from the mild group on key variables such as managing on income; social participation, negative life events, partner abuse, days out of role and health service use. The moderate, increasing and

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**Table 3** Comparisons of trajectories of depressive symptoms (PHQ-9) on baseline continuous measures.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Number in analysis</th>
<th>1 Severe (n=69)</th>
<th>2 Mild (n=532)</th>
<th>3 Decreasing severity (n=32)</th>
<th>4 Increasing severity (n=18)</th>
<th>5 Moderate (n=138)</th>
<th>Group differences (p &lt; 0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SE</td>
<td>M</td>
<td>SE</td>
<td>M</td>
<td>SE</td>
<td>M</td>
</tr>
<tr>
<td>Age</td>
<td>789</td>
<td>48.30</td>
<td>1.72</td>
<td>48.64</td>
<td>0.63</td>
<td>45.76</td>
<td>2.30</td>
</tr>
<tr>
<td>Highest level of education b</td>
<td>787</td>
<td>2.70</td>
<td>0.19</td>
<td>3.14</td>
<td>0.07</td>
<td>3.24</td>
<td>0.25</td>
</tr>
<tr>
<td>Employment c</td>
<td>786</td>
<td>1.96</td>
<td>0.12</td>
<td>1.46</td>
<td>0.03</td>
<td>1.59</td>
<td>0.16</td>
</tr>
<tr>
<td>Managing on income d</td>
<td>785</td>
<td>3.38</td>
<td>0.14</td>
<td>2.51</td>
<td>0.04</td>
<td>3.08</td>
<td>0.20</td>
</tr>
<tr>
<td>Income before tax</td>
<td>752</td>
<td>2.43</td>
<td>0.27</td>
<td>3.84</td>
<td>0.11</td>
<td>3.48</td>
<td>0.41</td>
</tr>
<tr>
<td>SEIFA advantage deciles</td>
<td>787</td>
<td>6.06</td>
<td>0.33</td>
<td>7.00</td>
<td>0.11</td>
<td>6.99</td>
<td>0.42</td>
</tr>
<tr>
<td>Smoking e</td>
<td>785</td>
<td>1.69</td>
<td>0.18</td>
<td>1.03</td>
<td>0.05</td>
<td>1.34</td>
<td>0.22</td>
</tr>
<tr>
<td>Physical activity (Armstrong et al., 2000)</td>
<td>787</td>
<td>3.19</td>
<td>0.41</td>
<td>4.52</td>
<td>0.13</td>
<td>3.71</td>
<td>0.54</td>
</tr>
<tr>
<td>Social participation score (Baum et al., 2000)</td>
<td>789</td>
<td>20.31</td>
<td>1.53</td>
<td>27.71</td>
<td>0.53</td>
<td>26.22</td>
<td>1.99</td>
</tr>
<tr>
<td>Total chronic illness b</td>
<td>788</td>
<td>2.09</td>
<td>0.28</td>
<td>1.27</td>
<td>0.06</td>
<td>1.65</td>
<td>0.26</td>
</tr>
<tr>
<td>Days out of role due to physical health problems</td>
<td>744</td>
<td>30.28</td>
<td>4.77</td>
<td>10.22</td>
<td>1.02</td>
<td>20.21</td>
<td>5.69</td>
</tr>
<tr>
<td>Days out of role due to emotional problems</td>
<td>747</td>
<td>40.32</td>
<td>4.43</td>
<td>8.05</td>
<td>0.82</td>
<td>25.58</td>
<td>5.52</td>
</tr>
</tbody>
</table>

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* Post hoc group differences calculated with multivariate and univariate analysis of variance.
* Highest level of education: 1: Left school before year 10; 2: Completed year 10; 3: Completed year 12; 4: Certificate/Diploma; 5: Bachelor degree or higher.
* Employment: 1: Employed/Student, 2: Not employed, 3: Unable to work.
* Managing on income: 1: Easily/not too bad, 2: Difficult some of the time, 3: Difficult all of the time.
* Partner abuse: 0: No abuse, 1: Other abuse, 2: Severe abuse.
* Total chronic illness based on top 12 conditions seen in general practice: asthma, emphysema, diabetes, arthritis, back problems, hypertension, chronic sinusitis, lipid disorder, heart disease, cancer, stroke and dermatitis.
* Visits to health professionals: Number of visits to GP, psychologist, psychiatrist, counsellor, social worker, family therapist, alcohol and drug worker, and domestic violence worker in previous 12 months.

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**Fig. 1.** Trajectories of depressive symptoms (PHQ-9) over 12 months of follow-up for the best fitting five-class model.
decreasing severity groups did not differ significantly from each other on any of the measured variables.

4. Discussion

Using growth mixture modelling and the PHQ-9 as a continuous measure, we identified five distinct depressive symptom trajectories within this primary care cohort. The most striking findings are the degree to which symptom trajectories remained static over time and the associations between the “severe” group and the high levels of anxiety and abuse. These findings suggest that depression is not always an episodic disorder, especially as it presents in primary care and raises the possibility that co-morbid factors which we have not reported, such as specific genotypes or chronic sinusitis, lipid disorder, heart disease, cancer, stroke and dermatitis.

