Impact of socioeconomic position and distance on access and treatment of patients with depressive disorders in Denmark

PhD Thesis

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…She (the GP) asked me if I had been stressed out lately, and I told her: no, except my mom is dying, my daughter is losing her unborn child to social services, and I have had prostate cancer, I have high blood pressure, asthma and diabetes, then no, I don't think much is going on at the moment.[1]

Preface

The present study originates from challenges experienced in the Psychiatric Triage Unit in Region Zealand, Denmark. The region has a population of 800,000 citizens serviced by approximately 500 general practitioners, who until 2012 referred patients directly to outpatient psychiatric care at one of more than 30 local units. Beginning in September of that year, general practitioners began to refer all adult patients to a centralized Psychiatric Triage Unit. The aim of establishing the unit was to improve efficiency and provide "more equal access" to psychiatric care. While the efficiency measures were easily documented, the evaluation of improved equal access was more challenging.

In 2013, after the Psychiatric Triage Unit had been running a full year, we compared the use of outpatient mental health services with socioeconomic index scores and found the southern region – the most deprived and remote part of the region – had 20% lower per capita contact rates with public or private psychiatrists and psychologists than the regional average. We assumed distance to services could be an explanation of these differences, or differences in the general practitioners' referral practices, favoring patients in higher socioeconomic position, or perhaps patients in lower socioeconomic position were less likely to accept referral to mental health care. This thesis aims to answer these questions.

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Contents

List of papers

This thesis is based on the following three papers:

I.   Impact of socioeconomic position and distance on mental health care utilization: a nationwide Danish follow-up study.
(Published in *Social Psychiatry and Psychiatric Epidemiology*)

II.   Socioeconomic position, symptoms of depression, and subsequent mental health care treatment: a Danish register-based six-month follow-up study on a population survey.
(In print *BMJ Open*)

III.   Socioeconomic position and perceived barriers to accessing mental health care for individuals with symptoms of depression: results from the Lolland-Falster Health Study.
(In review, *BMJ Open*)

Abbreviations

ATC   Anatomical Therapeutic Chemical classification system

CI   Confidence Interval

DSM-5   Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition

GP   General Practitioner

ICD-10   International Classification of Diseases, Version 10

IRR   Incidence Rate Ratio

MDD   Major Depressive Disorder (DSM-5; used in USA and often in research)

MDI   Major Depression Inventory

MHC   Mental Health Care

OR   Odds Ratio

SEP   Socioeconomic position

SSRI   Selective Serotonin Reuptake Inhibitor

TCA   Tricyclic Antidepressants

This Thesis at a glance

What is already known on this subject?
- *The Inverse Care Law*, where remote areas are drained of jobs, healthy citizens, and health services, is also known to be in effect in Denmark.
- People in low socioeconomic position (SEP) have higher morbidity in general and also specifically for mental health disorders.
- Increasing distance to mental health care (MHC) is associated with decreasing contacts. It is not known if this effect has a greater impact on persons in low SEP than on those in high SEP.
- Patients in low SEP use specialized services less, though their need could be expected to be higher. It is not known if this is due to referral practices of general practitioners (GPs) or to patient choice.
- Social equality in access to health care is a national ambition; it is not known if the Danish health care system delivers on this ambition for depressive disorders.

What does this study add?
- People in low SEP are more often prescribed antidepressants.
- Distance has a stronger negative impact on specialized MHC utilization for patients in low SEP. Persons in low SEP with symptoms of depression more often perceive transport as a barrier for mental health care use than individuals in high SEP.
- People in low SEP use co-payed psychologists less and perceive expenses associated with treatment as a barrier for use.
- Patients with symptoms of depression and in contact with their GP are treated according to their symptoms, independent of SEP.
- Many with symptoms of moderate to severe depression are not treated, independent of SEP.
- Stigma affects one in five with symptoms of depression but is not associated with SEP.

What conclusions does this study support?
- Centralization of mental health services – increasing travel distances – will increase inequality in MHC treatment.
- Co-payment for psychologist services generates inequality in MHC.
- Mental health literacy may be a problem indicating a greater need for patients to know of—and GPs to recognize—symptoms of depression.

1. Background

1.1 Introduction

The aim of the thesis is to explore if the Danish healthcare system provides equal access to and treatment of patients with depressive disorders – and if not, to explore reasons why.

Initially, I will describe the association between socioeconomic position (SEP) and health, mental health, and common mental disorders. Given the focus on depressive disorders, the diagnostic features and the impact of depression are described. High proportions of patients with depressive disorders are not treated; this and the association with SEP is described in a section on mental health care (MHC) use. An aim of the healthcare system in Denmark, as in most high-income countries, is equal access to treatment for patients with equal needs. Equality, need, and the model for access adopted for the thesis is outlined, with special attention given to the known impacts of geographical distance on MHC use, since it is a central part of Study I. Finally, before describing the aims of the thesis in detail, the health system and prevalence of depressive disorders in Denmark are described, since these studies have been done within that context.

1.2 SEP and health

SEP and health are closely associated and the association has been documented for centuries. In the second half of the 19th century, there was no dispute on whether disease and early death was more likely in poor areas. In an enlightening review, Sally Macintyre[2] describes that the first classification of social classes in the UK was put forward as early as 1887 and was done so in order to establish a class mortality rate. At that time, the dispute was not *if* a disparity in health between classes did exist – being evident by sight – but *why*. The competing explanations were hereditary, environmental and behavioral.

A century later, by 2005, the Commission on Social Determinants of Health was established by World Health Organisation (WHO) to support countries in addressing the social factors leading to ill health and health inequities. They published their final report *Closing the gap in a generation* in 2008[3], and gave support to similar reports in other countries, among them England in the UK in 2010[4], Denmark in 2011[5], and Norway in 2014[6]. These reports all document the association between low SEP and increased morbidity and mortality, however measured, from birth to the grave, and all provided recommendations for actions to reduce the inequalities.

In Denmark[5], inequality in life expectancy increased dramatically from 1987 to 2011 across educational groups, for men from 2.0 to 4.1 years between the lowest and highest educational groups, and for women from 1.2 to 2.6 years. The difference in life expectancy between the highest and lowest income quartiles increased from 5.5 years to 9.8 years for men and from 5.3 to 5.8 for women during the same period. The doubling of the inequality in life expectancy over 25 years was mostly caused by a drop in mortality rates for individuals in high SEP, a change that was not experienced among those in low SEP. Cardiovascular diseases account for about 20% and cancer for about 10% of the inequality in remaining life expectancy between educational groups. Life expectancy for Danish females was below the EU-28 average, at 82.8 years in 2016, and at the EU-28 average for men, at 79.0 years[7].

As for socioeconomic disparity in morbidity in Denmark, the prevalence of long-term illness is 38% greater among those with lower levels of education (i.e. less than 10 years) compared with those who have more than 12 years of education; for activity limiting illness, the difference rises to 78%, and for chronic restrictions in activity and for job cessation the differences are 118% and 178%, respectively[5 p 34]. The National Board of Health released a report based on data from the Danish National Patient Register in 2015 which repeated the findings of social inequality in morbidity and mortality related to 21 diseases[8].

The Norwegian report[6] on inequality in health stated children of mothers with few years of schooling have a 67% higher risk of dying during their first four weeks of life compared to children born to mothers having higher levels of education. Similarly, the children of mothers with lower levels of education have more than double the chance of dying in their first year of life. The risk of stillbirth is also higher among women in low SEP.

Recently, reduction of health inequalities has become a goal for the World Bank[9] as well as the Organisation for Economic Co-operation and Development (OECD)[10].

1.2.1 SEP and mental health

Sustained economic hardship can lead to decreased physical, psychological, and cognitive functioning[11], and is associated with a higher prevalence of mental health problems as well[12].

The impact of experiencing poor mental health is profound. In a follow-up study in several national registers on respondents in the *Danish National Health Survey 2010* reporting on perceived mental health (using Short Form 12), poor mental health was associated with: impaired educational achievements up to four years afterwards, increased risk of divorce, lower likelihood of being married, greater risk of losing employment, and lower chance of regaining employment, in unadjusted analysis. Adjusted for education, the chance of having children was reduced by 25-40% when mental health was reported as poor. The risk of death more than doubled for respondents reporting poor mental health when adjusted for education and chronic diseases, except for women under 45, who only have a 32% additional risk[13].

The research in the field also indicates children and adolescents in low SEP are two to three times more likely to develop mental health problems[14].

The classic discussion on whether low SEP causes mental health problems or mental health problems cause low SEP has found support for both scenarios: for example, low SEP is an outcome of schizophrenia, whereas low SEP is a determinant for depression[15 16], the latter described in more detail below.

1.2.2 SEP and Common Mental Disorders

Common mental disorders (CMD) are defined by the National Institute for Health and Care Excellence as depression and anxiety disorders, including OCD and PTSD, which may affect up to 15% of the population at any given time[17]. For all of these disorders the recommended pharmacological treatment is antidepressants, if any[18]; this is the case in Denmark as well[19]. The term CMD is relevant because of the overlap of symptoms seen in anxiety and depressive disorders[20] and PTSD as well[21], encompassing a large group of patients in primary care. Some studies also include substance abuse in the definition. CMD is more prevalent among people in low

SEP[22]. Childhood maltreatment or more than one CMD present predicts persistence of the disorder, later risk of suicide attempts, and substance abuse among untreated individuals[23]. In the UK, 29% of sickness absences certified by GPs were due to CMD[24]. A nationwide Norwegian study reports that within one year, 2.6% of employed men and 4.2% of employed women consulted their GP with a new episode of CMD; 45% were sickness certified and 24% absent more than 16 days[25]. CMD are associated with a higher risk of disability retirement[26]. A Swedish study of 4,823,069 individuals found the risk of disability pension due to back pain had a hazard ratio (HR) of 3 and almost double for CMD, but it tripled to a HR of 15–19 for individuals with both conditions[27].

1.2.2.1 SEP and depression

As for depressive disorders alone, they too are more prevalent among people with a low SEP[28] and increased by worsening socioeconomic circumstances[29]. There is a dose-response relationship between income as well as education on incidence, prevalence, and persistence of depression[28]. Likewise, negative socioeconomic changes will increase the risk of incident mental disorders, particularly mood disorders[30], and financial strain in itself is associated with having a depressive disorder[31 32]. Childhood trauma predicts chronicity of major depressive disorders (MDD) and need for specialist treatment[33].

The negative association between low SEP and mental health is evident. Given depressive disorders is the subject of the studies a description of symptoms and impact of the disorder is relevant.

1.3 Depression

1.3.1 Diagnosis of depression

According to ICD-10[34] , individuals in typical depressive episodes will usually suffer from: *depressed mood, loss of interest and enjoyment, and reduced energy leading to increased fatigue and diminished activity [*core symptoms*]. Marked tiredness after only slight effort is common.*

*Other common [*associated*] symptoms are:*
> *(a) reduced concentration and attention;*
> *(b) reduced self-esteem and self-confidence;*
> *(c) ideas of guilt and unworthiness (even in a mild type of episode);*
> *(d) bleak and pessimistic views of the future;*
> *(e) ideas or acts of self-harm or suicide;*
> *(f) disturbed sleep;*
> *(g) diminished appetite.*
The severity of the depression is defined by the number of symptoms present.

Mild depressive episode: defined by at least two core symptoms, plus at least two of the associated symptoms. None of the symptoms should be present to an intense degree.