The common depressive trajectory is one of mild symptoms which represent the course experienced by two-thirds of the cohort. Using DSM-IV-TR criteria this group might be considered to demonstrate a mild or ‘sub-syndromal’ course. This group is likely to make up the majority of those identified when screening takes place for depression in primary care, and hence better understanding of what predicts this course is of major clinical relevance in primary care (Thompson et al., 2001). This group differs significantly on a number of important socio-demographic and clinical factors from those that experience more severe depressive trajectories. Nevertheless, this group is still characterised by increased likelihood of isolation, chronic physical illness, disability and less social support when compared with the entire population screened for the diamond cohort (see Table 1) (Gunn et al., 2008, 2012).

The severe and moderate trajectory groups reported high levels of morbidity and disability at baseline. The severe group is characterised by social and economic disadvantages, history of abuse and violence, isolation, high levels of physical and mental co-morbidity and substance use and low levels of healthy lifestyle habits such as exercise. Almost all of the severe group and most of the moderate group had received a diagnosis of depression from a doctor or psychologist. A half to two-thirds reported using antidepressants at baseline. On average they made 12–17 visits to health professionals for the year prior to entering the cohort. This pervasive picture of suffering, disadvantage and disability in the light of high use of health services suggests ‘treatment resistance’ and highlights the need for new approaches to management. The high levels of abuse support the findings of Chapman et al. (2004) and reinforce the need for prevention and early detection of childhood abuse. Such approaches are likely to require both health care and social care responses.

Only 50/789 (6.3%) participants experienced a trajectory indicating what could be considered an ‘episode’ of depression. The ‘increasing’ and ‘decreasing’ severity trajectory groups did not differ markedly from each other on any of the measured variables. Perhaps this trajectory group represents those upon which our care and social care responses.

The identified trajectories may also represent other important factors which we have not reported, such as specific genotypes or gene–environment interactions or personality-related subtypes. We are completing genotyping of a large sub-group of the cohort and will report our findings in the near future.

Several strengths of the study should be noted. Firstly, the large primary care sample and the naturalistic and prospective study design which documents the natural history for one year in the life of participants who were not part of a treatment trial. The natural history approach builds upon and extends the work of Chapman et al. (2004) and other studies which document the natural history of depression.
of Aikens et al. (2008) and Rost et al. (2001), who undertook intervention studies. Secondly, the inclusion of participants from across the wide range of depressive symptoms rather than only those meeting diagnostic criteria for MDD. Thirdly, the three monthly follow-up intervals, using a self-report tool that is not subject to lengthy recall bias. Other strengths include the wide range of socio-demographic and clinical variables measured. Based upon a social model of health we included factors from the social world such as social participation, life events and lifestyle factors such as exercise, smoking and substance use. The use of growth mixture modelling allowed us to make maximum use of all available data rather than the short-comings of using methods that cannot account for missing observations. Finally, the inclusion of the PHQ-9 scale as a measure of depressive symptoms makes the findings clinically relevant, as this measure is in widespread use in primary care, especially in the USA and UK.

The study limitations include that the findings are based upon a single cohort. All measures relied on self-report and the sample was drawn from a mostly English speaking adult population that represents middle-aged to older adults. It may not be representative of culturally different, paediatric, adolescent or young adult populations. The measurement of depressive symptoms every three months by asking about the past four weeks means that we cannot exclude the possibility that some people may have experienced short-lived changes in their depression status between measurement periods.

Our findings differ markedly from Dunn et al. (2011) and Kuchibhatla and Fillenbaum (2011), who measured depressive symptoms at similar follow-up intervals. The most likely reason for this is that these studies used groups undergoing treatment for life-threatening conditions: Dunn et al. (2011), in a group of women following breast cancer surgery and Kuchibhatla and Fillenbaum (2011) in a group of elderly people with heart failure. Whereas these other studies have significant numbers of people with decreasing or increasing severity trajectories our findings are dominated by a picture of stasis.

Our findings support those from another large current cohort study from the Netherlands (NESDA) (Rhebergen et al., 2012). Rhebergen et al. (2012) examined trajectories of those with current MDD or Dysthymia using a retrospective life chart interview approach which, whilst prone to recall bias, demonstrates similar static trajectories to those reported here. Similarly, the largest trajectory group consisted of those with symptoms below the diagnostic threshold for MDD. Considerable debate exists around the importance of sub-syndromal depression. Some see the diagnostic threshold for MDD to be so high that it is dominated by a picture of stasis.

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5. Conclusions

Cross-sectional categorical diagnostic approaches provide little guidance as to the likely course of depressive symptoms (Rhebergen et al., 2012). The findings presented here indicate future directions for building prognostic models to distinguish those who are likely to have a mild course from those who are likely to follow more severe trajectories. Such models would assist clinical decision making and better targeting of interventions and will require prognostic tools which are easy to apply in the busy clinical setting of primary care. Further research is needed to determine the most appropriate clinical response for the mild trajectory group, which forms the largest burden for primary care.

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Conflict of interest
No conflict declared.

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