Moderate depressive episode*: at least two core symptoms plus at least three (and preferably four) of the associated symptoms. Several symptoms are likely to be present to a marked degree, but this is not essential if a particularly wide variety of symptoms is present overall.

Severe depressive episode: all three core symptoms should be present plus at least four other symptoms, some of which should be of severe intensity.

Severe depressive episode with psychotic symptoms: same criteria as for a severe depressive episode above and in which delusions, hallucinations, or depressive stupor are present. Severe psychomotor retardation may progress to stupor.

The depressive episode should usually last at least 2 weeks. A former manic or hypomanic episode will change the diagnosis to bipolar affective disorder.

In the Diagnostic and Statistical Manual of the American Psychiatric Association, fifth edition (DSM-5), depression is termed major depressive disorder (MDD). DSM-5 diagnostic criteria for depression requires four to five of the same symptoms mentioned above, but either depressed mood or loss of interest must be present (core symptoms). The mild form has two symptoms present[35].

The age of onset of depression is late adolescence, early-middle adulthood and in late adulthood; the median reported onset is in the mid-twenties, affecting twice as many women as men. For high-income countries the lifetime prevalence is estimated at 14.6% and the 12-month prevalence at 5.5% [36]. Recurrence of depressive disorders is common: 85% of patients treated in specialized settings will experience a new episode within 15 years[37], and 42% within 20 years in the general population[38].

1.3.2 Impact of depression

The impact of depressive disorders is considerable. Globally, MDD is ranked fifth among causes of years lived with disability, though in high-income countries it ranks third; in Denmark, MDD ranks sixth[39]. The offspring of depressed parents are a high-risk group for onset of anxiety disorder and MDD in childhood, MDD in adolescence, and alcohol dependence in adolescence and early adulthood[40]. When adjusted for sociodemographic factors, the odds ratios (OR) for school drop-out is found to be 2.75 (confidence interval (CI) 1.18–6.42) for MDD[41].

Depression is associated with considerably reduced life expectancy. A diagnosis of depression — also when evaluated by survey-based information — is significantly associated with higher mortality from all, natural, and unnatural causes, for white males[42]. It is estimated that life expectancy is reduced by 14 years for men and 10 years for women treated for severe unipolar depression[43].

Mental disorders topped the list of the costliest conditions in Norway in 2013[44], even before production loss was included. By 2003, the annual per capita excess cost of depression was calculated to be 2,278€ for an adult in the Netherlands[45], with production loss constituting 70% of this. In a study of 30 European countries in 2010, the average cost for MDD was estimated to be 3,034€ per capita with production loss constituting 59% and mood disorders generally being more prevalent, ranking as the most costly brain-related disorder in Europe; MDD alone was exceeded only by dementia and psychosis[46]. By 2013, depression was ranked sixth in personal healthcare spending out of 155 diseases in the USA[47], whereof 32% was on pharmaceuticals and overall 13% spent by the age group ≥65.

It is estimated that implementing treatment guidelines for all citizens suffering from depression would return the economic investments by a factor of 2.5 in high-income countries, not including the additional health value[48]. The higher revenue would be due to reduction of the treatment gap, though coverage of only half the gap is included in the calculation. Indeed, the treatment gap is a significant problem and also a problem associated with SEP, as described below.

1.4 Equality in Health Care Use

Equal access to healthcare based on need and the reduction of health inequalities are major policy objectives in most high-income countries[10]. The WHO states that addressing social inequalities contributes significantly to the health and well-being of individuals and countries[49]. The Danish Health Care Act determines, in the second paragraph, that the healthcare system shall fulfill the need for easy and equal access to healthcare[50].

WHO Europe defines equity in health care as: equal access to available care for equal need, equal utilization for equal need, equal quality of care for all. They state further: "Equity in health implies that ideally everyone should have a fair opportunity to attain their full potential and, more pragmatically, that none should be disadvantaged from achieving this potential, if it can be avoided"[51].

About the difference between equality and equity Culyer et al. [52] state that equity requires either equality of something or else its fair inequality; fair inequalities in treatment exist when the inequality arises from a fair claim for being treated differently, e.g. higher need, the latter referring to vertical equity. Horizontal equity is an attempt to gain equity through the equality of something. In health care research, the issue of vertical equity is less commonly addressed[53].

As for equality in health care, a study of OECD countries concludes that people with higher incomes are significantly more likely to see a specialist than people in lower SEP[54]. This is supported by population surveys in Denmark, which show a linear correlation between increasing education and increasing use of specialist services[55]. A recent study found significant inequalities associated with general practitioner (GP) and specialist healthcare use across Europe, with higher SEP groups more likely to use healthcare specialists compared with groups in low SEP[56].

1.4.1 SEP and mental health care use

When focusing on inequality in mental health care, similarly, people with more years of education are less likely to use primary care in the event of emotional problems and more likely to use MHC services compared to people with fewer years of education[57 58]. Since common mental health problems are significantly more frequent in populations in lower SEP[22 59], the utilization of services would be expected to reflect this; but apparently it does not.

In high-income countries 35.5%-50.3% percent of citizens with severe mental disorders are not treated[60]. The treatment gap of MDD was estimated to be 45.4% in Europe in 2004[61]. Other studies have found only 22% of individuals with MDD in high-income countries receive minimally adequate treatment[62].

Additionally, not all users of MHC are in clinical need[63]. As for depression and anxiety disorders, some studies have found access to specialist care to be reflective of clinical need, with little inequity in SEP[64 65], whereas

others report specialized mental health services are not provided to persons in low SEP according to need[66][67], or that higher SEP is associated with more use of specialized mental health services[68].

Summing up, depressive disorders are common; have a strong socioeconomic gradient; affect individuals from an early age; have a lifelong impact; and are associated with considerable disability and reduced life expectancy. It is not evident if the healthcare needs of people suffering from depression are actually met or not.

1.5 The concept of need

When equity in care is defined as equal treatment for equal need, "need" is obviously a core issue. In the literature on healthcare use, *need* is usually defined either as the patient's perceived need or as clinical need. In surveys, perceived need can be revealed by direct questions on perceived fulfilled/unfulfilled needs, or by description of health problems and use of services. The *clinical need* can either be defined by clinical examination or, more often, by questionnaire-based diagnostic tests/screening tests and the like.

The theoretical model in Figure 1.1 is inspired by Sara Allin's description of unmet need[69] and Stevens and Gabby on demand and supply[70]. In the model, "Use" indicates treatment, "Felt need" the perceived need for care by the patient, whereas "Clinical need" is the professionally evaluated need and indicates functional impairment that it is possible to treat. *Possible to treat* would be termed by an economist as capacity to benefit[71]. Need in a medical context is somewhat different from need in a sociological/economic context. For clinicians, the model will describe symptoms (felt need), disease (clinical need) and treatment (use); for economists it will describe demand (felt need), need (clinical need) and supply (Use). I will primarily describe the model in a medical (psychiatric) context.

Figure 1.1: Correlation between need and use of health care
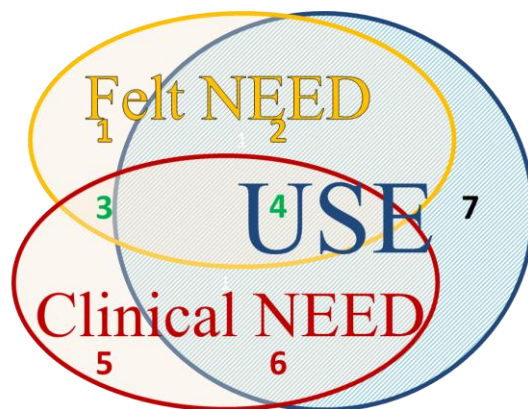
The numbered fields in the figure indicate some degree of need fulfillment described in the following.

1) **Unmet need, felt, but no clinical need**: Symptoms are not treated, possibly because a) the patient has not sought care; b) no treatment offered after clinical evaluation. Patient could be experiencing subthreshold symptoms of depression in e.g. situations of intense sorrow or grief.

2) **Met need, felt, but no clinical need**: Possible scenarios: a) antidepressant treatment of subthreshold symptoms of e.g. depression, sorrow, or grief, or b) treatment of *the worried well,* or c) *overtreatment,* when the best scientific evidence demonstrates that a treatment provides no benefit for the diagnosed condition[72].

3) **Unmet need, felt and clinically present**: Symptomatic disease not treated. Possible scenarios: a) lack of resources, lack of access; b) patient not aware of treatment possibilities; c) choice of no treatment; d) suboptimal care.

4) **Met need, felt and clinically present**: Symptomatic disease treated.

5) **Unmet need, not felt but clinically present**: Possible scenarios: a) no contact with clinician; b) asymptomatic condition not recognized by clinician; c) suboptimal care.

6) **Met need, not felt but clinically present**: Symptom not felt but recognized by clinician and treated. Possible scenarios: a) treatment of asymptomatic hypertension and other types of preventive medicine including antidepressants for recurrent depressive disorders; b) coerced treatment.

7) **Health care use/treatment, no felt need and no clinical need**: Possible scenarios: a) prolonged contact with healthcare provider after cessation of symptoms or continued medical treatment beyond clinical need; b) preventive care without effect. Termed as "met-un-need"[73] or *overdiagnosis*, this is defined as diagnosis of a condition not currently harmful or one that will not progress to become harmful in the patient's lifetime[74].

Unmet need as defined in scenarios 3 and 5 are areas of potential improvement described as health gaps or treatment gaps. Depending on the clinical definition of a disease, the size of the *unmet need* group can "increase" or "decrease". Additionally, when clinical need is defined by capacity to benefit, introduction of new treatments will also expand the group with *unmet need* for a period, until they are in treatment. Over time, new diseases emerge or are recognized as diseases (scenario 1) and present candidacy for treatment (scenario 4), e.g. Binge Eating Disorder or Bodily Distress Disorder, both recognized in DSM-5 but not included in ICD-10, and as such represent a public demand for treatment (officially) not yet recognized as *clinical need*.

The model provides an operational and theoretical overview of problems with access and where to focus attention depending on the issue/area of the problem. I will return to the model later. The three studies included in this thesis all rely on *clinical need*.

When access to care is studied, some description of the concept itself is necessary.

1.6 Access to care

Access to care is a complex issue and calls for a theoretical frame to grasp and define elements within the concept. I have chosen to adopt the model of Levesque et al[75] over the much-used behavioral model of Aday and Andersen[76], because it intuitively seems better structured, more comprehensive and easier to

operationalize. Levesque et al combine several theories on access to healthcare and final treatment outcome. The model is patient-centered and based on service demand and supply, between which they describe the stepwise fulfillment of needs in the process from recognizing a health care need to a final health care outcome. The model has five dimensions of accessibility, with associated enforcing or inhibiting factors on the supply side, and five corresponding abilities on the demand side, likewise with associated enforcing or inhibiting factors.

Figure1.2. Model of a conceptual framework of access to health care[75]
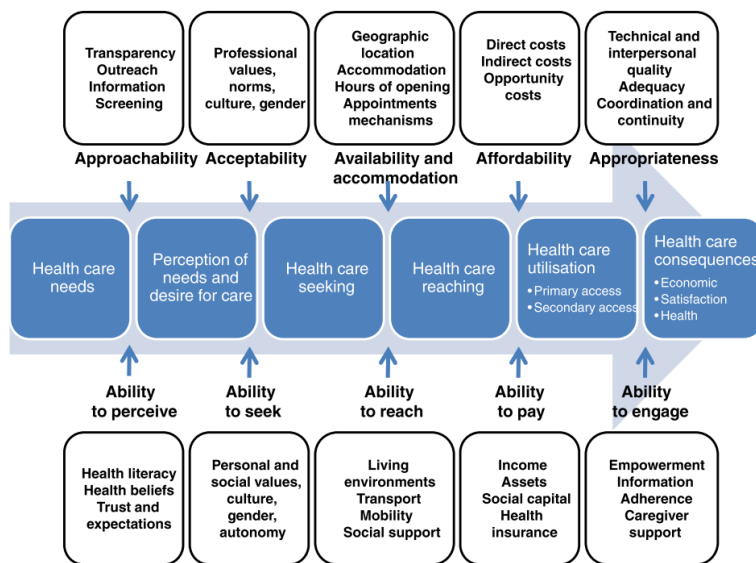
The model is used in Study III where the five abilities serve as the foundation for five questions on accessing care.

Distance to services is essential to access, and a central part of Study I, and therefore some elaboration on distance is necessary as well.

1.6.1 Distance to mental health care

The impact of distance on the utilization of MHC services has been subject to analysis for more than 150 years. In 1853, Edgar Jarvis described how the utilization of mental hospitals was inversely proportional to the travel distance in the catchment area[77]. Also, in Scandinavian countries this was noticed early on; for example, geographic distribution of admissions to the State Mental Hospital in Risskov, Denmark in 1852-77 were reported to decrease with increasing distance[78], a finding repeated after 100 years[79]. In Norway, the impact of distance was analyzed more closely and the authors concluded that senile, epileptics and imbeciles with psychotic symptoms tended to have poorer chances on a waiting list to enter overcrowded facilities, but when new beds were established, these patients from the vicinity would be first in the queue[80]. The association

between distance and type of patients admitted to the State Mental Hospital was studied again using data from 1949-51 on admissions from Aalborg and Aarhus — a 110 km distance[81]. The author Mogens Bille found senile and chronical patients, as in Norway, were from the vicinity — and he noticed that travel expenses from Aalborg to Aarhus would be equivalent to a day and a half's worth of pay for a female worker; thus, it is understandable people hesitate to have their relatives admitted far away from home.

The impact of distance on MHC contact has been proven repeatedly since then and has also been shown to be relevant for outpatient treatment [82] and within cities too[83]. Compared to somatic health care, the utilization of MHC services is more sensitive to travel distance[84]. Distance has an impact on the type of treatment chosen by patients with depression; longer distance is associated with less therapy and more antidepressants and thus sub-standard treatment [85 86]. In Australia, distance to mental health services has proven to be a barrier in itself, affecting persons in low SEP more strongly [87]. Aside from the Australian study, to our knowledge, the socioeconomic impact of distance to psychiatric services has not been described before.

1.7 Socioeconomic position – concept of measurement

This thesis will rely on studies of comparisons within socioeconomic groups, which necessitates a brief elaboration on the measurement of SEP.

SEP can be measured in many ways; the choice of indicator of SEP has to relate to the population studied in the best manner possible. The figure below by Galobardes visualizes relevant indicators of SEP at different stages in a lifespan. Access to reliable data, study objects, and study objectives should be considered when choosing the indicators. In the following, some common indicators of SEP are commented on, primarily based on the presentation by Galobardes[88 89].

Figure1.3. Examples of indicators measuring life course socioeconomic position, from Galobardes[88]
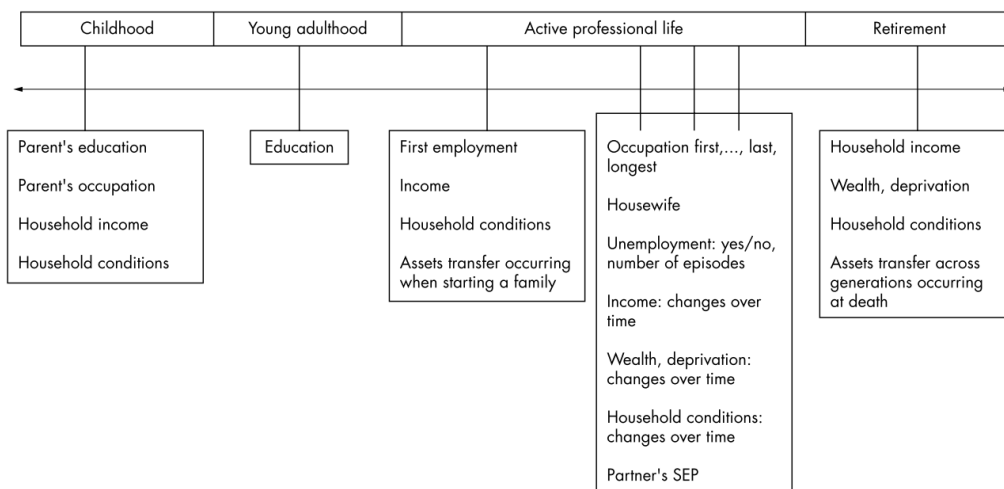
Social class as term related to the position an individual possesses in a society was commonly used in epidemiological studies and by the public from the end of the 19th century well up until the 1970s–80s; since

then it is more rare. Social class is usually defined by a combination of indicators of social position such as education, income and business ownership. Social class is not defined in a uniform manner, making international comparisons difficult.

Housing conditions have previously been widely used as indicator of SEP. Conditions could include presence of an indoor flushing toilet, damp walls, central heating, materials of house construction, etc. Housing conditions are rarely used as an indicator of SEP in studies from high-income countries; Eurostat collects data on inadequate housing conditions but these are more often used as a kind of national poverty scale. Correspondingly, household assets such as access to a telephone, dishwasher, boat, car, etc., are not usually part of indicators of SEP in high-income countries, although they are available in *Statistics on Income and Living Conditions* (SILC) provided annually to Eurostat[90].

Education is often used in epidemiological studies as an indicator of SEP. Unlike income and social class, education, once gained, does not change. Education can indicate cognitive skills and thereby certain abilities relevant to (health) literacy. Education systems vary widely across countries in terms of structure and curricular content and consequently it can be difficult to compare national education systems between countries. In order to overcome this, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has developed guidelines for classification of education in the *International Standard Classification of Education* (ISCED)[91].

ISCED is not yet used consequently in medical literature, where the primary focus is elsewhere; education is often described by number of years or in categories on an ordinal scale.

Recent birth cohorts have also spent an increasing number of years on education, indicating that comparisons across birth cohorts can be problematic.

Income is often used as indicator of SEP and is the one indicator most directly measuring material resources. It has a *dose-response* association with health. Depending on the study objective, household income can be relevant.

OECD and Eurostat[92] use *Household Equivalent Income/equivalised disposable income* – as does Statistics Denmark, whereby the family unit and expenses associated with children living at home are included. It is considered a more accurate measure of accessible means or *purchasing power*. This indicator is used in Study I.

Financial strain is another indicator of economic distress used in surveys; this is measured by ability to pay bills or ability to access money/cash reserve. These indicators are a part of SILC[90].

Wealth is yet another indicator of SEP and can be measured in different ways, e.g. ownership of one's home or size of personal fortune.

Income is a continuous variable and as such easy to arrange and compare. Income might not give a good indication of SEP for younger age groups whose income can be low, whereas other indicators of SEP can be high if they are studying. For children and adolescents the parental income is used as an indicator. For retired

persons, when the income might not be high, wealth indicators can be used. Financial strain is an economic indicator useful across age groups.

Occupation is an old type of indicator. The structure of the International Standard Classification of Occupations (ISCO-08) is used in Denmark, with an extension in detail (DISCO-08). In some ways, occupation combines both income and education as an indicator of SEP, but the ranking is categorical as opposed to the ordinal ranking possible with the other two indicators. For retired persons, former occupation can be relevant and for students, future occupation can be used as proxy.

The Danish socioeconomic classifications (SOCIO02/SOCIO13) provide data on the type of occupation associated with the main source of income the previous year, including information on unemployment and recipients of social benefits.

Occupational status separates some vulnerable groups, which depending on the study objectives can be relevant. Again, these are categorical variables, which can point out special groups but not necessarily reveal a social gradient.

1.8 Setting of the study

To give an understanding of the setting in which the studies have been conducted, the Danish healthcare system is described briefly, as are the societal impacts of depressive disorders and the recommended treatment in Denmark.

1.8.1 The Danish healthcare system

In Denmark, healthcare is tax-funded and free at delivery; 84% of healthcare expenditures are publicly financed (2015). The remaining 16% are financed primarily through patient co-payments. The country is divided in five administrative areas (regions) responsible for healthcare, running hospitals and reimbursing services delivered by privately operating medical specialists and GPs. The 98 municipalities provide health services related to disease prevention and health promotion, and they are additionally responsible for rehabilitation outside hospital settings, school health services, dental treatment of children and adolescents, postnatal care, physiotherapy, alcohol and drug abuse treatment, home care services, nursing homes, and other services for elderly people. The GP acts as a gatekeeper to more specialized care[93].

Treatment by medical specialists such as psychiatrists is free, whereas treatment of adults by psychologists is subsidized only for patients with specific conditions, including reaction to specific traumatic events, mild to moderate depression, and mild to moderate anxiety disorders, the latter only until the age of 38[94]. In 2014, the co-payment for a psychologist appointment was equivalent to 44€ per session, up to 12 sessions[95]. The municipality can cover the co-payment if the patient has no means and the treatment is necessary to obtain a job.

1.9 million Danes (50% of the population aged 20–70 years) had a supplementary private health insurance plan in 2016, usually paid by the employer. Less than 3% of the insurance plans were privately paid. Expenses for psychiatric and psychologist treatment were 31.5€ million by 2016, which is an increase of 33% since 2013[96].

The public part of the expense for a psychologist (or a psychiatrist) is covered by public health care, including for privately insured persons. Thus, privately insured persons are included in the national data.

Some structural problems exist in the distribution of healthcare services. In some remote areas there is a lack of GPs and family doctors are replaced with "Regional Clinics" operated by firms, with different doctors attending the clinics. The lack of GPs is particularly problematic in deprived areas[97]. Likewise, medical specialists are also more scarce in remote areas; in 2010, 30% of all specialists in the country resided in just four municipalities north of Copenhagen[98].

1.8.2 Depressive disorders in Denmark

In the following, the occurrence of depressive disorders in Denmark, its estimated societal cost, and treatment is described. Having no access to GP records, the true extent of healthcare treatment directed toward depressive disorders is not known.

The prevalence of depressive disorders differs across countries. In a national Danish survey of adults aged 40 to 50 conducted in 2000 and repeated in 2006, the prevalence of MDD increased from 3.3 to 4.9%[99]; however, a population study from the municipality of Naestved in 2011 found only 2.3% with symptoms of ICD-10 depression[100]. All three studies used the Major Depression Inventory (MDI) as measurement tool. In an extensive governmental report on MHC in Denmark, it was estimated that 5–7% annually suffer from depression, and that the rate had not changed between 2001 and 2011[101 p.50]. Eurostat reports a prevalence of 6.3% adults with depressive symptoms and 3% with major depression symptoms in Denmark [7]. A recent Danish national survey reported 7.0% of adults suffer from depressed mood nationally and 7.8% in the Region of Zealand[102].

Besides risk of suicide and death[103] and personal and social suffering, there is a societal impact of depression. According to the National Board of Appeal, which handles statistics and complaints in the social and employment sectors, mental disorders constituted 42% of the causes for granting disability retirement in Denmark by 2014[104]; almost 300 people or 12% were due to depressive disorders (Figure 1.4). In the report *Burden of Diseases in Denmark*[8], healthcare expenses for depressive disorders were 165€ million annually and economic expenses for sick-pay and early retirement totaled 420€ million. The excess mortality and suicides associated with depressive disorder is not included in these figures. These total costs of depressive disorders are only superseded by anxiety disorders, schizophrenia, and lower back pain, and supersede all specific cancers, ischemic heart disease, and diabetes.

Figure 1.4. Social impact of depression in Denmark, disability retirement

Causes for disability retirement	n	2014
# 1 Mental disorders	2439	42%
# 2 Musculoskeletal disorders	812	14%
# 3 Ischemic heart diseases	524	9%
# 4 Nervous/sensory system	545	9%
# 5 Cancer	743	13%
# 6 Respiratory diseases	203	3%
# 7 Congenital deficiency	83	1%
# 8 Accidents, violence etc.	156	3%
# 9 Social indication	10	0%
# 10 Other diagnoses	312	5%
	5827	

Causes for disability retirement in Denmark 2014, Mental disorders

Others 8% | Abuse 8% | Schizo & bipolar 13% | Mental retard. 20% | Depress. 12% | Personality & behav. 8% | Anxiety 6% | PTSD & adjust 25%

N 2439
Tal fra Ankestyrelsen
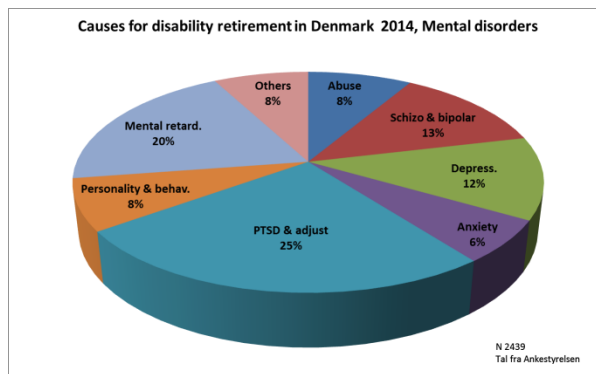
1.8.2.1 Treatment of depressive disorders

The Danish national guidelines[105] recommend a stepwise increasing intensity of treatment for depression. It starts with counselling by GP and mental health counselling (talk therapy) provided by the GP, followed by prescription of antidepressants, again followed by or concurrent with referral to therapy with a psychologist, then referral to treatment by a psychiatrist, and finally referral to a public outpatient psychiatrist or eventually inpatient treatment at a psychiatric hospital, depending on treatment response and the severity of the depression.

The pharmacological treatment of adults with depression is regulated by instructions from the National Board of Health. Since 2014, pharmacological treatment of adults 18–24 years of age is to be handled by or under the guidance of a psychiatrist[106].

The national reference programme for non-pharmacological treatment of unipolar depression[107] recommends physical exercise as supplementary treatment for patients with mild to moderate depression, and psychotherapy in combination with medicine for patients with moderate to severe depression.

The recommended initial mental health counselling provided by a GP consists of at least two talk therapy sessions within the first six months and up to seven talks within one year. This type of therapeutic counselling is registered and paid as additional reimbursement to the GP and regulated by national agreements with the Regions of Denmark[108]. There is no formal requirement as to the methods used, except that it should be relevant. In order to receive reimbursement for the service, the GP has to receive regular supervision from other GPs, psychologists, or psychiatrists, either individually or in groups[108].

As for the use of antidepressants in Denmark, the incidence of antidepressant use in the age group 10–49 decreased considerably between 2010 and 2013, after an increase the ten years previous, whereas the incidence rate of depression in 2010 –2013 was unchanged[109]. By 2016, a little more than 7% of the population had redeemed at least one prescription of antidepressants (414,521 individuals). The decline is primarily in use of selective serotonin reuptake inhibitors (SSRI). The proportion redeeming a prescription of antidepressants increases by age in all Nordic countries. In Denmark, 17% of all persons 75+ years have had at least one redeemed prescription of antidepressants (males 13%, females 21%)[110]. It has previously been demonstrated that the use of antidepressants increases substantially with proximity to death. In the last phase of life, independent of whether the patient dies at age 65 or 90, about 33% of females and 25% of males receive antidepressants in their last 6 months living[111].

It is not possible to get data on the diagnoses of patients treated by private psychiatrists in Denmark, but the total number of patients has decreased from 2012 until 2016 by 2.1% annually. Likewise, and in the same period, the number of patients receiving mental health counselling from their GP had an annual 4.1% decrease[112]. However, data on use of psychologist services for treatment of depressive and anxiety disorders are accessible. The number of patients treated by psychologists for anxiety or depression has risen from 40,097 in 2012 to around 46,500 in 2014–16, at which point the number stagnates[113]. Public support for treatment by

psychologists was introduced by 1992, primarily only for serious life events but gradually extended since to encompass what is described above in section 1.7.1. The expenses for psychologist treatments are limited by a ceiling of public support to the individual psychologist at 270,000 kr. (36,200€) per year by 2016[114]. The ceiling of expenses for psychological treatments for anxiety and depressive disorders has been reached in the latest years and can explain the stagnation[115].

1.9 Aim of the thesis

As demonstrated above, common mental disorders, particularly depression, are widespread health problems with grave personal and societal consequences, affecting persons in low SEP most strongly. Therefore, the studies on use of healthcare associated with these disorders are relevant when examining potential social inequality in mental health care.

The aim of the thesis is to explore if the Danish healthcare system provides equal access to and treatment of patients with depression – and if not, then why.

Objectives of Study I, II, III

I. To determine the impact of *socioeconomic position* and *distance to provider* on outpatient mental health care utilization among incident users of antidepressants.

II. To examine if the severity of symptoms of depression was associated with the MHC treatment received, independent of SEP in both type and frequency of treatments and highest gained treatment level within six months, following a symptom score in a survey study.

III. To evaluate if the perceived barriers to accessing MHC differ across individuals with symptoms of depression according to their SEP.

2 Method and material

2.1 Study I
Study design
The study was conducted as a register-based one-year follow-up study on mental health service utilization after initiated treatment with antidepressants.

2.1.1 Study sample and study period
The study sample consisted of all individuals aged 20 to 64 years living in Denmark who were prescribed antidepressants (Anatomical Therapeutic Chemical (ATC) classification system N06A) in 2013, according to data extracted from the Danish National Prescription Registry [116][117]. Only patients with no previous prescription of antidepressants in 2012 were included. Bupropion (ATC N06AX12) was not included since it is only prescribed for smoking cessation in Denmark. Tricyclic antidepressants (ATCs N06AA) were not included either, as they are not recommended as the first choice for treatment of depression and are frequently used as a secondary analgesic [118][119]. All persons migrating in 2012 were excluded as they could not be accounted for during the full study period. Finally, all patients coded as terminally ill at first prescription, and thereby specially subsidized, were excluded[120]. The resulting population was followed for 12 months per individual or until death or emigration, if that occurred before.

2.1.2 Data sources and handling
The data sources and the data management are described in the following.

2.1.3.1 National registers on the population and resources

The Danish Civil Registration System
Since 1968, all persons with permanent residence in Denmark are registered in the Danish Civil Registration System (CRS) and assigned a unique 10-digit personal identification number, the CRS number. The CRS allows for technologically easy, cost-effective, and unambiguous individual-level record linkage of Danish registers. Daily updated information on migration and vital status allows for nationwide cohort studies with virtually complete long-term follow-up until emigration or death[121].

Data concerning age, sex, address, marital status, cohabitation status, country of origin and vital status were gathered from the CRS. Country of origin was grouped into: 1. *Denmark*; 2. the EU and other European countries, North America and Oceania as: *Europe/Western countries*; 3. Africa, South and Latin America, stateless and unknown as: *Non-western countries*.

The home addresses of the study sample individuals were drawn from CRS and GIS positioned (geographic information system).

Danish registers on personal income and transfer payments

The Income Statistics Register provided by Statistics Denmark contains more than 160 variables, including salary, entrepreneurial income, taxes, public transfer payments, capital income, private pension contributions, and payouts. The income data are generally of high quality[122].

Data on family income was drawn from the Danish Income Statistics Register. Family income was chosen since the household represents shared common resources, and because, as far as income is concerned, it is more strongly and consistently associated with health than individual income[123]. In this study, we used equivalent disposable family income, similar to OECD's modified scale and the one used by Eurostat[124].

Likewise, Statistics Denmark provides data on the main source of income (socioeconomic classification 2002, termed SOCI02) based on the Income Statistics Register[125]. The 22 categories were reduced to 8: self-employed (including assisting wife), employee, student, unemployed, retired, welfare, other, and not available.

Educational registers

The education registers are generated from the education institutions' administrative records via collaboration between Statistics Denmark and Danish Ministry of Education. The validity and coverage of the registers is very high[126].

Statistics Denmark delivered data from the population's Education Statistics Register on highest completed educational level by January 2013.

The Digital Motor Register

All motorized vehicles and trailers are required to register in the national Digital Motor Register in Denmark, where the vehicle is registered by type and owner[127].

Access to a motorized vehicle was verified through the Digital Motor Register, Statistics Denmark. If a vehicle was registered to an individual in the study population or a member of the family, it was considered as positive access. Vehicle registration was categorized into: none; car owner; motorcycle; 45kph moped. If a car and a motorcycle and/or 45kph moped were owned by the same person or family, only the car was included.

2.1.3.2 National Health Registers

The Danish National Patient Register

The Danish National Patient Register was established in 1977 and includes information on all contacts with hospitals, including private hospitals since 2003, with data on diagnosis and procedures. The aims of the register are to provide statistics for healthcare planning, disease and treatment monitoring, quality assurance, and research[128].

Information on comorbidity was drawn from the Danish National Patient Register and the Danish Psychiatric Central Research Register[129]. Information on psychiatric comorbidity was obtained for patients who had received inpatient or outpatient hospital services. Diagnoses in the registers have been coded according to ICD-10 since 1994. The chronic diseases included: cancer, diabetes, psychiatric disorder, IHD, stroke, COPD and

arthrosis. (ICD-10: C00–C43; C45–C96; E10–E11; F00–F98.9; I20–I25; I61–I64; I69; J43–J44; M05–M06; M08–M09; M15). One occurrence in the register of one of the diagnoses counted as positive for a chronic condition. These diseases are categorized as diseases of public health concern in Denmark, which also includes osteoporosis and dementia. Osteoporosis was not included in the study, as symptoms are rarely known until the age of 70[130]. Dementia was not included for the same reason. Dementia is very rare for the age group under consideration.

We excluded cancer as a comorbidity if it had occurred ≥ 10 years before the first prescription and not since, since we then considered it to be cured or in complete remission. Likewise, a former psychiatric disorder was excluded as a comorbidity if a person had been registered with misuse of alcohol or drugs ≥ 10 years ago and had not since then been registered with a mental disorder; they too were considered to be cured.

The data for psychiatric comorbidity date back to 1969. Until 1994, the diagnoses were coded in ICD-8. The codes included were: 290; 292–301; 305–315. (Alcohol and drug misuse and sexual deviation were thus not included).

Information on treatment in public inpatient and outpatient psychiatric facilities was drawn from the Danish National Patient Register, ICD-10 coded F00–F99.

Data on outpatient public psychiatric services and services by private outpatient psychiatrists were grouped together in the analyses, as public outpatient psychiatric services are used instead of private services in areas with no access to a private psychiatrist. The grouping was termed *outpatient psychiatrist*. One-day psychiatric hospital admissions were re-categorized into emergency contacts and termed as: *Emergency and short admissions*.

The Danish National Health Provider Register
The Danish National Health Provider Register keeps record of all healthcare providers practicing according to the law on public health insurance in primary healthcare as GPs, practicing medical specialists, psychologists, physiotherapists, dentists, or chiropractors, etc. The register contains information on address, profession and type of medical specialist[131].

The Danish National Health Service Register
The Danish National Health Service Register covers healthcare contacts to primary healthcare, including GP, practicing medical specialists, psychologists, physiotherapists, dentists, chiropractors, and chiropodists. The registry has collected data since 1990. The register has data on reimbursed services linked to provider and the CRS number of the patient. It contains contact by type, date, and a limited number of procedures reimbursed by agreement. The register does not contain diagnoses[132].

Data on the utilization of private psychiatrists, psychologists, and GPs were drawn from the Danish National Health Service Register for Primary Care. Mental health counselling provided by a GP (talk therapy), as discussed above, consists of at least two talks within the first six months and up to seven talks within one year.

This type of therapeutic counselling is registered and paid as additional reimbursement to the GP, thus possible to extract from the register (Supplementary Table 1).

The public part of the expense for a psychologist (or a psychiatrist) is covered by Danish National Health Insurance, which is also the case for privately insured persons.

The Danish National Prescription Registry
Since 1995, the Danish National Prescription Registry[133] has collected data on all redeemed prescriptions of medicine in Denmark. Data contains 46 variables, including the date the prescription was redeemed, dose, name, packet size, Anatomical Therapeutic Chemical (ATC) code[117], and prescriber name. Data are linked to CRS number and accessible in anonymized form on servers at Statistics Denmark.

Calculation of distance to services
The home addresses of the study population were drawn from CRS and GIS positioned. Addresses for all GPs, psychologists and private psychiatrists were drawn from the Danish National Health Provider Register. Addresses for outpatient mental health care services (public psychiatric services) were drawn from homepages and confirmed by regional officials. The distances in meters by road from the participant's home address to the nearest located health provider at the time of the first prescription have been calculated by Statistics Denmark in ESRIs ArcMap 10.3 using Network Analyst.

2.2 Study II

2.1.1 Setting and design
Study design
The study was conducted as a six-month follow-up study on MHC utilization and use of antidepressants in national registers of participants who scored positive for symptoms of depression in the population survey.

Using the CRS number from the Danish General Suburban Population Study (GESUS)[134] we linked to national registers and tracked the use of healthcare services and antidepressants for four months (120 days) prior and six months (180 days) after the respondents entered the GESUS study, or until their death or migration, if that occurred before. Data from national registers covered the years 2010-2014 in order to fit a timeframe of four months prior to index date; however, the sample was reduced to include only respondents entering the GESUS study from May 2010, due to lack of data availability from 2009. The period of four months prior to the study was chosen assuming active treatment would include a treatment appointment or renewed prescription at least every three to four months.

2.2.2 Data sources and handling

Danish General Suburban Population Study
GESUS collected data from January 2010 through October 2013 in the municipality of Næstved, Denmark. The municipality of Næstved is located 90 kilometres south of the capital Copenhagen. It has a total population of 81,000 and a socioeconomic index score 4% lower than the 2013 national average[135]. All citizens over the age of 30 were invited, as were a random selection of one-quarter of citizens between 20 and 30 years of age. The

study consists of 21,253 participants, equivalent to 43% of the invited citizens, and the median age of participants was 56 years and 52 years for non-participants. Biological (blood samples), biometric, and questionnaire data were collected.

Major Depression Inventory (MDI)

Data on symptoms of depression was collected by the Major Depression Inventory (MDI) from the questionnaire (Supplementary Table 2). The MDI is based on the 12-item Likert scale and has been found to have an adequate internal and external validity for defining different stages of depression[136]. The MDI is based on the ICD-10 diagnostic criteria for depressive disorder[34] with scores ranging from 0 to 50: scores ≤ 20 do not indicate depression; mild depression is defined by a score from 21–25; moderate depression from 26–30; and severe depression from 31–50[137]. In the study, we collapsed moderate and severe depression into the same category, reducing the categories to three in order to gain statistical power: no/few symptoms (summed MDI 0–20), mild symptoms (summed MDI 21–25), and moderate/severe symptoms (summed MDI 26+). The splitting of symptomatic individuals into only two groups (mild or moderate/severe) was supported by the recommended therapeutic approach at the time: patients with mild symptoms were recommended "watchful waiting" and perhaps supportive consultations, whereas patients with moderate to severe depression were recommended antidepressants and therapy by a psychologist or a psychiatrist[138]. If more than two items were missing in the MDI, the score was categorized as missing[139].

Socioeconomic position

Education and income were chosen as measures of SEP due to the respondents' age distribution skewing older than the general population; older age groups tend to have lower education and they also have lower incomes, and occupation is not a useful SEP measurement for retired individuals, since all will fall in the same category.

Education was classified as: None if the respondent did not complete any postsecondary education; Short for vocational education of 1–3 years; Medium for academy/professional graduates of 1–3 years; Long for baccalaureate who completed 3–4 years; and Academic for those who completed graduate study of ≥ 5 years. In the analysis, the categories of Short and Medium (1–3 years) were analysed together as 1–3 years postsecondary education, and so were the categories of Long and Academic (3–4 and 5+ years) as 3+ postsecondary education. Students were categorized at the level that their studies would end in, e.g. students in doctoral programs would be categorized as Academic even though they had not yet completed 5 years of graduate study.

Information on income was also extracted from the GESUS questionnaire, where it was reported in Danish Kroner (DDK). 100 DDK equals 13.42€ at a fixed exchange rate, in effect for decades. Income was grouped into three equal groups: Less than 300,000 DDK; 300,000–599,999 DDK; and 600,000+ DDK and reported as: < 40,250€; ≥ 40,250€ < 80,499€; or ≥ 80,500€.

2.2.2.1 Extrinsic variables

Additional sociodemographic data was collected from GESUS: age, sex, marital status, and cohabitation status. Information on somatic comorbidity included: previous acute myocardial infarction (AMI), arteriosclerosis,

angina pectoris, stroke, cancer, diabetes mellitus, and hyper- or hypo-thyroidism. The somatic disorders were all grouped into one variable. Previous depressive episodes were registered separately.

Data on *Present medication* covered self-reported use of antidepressants. Respondents defined as being in *present treatment* included both participants who reported use of antidepressants and participants identified as currently using antidepressants according to the Danish National Prescription Registry, and/or were in contact with a psychiatrist and/or a psychologist within four months prior to the date of returning the questionnaire with the depression score (termed the *index date*).

2.2.2.2 Dependent variables

Data on dependable variables was drawn from national registers.

Data on the utilization of private psychiatrists, psychologists, and GPs was drawn from the Danish National Health Service Register for Primary Care[132].

Data on prescriptions for antidepressants (ATC N06A) was extracted from the Danish National Prescription Registry[116 117]. However, bupropion (ATC N06AX12) was excluded, as previously discussed, since it is only prescribed for smoking cessation in Denmark.

Information concerning public in- and outpatient psychiatric treatment was drawn from the Danish National Patient Register[140] (ICD-10 coded F00–F99).

The outcome variables were graded according to the stepwise treatment of increasing intensity for depression as recommended in the Danish national guidelines at the time[25] (Supplementary Table 3).

2.3 Study III

2.3.1 Study design

The study was conducted as a cross-sectional population survey.

Respondents with symptoms of depression were asked five questions on perceived barriers to accessing professional health care, and the response was related to the symptom score and socioeconomic position.

2.3.2 Data sources and handling

The Lolland-Falster Health Study

The Lolland-Falster Health Study (LOFUS) is a population survey conducted in the two remote municipalities of Lolland and Guldborgsund, located 1½–2 hours' drive south from the capital Copenhagen. In the 2017 national ranking of all 98 municipalities, these two were ranked the most deprived and the 8th most deprived municipalities, respectively[141]. Together, the municipalities comprise 103,000 citizens, 50% being 50 years of age or older in 2017[142]. The study aims to enroll 25,000 participants of all ages and will be conducted from 2016 through 2020. Participants are randomly selected by civil registration numbers[143], invited by mail, and re-invited by phone. The study covers several health areas: mental health, health literacy, social issues, genetics, kidney, ear nose and throat problems, and more. Beyond questionnaire responses, LOFUS data includes blood samples and biometrics. The study is described in detail elsewhere[144].

The present study relies on responses to the questionnaire from adults, with data drawn from LOFUS at the end of 2017, while data collection was still ongoing.

The subjects included are respondents with symptoms of depression. All respondents who scored > 20 on the MDI were prompted with specific questions on perceived barriers to seeking help for mental health problems, as described below.

Socioeconomic position
SEP was measured by employment status, educational attainment, and financial strain.

Employment status was gathered using 14 different items in the questionnaire. Respondents over the age of 67 were categorized as retired unless they were employed. The categories of employment were reduced to four in the analyses: Working (employee; self-employed; combined employee and self-employed; military; secondary school pupil; postsecondary student; apprentice; house-wife/husband); Temporary not working (unemployed; rehabilitation; sickness leave 3 months or more); Retired (retired due to age; disability benefit; early retirement); and Other (Other).

Educational attainment was measured and classified as the following: *no postsecondary education* if the respondent did not complete any postsecondary education; *1-3 years postsecondary education* for vocational

or academy/professional graduates of 1–3 years; *3+ postsecondary education* for baccalaureate matriculants who completed 3–4 years; and *academic* for those who completed graduate study of ≥ 5 years.

The questionnaire gathered responses concerning financial strain with the following question: *How often within the last 12 months have you had problems paying your bills?* With the possible answers: *Never; Few months; Approximately half the months in the year; Every month*. In the analysis, the categories were reduced to three to gain power, merging *Approximately half the months in the year* and *Every month* into one category *Half the time+*.

2.3.2.1 Extrinsic variables
Sociodemographic variables included were sex, age, marital status, and cohabitation.

Questions on *Self-perceived general health* (SRH) were provided to respondents with a five-point Likert scale from *very good* to *very bad*. In addition, the presence of a *longstanding health problem* was posed as a binary question and *General activity limitation* was gauged in three grades from *severely limited* to *not at all*. Both of these questions were adopted from the European Health Status Module[145].

The questionnaire included inquiries regarding past and present medical problems; specifically concerning mental health status, the respondents were asked if they presently suffered from or had ever suffered from anxiety disorder and/or depression.

2.3.2.2 Dependable variables and the questionnaire
We developed a short list of questions to be included in the LOFUS questionnaire for respondents who scored positive for symptoms of depression.

The conceptual frame for evaluating a patient's personal preferences and abilities to access care were based on the theoretical approach presented by Levesque et al[75]. The model has five dimensions of accessibility with associated enforcing or inhibiting factors on the supply side, and five corresponding abilities on the demand side, likewise with associated enforcing or inhibiting factors. (See Figure 1.2. p.18)

We aimed to develop five questions which could reveal the five abilities which a potential patient should possess. We did so by adopting a validated questionnaire: the *Barriers to Access to Care Evaluation* questionnaire (BACE v3) developed by Sara Clement et al.[146] and grouping their 30 questions into five (see Supplementary Table 4). Some of the items were not considered relevant in the present context — such as questions related to ethnicity. Relatively few non-ethnic Danes are living in Lolland-Falster and given that the questionnaire would be in Danish, an additional number would be excluded, leaving very few for whom that question would be relevant.

The questions were evaluated for content validity in a focus group interview consisting of a group of ten patients and relatives of psychiatric patients (the Panel of Relatives and Patients of Psychiatry Services in Region Zealand) in December 2014. The themes were deemed relevant and the questions understandable according to the group. They offered some suggestions for rephrasing, which were followed.

The questions were framed:

Have any of the reasons listed below prevented, delayed, or discouraged you from seeking or continuing professional care for a mental health problem?

It has had an impact, that I ..

> *1) … have been unsure what to do to get professional care*. ("Knowledge" in the following)
>
> *2) … have been concerned for what others might think, say or do.* ("Stigma")
>
> *3) … have had difficulty with transport or traveling for treatment.* ("Transport")
>
> *4) … have not been able to afford the expenses that followed.* ("Expense")
>
> *5) … have had bad experiences with professional care for mental health problems*. ("Experience")
>
> *6) These questions are not relevant for me/I do not want to answer.*

Answers to question 1–5 were listed in four grades, ranging from *Not at all* to *Quite a lot;* question 6 was binary*.*

2.4 Statistical analyses

2.4.1 Study I

Logistic regression was used to calculate the odds ratio (OR) for the association between SEP and contact with a health service provider. Among those who had contact with a mental health service provider, Poisson regression was used to calculate the incidence rate ratio (IRR) for the association between SEP and the frequency of contacts. Both analyses were adjusted for sex, age, cohabitation status, country of origin, somatic as well as psychiatric comorbidity, and access to a vehicle.

A logistic as well as a Poisson regression analysis of interaction between income and distance, and education and distance, was performed for each outcome measure. For interactions significant at a level of 0.01 or less, further analyses were performed; the impact of distance on contact with the identified mental health service was analysed with logistic regression on income and/or education stratified within groups. Distance was measured in 5 kilometre intervals. The analysis of the impact of distance within different educational and/or income groups on the frequencies of contacts was done using Poisson regression. These analyses were done for each type of healthcare service showing interaction.

OR and IRR were estimated at 95% confidence intervals (CI), and p-values were reported.

2.4.2 Study II

First, we estimated the association between SEP and the different binary outcome variables (that is, the five different types of health care contact: *No health care contact*, *GP consultation*, *Mental health counselling by GP*, *Antidepressants*, and *Specialized mental health services*) in separate logistic regression models, both uni- and multivariable. Each model was stratified into three MDI categories: no/few symptoms (MDI < 21), symptoms of mild depression (MDI 21–25), and symptoms of moderate to severe depression (MDI ≥ 26). The SEP category '*No postsecondary education* and income *< 40,250€*' was used as the reference category. To examine a possible interaction between SEP and MDI category, we employed logistic regression models for each outcome, with patients having *No postsecondary education / < 40,250€* and *no/few depression symptoms* as key reference.

Second, in order to evaluate differences in visits and prescription rates, we estimated IRR by Poisson regression models for each type of contact (*GP consultation*, *Mental health counselling by GP*, *Antidepressants*, and *Specialized mental health services*). For each type of contact, analyses were restricted to those patients who had at least one contact. For exposure, death and emigration within 180 days after index date were taken into consideration. As above, analyses were stratified into MDI category, and the SEP category '*No education* and *< 40,250€*' was used as a reference category.

Finally, we performed a linear regression analysis for the effect of combined SEP and MDI category on the highest reached treatment level (see treatment progression described above). The treatment levels were categorized as shown in Supplementary Table 3 (0: no treatment/contact; 1: GP consultation; 2: MHC by GP; 3: antidepressants; 4: psychologist; 5: private psychiatrist; 6: public psychiatrist; 7: psychiatric hospital). Patients

having *No postsecondary education / < 40,250€* and *no/few depression symptoms* were the key reference groups.

All multivariable regression models included age (*20–59* versus *60+*), sex, present treatment with antidepressants, and psychologist or psychiatrist (*yes/no*), in addition to the variable studied in the univariate (crude) analysis. In analyses including income, cohabitation was also included.

The significance level was 5% throughout, and all reported confidence intervals were 95%. All statistical analyses were performed using Stata 14[147].

2.4.3   Study III

For respondents with symptoms of depression we estimated the association between SEP and the outcome variables (five types of barriers to MHC: knowledge; stigma; transport; expense; experience) in separate multivariable logistic regression models after excluding respondents replying *Not relevant*. Likewise, we performed the same analyses with the three grades of depression (mild, moderate and severe) and depression score uncategorized (MDI score) as independent variables, which is presented as supplementary material. The SEP categories were employment status, education, and financial strain. *Working*, *postsecondary education,* and *no economic distress* were used as reference categories.

The logistic regression models were adjusted for age (18–59 versus 60+) and sex in addition to the variables studied in the univariate (crude) analysis.

The significance level used was 5% throughout, and all reported confidence intervals were 95%. All statistical analyses were done in Stata 15[148].

2.5 Ethics

The study was approved by the Danish Data Protection Agency by journal number 2015-41-3984.
Access to data from the Danish Suburban Population Study was approved by the Board of the Danish Suburban Population Study by December 23, 2015. Approval by an ethics committee is not required for register studies.

For the Lolland-Falster Health Study, informed written consent was obtained. Region Zealand's Ethical Committee on Health Research (SJ-421) and the Danish Data Protection Agency (REG-24-2015) approved the study.

Patient and Public Involvement in Study III
The study objectives were discussed with the members of the Panel of Relatives and Patients of Psychiatry Services in Region Zealand along with the validation of the questions in December 2014. The preliminary results were discussed with the group again in December 2017. The final results were distributed to the group in February 2018 along with an invitation for additional comments. One member of the patient panel responded to the invitation and provided additional comments/discussion. Comments from patients are included in the discussion. The published article will also be distributed to the patient panel.

3. Results

3.1 Results of Study I

Impact of socioeconomic position and distance on mental health care utilization: a nationwide Danish follow-up study.

Table 3.1.1 Characteristics of the study sample and the Danish population

Charactaristics of the study sample and population		Total		Dk 2013*
		N	Pct	Pct
		50.374		
Sex	Male	21.736	43	50
	Female	28.638	57	50
Age at entrance	20 - 29	11.065	22	21
	30 - 39	11.750	23	21
	40 - 49	12.734	25	25
	50 - 59	10.819	21	22
	60 - 64	4.006	8	10
Family type	Single	21.769	43	45
	Cohabitating	28.605	57	55
Education	< 10 years	16.256	32	10
	10 - 12 years	21.100	42	62
	>12 years	10.827	17	15
	NA	2.191	4	4
Employment status	Self employed	1.686	3	8
	Employee	27.956	55	66
	Student	2.552	5	5
	Unemployed	2.139	4	4
	Retired	6.349	13	9
	Welfare	7.385	15	5
	Other	2.301	5	3
	NA	6	0	
Land of origin	Denmark	42.519	84	87
	Europe & Western countries	4.137	8	7
	Non-western countries & unknown	3.718	7	5
Vehicle	None	29.387	58	
	Car	20.375	40	
	Motorcycle	320	1	
	45-moped	292	1	
Comorbidity, somatic	Cancer (latest 10 years)	1.467	3	
	Diabetes	1.333	3	4 #
	Ischemic heart disease	2.881	6	
	COPD	720	1	3 #
	Arthrosis	484	1	5 #
	N chronic s 0	44.308	88	
	1	5.308	11	
	2	698	1	
	3	59	0	
	4	1	0	
Comorbidity psychiatric	Former mental disorder, yes	12.027	24	
Localization, City size	Capital, suburbs, ≥ 100.000	15.908	32	
	20.000 - 99.999	10.621	21	
	5.000 - 19.999	7.034	14	
	1.000 - 4.999	6.979	14	
	≤ 999	9.009	18	
	NA	823	2	
Region	Capital	14.187	28	32
	Central Jylland	12.765	25	23
	Northern Jylland	5.032	10	10
	Zealand	7.312	15	14
	Southern Denmark	11.078	22	21

* Statistics Denmark: www.statistikbanken.dk accessed august 2016. Data of agegroup 20 - 64 years as of january 2013
# Statens Institut for Folkesundhed: Sundheds- og Sygelighedsundersøgelsen 2013, accessed june 2016:
www.si-folkesundhed.dk/Forskning/Befolkningens%20sundhedstilstand/Sundhed%20og%20sygelighed%20SUSY/SUSY%202013.aspx

COPD: chornic obstructive pulmonary disease; Chron: chronical diseases

Figure 3.1.1 Sampling of incident users of antidepressants from the national population
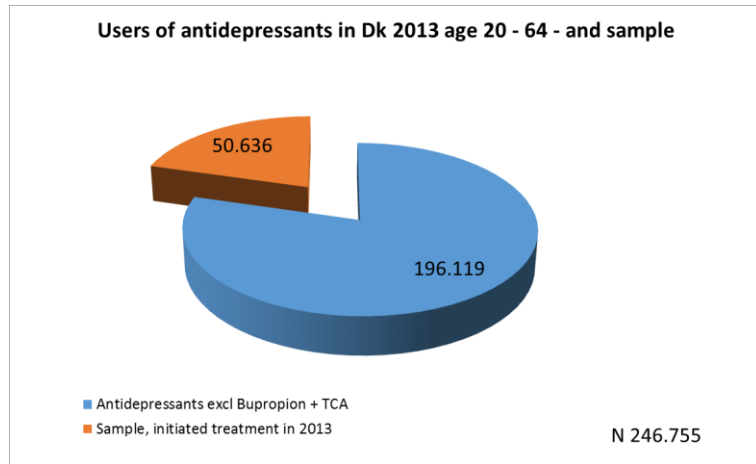
We followed a cohort of 50,636 incident users of antidepressants for 50,374 person-years at risk, constituting one fifth of all users in 2013 (Figure 3.1.1.). Nearly 60% of the study population was female and 50% were older than 41 years. The age distribution was close to that of the national distribution (Table 3.1.1), but the educational achievements were much lower, as 32% had fewer than 10 years of education, compared to only 10% in the national sample. 13% were retired and 15% on welfare income compared to 9% and 5%, respectively, in the study population. The capital region was slightly underrepresented.

A total of 9,476 individuals (19%) of the study population used services provided by psychologists within the one-year follow-up (Table 3.1.2). Among persons in contact with public psychiatrists, 603 (9%) were also in contact with private psychiatrists, and 1,143 persons (16%) were also in contact with a psychologist (not shown).

Table 3.1.2 Contacts in crude numbers, distances to health services

Total number of contacts with mental health care services and distance to outpatient services					
Type of health care service used		N	Pct		Total sum of contacts
Public psychiatrist (Outpatient mental health clinic)		7,035	14		75,209
Admission mental hospital > 1 day		1,783	4		2,619
Psych. emergency ward =< 1 day		1,811	4		2,599
Private psychiatrist		4,681	9		31,279
Psychologist		9,476	19		64,865
GP-Mental health counselling		17,638	35		56,692
GP consultation		48,711	97		37,227
Person-years					50,374
Distance to outpatient provider in kilometers					
Type	Mean	Median	90%	Min	Max
GP	2.1	1.1	5.6	0	26.3
Psychologist	4.4	2.1	12.0	0	56.0
Private psychiatrist	10.6	4.7	25.6	0	191.9
Public psychiatrist	10.7	6.7	25.6	0	87.2
Out-patient psychiatrist*	7.8	3.8	19.9	0	85.6

GP: general practitioner; GP mental health counselling, equivalent to talk therapy provided by GP

* Outpatient psychiatrist combines public psychiatrist and private psychiatrist - distance calculated to the nearest one

Table 3.1.3 Association of income and education with MHC contact in OR and number of visits in IRR

Separate analyses of correlation of income or education with mental health service used, in odds ratios and incidence rate ratios of contact

Contact to services y/n . Two separate analyses of correlation of income or education with mental health service used

	Contact outpatient psychiatrist				Contact psychologist				Contact GP-MHC				Psychiatric emergency clinic				Admission MH > 1 day			
	OR	P	CI	N	OR	P	CI	N	OR	P	CI	N	OR	P	CI	N	OR	P	CI	N
Family equivalent income																				
Highest third	1			50.373	1			11.113	1			9.033	1				1			
Middle third	1.03	0.414	0.97 1.09		0.71	<0.001	0.67 0.75		0.90	<0.001	0.86 0.95		0.94	0.344	0.82 1.07		0.92	0.224	0.81 1.05	
Lower third	1.25	<0.001	1.17 1.34		0.49	<0.001	0.46 0.53		0.81	<0.001	0.77 0.86		0.82	0.007	0.71 0.95		0.86	0.041	0.74 0.99	
Education*	OR	P	CI	N	OR	P	CI	N	OR	P	CI	N	OR	P	CI	N	OR	P	CI	N
12 + yrs	1			48.183	1			10.659	1			8.869	1				1			
yrs 10 - 12	0.92	0.005	0.86 0.97		0.67	<0.001	0.63 0.71		0.89	<0.001	0.85 0.94		0.99	0.888	0.86 1.13		1.06	0.377	0.93 1.22	
<10 years	0.95	0.103	0.89 1.01		0.37	<0.001	0.35 0.40		0.71	<0.001	0.67 0.75		0.90	0.147	0.78 1.04		0.94	0.403	0.81 1.09	

Incidence rate ratios of contact among patients who had one visit or more. Two separate analyses of correlation of income or education with type of mental health service used

	Outpatient psychiatrist				Psychologist				GP-MHC				Psych. emergency clinic				Admission MH > 1 day			
	IRR	P	CI	N	IRR	P	CI	N	IRR	P	CI	N	IRR	P	CI	N	IRR	P	CI	N
Family equivalent income																				
Highest third	1				1				1			17.638	1			1.752	1			1.783
Middle third	0.90	<0.001	0.88 0.91		0.93	<0.001	0.91 0.95		1.00	0.639	0.98 1.02		1.02	0.734	0.91 1.15		1.03	0.614	0.92 1.14	
Lower third	0.83	<0.001	0.81 0.84		0.94	<0.001	0.91 0.96		0.94	<0.001	0.92 0.97		1.06	0.364	0.94 1.14		0.95	0.382	0.84 1.07	
Education*	IRR	P	CI	N	IRR	P	CI	N	IRR	P	CI	N	IRR	P	CI	N	IRR	P	CI	N
12 + yrs	1				1				1			17.038	1			1.677	1			1.709
yrs 10 - 12	0.92	<0.001	0.90 0.93		0.92	<0.001	0.90 0.93		0.99	0.395	0.97 1.01		0.98	0.729	0.87 1.10		1.00	0.988	0.89 1.12	
<10 years	0.75	<0.001	0.74 0.76		0.80	<0.001	0.79 0.82		0.93	<0.001	0.91 0.96		1.06	0.370	0.94 1.19		1.04	0.511	0.92 1.17	

* Adjusted for age, sex, country of origin, cohabitating status, access to vehicle, comorbidity psychiatric, comorbidity somatic

GP-MHC: Mental health counselling by general practitioner (talk therapy); Admission MH: admission to mental hospital; IRR: Incidence rate ratio; CI: confidence interval; P: 0.05

Psychiatric emergency clinic: includes emergency contacts and admissions up to one day

SEP and contact and rates of contact to MHC services
Persons with the lowest incomes established contact with outpatient psychiatrists more often (OR 1.25; CI 1.17–1.34) compared to persons in the highest income group (Table 3.1.3, top); contacts with a psychologist were fewer for lower income groups (OR 0.49; CI 0.46–0.53) and fewer years of education (OR 0.37; CI 0.35–0.40), compared to higher income and educational groups. The same picture was seen for contact to GP-Mental health counselling as for psychologist related to income (OR 0.81; CI 0.77–0.86) and to education (OR 0.71; CI 0.67–0.75) compared to the highest groups.

No significant association with education or income and contact with emergency or inpatient psychiatric services was found.

Among patients who had contact with MHC services, persons in lower SEP had lower rates of visits to outpatient psychiatrists (Income IRR 0.83, CI 0.81–0.84; education IRR 0.75, CI 0.74–0.76), psychologists (Income IRR 0.94, CI 0.91–0.96; education IRR 0.80, CI 0.79–0.82), and visits to GP-Mental health counselling (Income IRR 0.94, CI 0.92–0.97; education IRR 0.93, CI 0.91–0.96) compared to those in higher SEP when adjusted for socio-demographics, comorbidity and access to a vehicle (Table 3.1.3, bottom).

Rates of contact with emergency or inpatient psychiatric services did not differ across SEP.

Distance to outpatient mental health services
Distances to health care services were short for most persons (Table 3.1.2). The average distance was 2 km (0–26) to a GP, 4.4 km (0–56) to the nearest psychologist, and 9 km (0–87) to the nearest outpatient psychiatrist. Only 10% had more than 12 km to the nearest psychologist or more than 20 km to the nearest outpatient psychiatrist.

Table 3.1.4 Impact of distance on MHC utilization, stratified by SEP

Impact of distance and income and education on mental health care utilization - stratified by SE groups

OUTPATIENT-PSYCHIATRIST				PSYCHOLOGIST			
Incidence rate ratio of contact *				Contact to health service y/n*			
	Each additional 5 km				Each additional 5 km		
Income	IRR	CI	P	Income	OR	CI	P
Highest income	0.99	(0.98;1.00)	0.005	Highest income	0.98	(0.94;1.02)	0.256
Medium income	0.95	(0.94;0.95)	<0.001	Medium income	0.98	(0.94;1.02)	0.299
Low income	0.95	(0.94;0.95)	<0.001	Low income	0.89	(0.85;0.94)	<0.001
Education	IRR	CI	P	Stratified log reg			
12 + years	0.99	(0.98;1.00)	0.81				
10 - 12 years	0.95	(0.94;0.95)	<0.001				
< 10 years	0.97	(0.96;0.98)	<0.001				
Stratified Poisson							

* Adjusted for: age, sex, cohabitating status, country of origin, psychiatric emergency visits, comorbidity somatic, comorbidity psychiatric
SE: Socioeconomic; OR: odds ratio; IRR: incidence rate ratio; CI: confidence interval; P: 0.05

We found an interaction between income, education, distance and rate of visits to outpatient psychiatrists. The IRR of contacts decreased by 1% for the highest and 5% for the lowest income group for each additional 5

kilometers of travel distance to an outpatient psychiatrist; likewise the rate decreased by 3% for patients with less than 10 years of education and 5% for patients with 10–12 years of education. There was no significant association between distance and use of outpatient psychiatrist among patient with the longest education (Table 3.1.4). There was no interaction between income, education, distance and contact versus no contact to outpatient psychiatrist.

We found interaction between income, distance and contact versus no contact to psychologist; contact decreased by 11% per additional 5 kilometers of travel distance for the lowest income group. The lowest income group was the only group significantly affected by distance, when adjusted for age, sex, cohabitating status, country of origin, psychiatric emergency visits, somatic and psychiatric comorbidity. We did not find interactions between income, education, distance and rates of visits to a psychologist; nor did we find interactions on contact or rates of visits to GP-Mental health counselling for those who used the services.

3.2 Results of Study II

Symptoms of depression and subsequent health care utilization and treatment — impact of socioeconomic position: a Danish six-month register-based follow-up on a population survey.

The study included 19,011 respondents from the GESUS study; the original 21,253 were reduced by 1,627 respondents who entered before May 2010 due to data unavailability for 2009. The respondents were further reduced by an additional 615 who did not have a valid MDI score (Figure 3.2.1). 29 deaths and four persons emigrating were included in the analysis only until death or migration. In all, 988 (5.2%) had symptoms of depression. Of these, 441 had symptoms of mild depression and 547 had symptoms of moderate and severe depression, and of the latter group 271 were rated severe.

Figure 3.2.1. Flow chart of sampling from the Danish General Suburban Population Study (GESUS)

Sampling from the Danish General Suburban Population Study

AD: Antidepressants; MDI: Major Depression Inventory
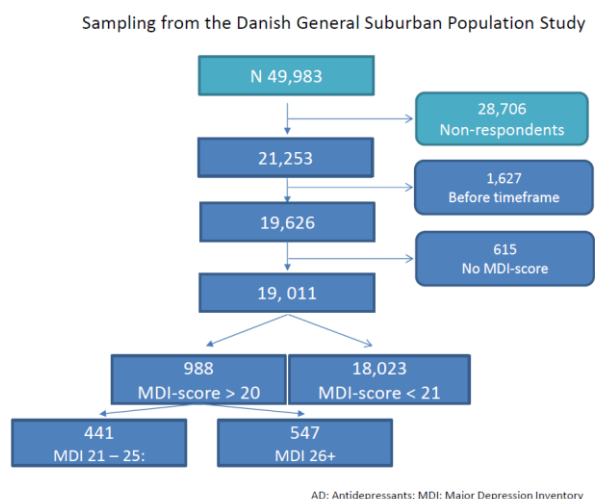
Table 3.2.1 shows characteristics of the study sample, including the 615 who had missing scores on MDI and were not included in the analysis. 54.5 % were female. The educational strata and income strata are shown for the group in detail; in the analyses strata are coded in similar colours (see below). Respondents with symptoms of mild to severe depression tended to be: younger, single or living without a partner, and without formal education, when compared to those with no/few symptoms.

In the study sample, respondents with no education beyond the secondary level were underrepresented and constituted half the proportion of study population, according to Statistics Denmark; the proportion with more than 3 years of postsecondary education constituted 32% of the sample compared to 19% in the population in Næstved[142].

Table 3.2.1 Characteristics of the study sample and symptom scores

Baseline characteristics of the study sample by MDI grade						
MDI score Symptoms of depression	All n (pct.)	Pop$	MDI < 21 None/few	MDI 21 - 25 Mild	MDI 26+ Moder./sev§	MDI missing NA
All	19626 (100)		18023 (100)	441 (100)	547 (100)	615 (100)
In treatment*						
No	18076 (92.1)		16860 (93.5)	334 (75.7)	335 (61.2)	547 (88.9)
Yes	1550 (7.9)		1163 (6.5)	107 (24.3)	212 (38.8)	68 (11.1)
Sex						
Male	8927 (45.5)	48.5	8349 (46.3)	162 (36.7)	168 (30.7)	
Female	10699 (54.5)	51.5	9674 (53.7)	279 (63.3)	379 (69.3)	
Age group						
20-29	294 (1.5)	12.9	266 (1.5)	10 (2.3)	17 (3.1)	
30-39	2382 (12.1)	15.9	2206 (12.2)	79 (17.9)	86 (15.7)	
40-49	4186 (21.3)	19.8	3891 (21.6)	106 (24)	146 (26.7)	
50-59	4417 (22.5)	18.3	4100 (22.7)	115 (26.1)	144 (26.3)	
60-69	5123 (26.1)	17.7	4771 (26.5)	74 (16.8)	93 (17)	
70+	3224 (16.4)	15.3	2789 (15.5)	57 (12.9)	61 (11.2)	
Marital status						
Married	13398 (68.3)		12519 (69.5)	234 (53.1)	259 (47.3)	
Separated/divorced	2174 (11.1)		1936 (10.7)	71 (16.1)	117 (21.4)	
Widow/er	1385 (7.1)		1172 (6.5)	37 (8.4)	45 (8.2)	
None of the above	2669 (13.6)		2396 (13.3)	99 (22.4)	126 (23)	
Cohabitating						
No	4342 (22.1)	30.9	3745 (20.8)	147 (33.3)	217 (39.7)	
Yes (incl missing)	15284 (77.9)	65.7	14278 (79.2)	294 (66.7)	330 (60.3)	
Education						
None (No postsecondary)	2988 (15.2)	29.9	2502 (13.9)	93 (21.1)	136 (24.9)	
Vocational/1-3yrs (1-3 years postsecondary)	8227 (41.9)	42.2	7645 (42.4)	169 (38.3)	199 (36.4)	
Academy/professional <3yrs (1-3 yrs postsecond.)	2156 (11)	4.4	2005 (11.1)	56 (12.7)	58 (10.6)	
Baccalaureate /3-4yrs (3+ years postsecondary)	5024 (25.6)	16.2	4706 (26.1)	104 (23.6)	137 (25)	
Academic/5+yrs (3+ years postsecondary)	1231 (6.3)	2.4	1165 (6.5)	19 (4.3)	17 (3.1)	
Income						
less than 150.000DDK (< 40,250€)	1063 (5.4)		847 (4.7)	38 (8.6)	69 (12.6)	
150,000 - 299,999DDK (<40,250€)	3406 (17,4)		3003 (16.7)	100 (22.7)	139 (25.4)	
300,000 - 449,999 DDK (≥40,250 <80,500€)	3601 (18.3)		3344 (18.6)	73 (16.6)	98 (17.9)	
450,000 - 599,000DDK (≥40,250 <80,500€)	3025 (15.4)		2863 (15.9)	64 (14.5)	66 (12.1)	
600,000 - 749,999DDK (≥80,500€)	3245 (16.5)		3086 (17.1)	74 (16.8)	64 (11.7)	
750,000 - 899,999DDK (≥80,500€)	1856 (9.5)		1794 (10)	22 (5)	29 (5.3)	
900,000 - 1,049,999DDK (≥80,500€)	693 (3.5)		667 (3.7)	12 (2.7)	9 (1.6)	
1,050,000DDK + (≥80,500€)	706 (3.6)		691 (3.8)	8 (1.8)	5 (.9)	
Missing	2031 (10.3)		1728 (9.6)	50 (11.3)	68 812.4)	
Comorb. former depression						
No	16755 (85.4)		15826 (87.8)	255 (57.8)	210 (38.4)	
Yes	2484 (12.7)		1917 (10.6)	173 (39.2)	319 (58.3)	
Missing	387 (2)		280 (1.6)	13 (2.9)	18 (3.3)	
Comorbidity somatic, all ¤						
No	13791 (70.3)		13109 (72.7)	195 (44.2)	168 (30.7)	
Yes	5835 (29.7)		4914 (27.3)	246 (55.8)	379 (69.3)	
Medication antidepressants #						
No	18537 (94.5)		17213 (95.5)	363 (82.3)	385 (70.4)	576 (93.7)
Yes	1089 (5.5)		810 (4.5)	78 (17.7)	162 (29.6)	39 (6.3)

§ Moderate or servere
* In treatment at index date or 120 days before by psychologist, psychiatrist, or antidepressant prescription, according to GESUS or registers
¤ Somatic comorbidities: Ischemic heart disease, diabetes, cancer, metabolic diseases
replied in questionnaire
$ Population of Næstved 2012, including only 25% 20-29 years old; education includes only until 69 years old

Table 3.2.2 shows odds ratios for MHC treatment contacts. Among respondents with no/few symptoms, the group with three or more years of postsecondary education were 30% more likely to have *No healthcare contacts at all* when compared to the group without postsecondary education (adjusted odds ratio (aOR) 1.32, CI 1.18–1.49). Similarly, respondents in the highest income group were 66% more likely to have *No healthcare contacts at all* when compared to the lowest income group (aOR 1.66, CI 1.46–1.89). Higher education (3+ years) as well as high income were associated with fewer consultations with a GP and fewer prescriptions of antidepressants compared to those without postsecondary education or with low income. However, increased

educational level was associated with more contact with specialized services (*1–3 years*: aOR 1.81, CI 1.13–2.88; *3 years+*: aOR 1.92, CI 1.18–3.13); this difference was not seen across the income groups.

Among respondents with symptoms of mild depression, there was no statistically significant difference across educational or income groups in odds for contacts and prescriptions in the adjusted analyses, except those with 1–3 years of postsecondary education had a lower use of mental health counselling by GP (aOR 0.30, CI 0.10–0.91) compared to respondents without any postsecondary education.

Respondents with symptoms of moderate to severe symptoms of depression showed no difference across socioeconomic categories in any type of health care contact in the adjusted odds ratios.

Table 3.2.2. Odds ratios for type of *MHC treatment* by educational and income level stratified by MDI grade

Odds ratios for type of *Mental health care treatment* by educational and income level stratified by MDI grade					
Symptoms, depression	**No/Few (MDI <21)**		**Mild (MDI 21-25)**		**Moderate/severe (MDI >25)**	
No contact at all	Crude OR	OR (adjusted)*	Crude OR	OR (adjusted)*	Crude OR	OR (adjusted)*
Education	(N=18023 pts.)		(N = 441 pts.)		(N = 547 pts.)	
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	**1.26 (1.13–1.40)**	1.10 (0.98–1.23)	1.96 (0.91–4.22)	1.62 (0.71–3.67)	1.73 (0.79–3.77)	1.62 (0.72–3.65)
3+ years postsec. educ.	**1.54 (1.38–1.72)**	**1.32 (1.18–1.49)**	**2.38 (1.05–5.38)**	2.01 (0.84–4.83)	1.99 (0.87–4.55)	1.79 (0.76–4.23)
Income	(N=16295)		(N=391)		(N=479)	
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥ 40,250 <80,500€	**1.69 (1.53-1.87)**	**1.39 (1.24-1.56)**	1.20 (0.62-2.33)	0.79 (0.36-1.76)	1.74 (0.89–3.40)	1.59 (0.72-3.52)
Income ≥80,500€	**2.27 (2.06-2.51)**	**1.66 (1.46-1.89)**	1.90 (0.99-3.63)	1.35 (0.55-3.33)	1.16 (0.51–2.63)	1.04 (0.38-2.82)
GP consultation						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	0.80 (0.72–0.89)	0.92 (0.82–1.02)	0.52 (0.26–1.06)	0.64 (0.31–1.35)	0.68 (0.35–1.31)	0.70 (0.36–1.37)
3+ years postsec. educ.	0.66 (0.59–0.74)	**0.77 (0.68–0.86)**	**0.46 (0.21–0.97)**	0.54 (0.24–1.19)	0.69 (0.34–1.41)	0.74 (0.36–1.53)
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥ 40,250 <80,500€	**0.60 (0.54-0.66)**	**0.72 (0.64-0.80)**	0.90 (0.48-1.67)	1.25 (0.60-2.61)	0.55 (0.30-1.00)	0.53 (0.27-1.07)
Income ≥80,500€	**0.45 (0.41-0.50)**	**0.60 (0.53-0.68)**	0.63 (0.34-1.84)	0.79 (0.34-1.84)	0.94 (0.44-1.97)	0.81 (0.33-2.01)
GP Mental health counselling						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	1.20 (0.84–1.71)	1.09 (0.76–1.57)	**0.34 (0.12–0.97)**	**0.30 (0.10–0.91)**	1.20 (0.61–2.33)	1.27 (0.65–2.50)
3+ years postsec. educ.	1.31 (0.90–1.89)	1.21 (0.83–1.76)	1.26 (0.50–3.17)	1.03 (0.38–2.81)	1.23 (0.59–2.55)	1.30 (0.62–2.73)
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥ 40,250 <80,500€	1.07 (0.80-1.43)	1.09 (0.78-1.53)	1.14 (0.43-3.05)	1.40 (0.44-4.47)	**2.06 (1.05-4.02)**	1.79 (0.81-3.97)
Income ≥80,500€	0.84 (0.62-1.14)	0.85 (0.57-1.28)	1.20 (0.44-3.31)	1.33 (0.34-3.96)	1.66 (0.77-3.59)	1.35 (0.52-3.53)
Antidepressants						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	0.85 (0.71–1.01)	0.75 (0.55–1.01)	0.96 (0.52–1.77)	1.11 (0.47–2.65)	0.72 (0.47–1.10)	0.82 (0.43–1.56)
3+ years postsec. educ.	**0.69 (0.57–0.83)**	**0.69 (0.50–0.95)**	1.17 (0.60–2.29)	1.40 (0.54–3.63)	0.65 (0.40–1.05)	0.86 (0.42–1.77)
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥ 40,250 <80,500€	**0.67 (0.57-0.78)**	**0.71 (0.52-0.95)**	0.77 (0.43-1.39)	1.29 (0.51-3.25)	0.67 (0.43-1.03)	0.53 (0.25-1.11)
Income ≥80,500€	**0.44 (0.37-0.52)**	**0.56 (0.39-0.80)**	0.63 (0.33-1.20)	1.25 (0.39-3.96)	**0.53 (0.32-0.89)**	0.53 (0.20-1.36)
Specialized services¤						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	**1.94 (1.24–3.03)**	**1.81 (1.13–2.88)**	1.34 (0.52–3.46)	0.79 (0.27–2.36)	1.30 (0.70–2.43)	1.73 (0.87–3.41)
3+ years postsec. educ.	**1.91 (1.20–3.05)**	**1.92 (1.18–3.13)**	2.01 (0.75–5.41)	1.41 (0.45–4.36)	1.25 (0.63–2.49)	1.67 (0.78–3.57)
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥ 40,250 <80,500€	1.03 (0.75-1.42)	1.11 (0.76-1.64)	0.67 (0.30-1.49)	0.79 (0.36-1.76)	1.32 (0.73-2.37)	1.47 (0.69-3.14)
Income ≥80,500€	0.89 (0.64-1.23)	0.99 (0.63-1.55)	0.96 (0.44-2.09)	1.35 (0.55-3.33)	1.05 (0.53-2.11)	1.36 (0.52-3.56)
* Adjusted for age group 60 +/-, sex, present treatment of antidepressants, psychologist or psychiatrist						
** Adjusted for age group 60 +/-, sex, present treatment of antidepressants, psychologist or psychiatrist, cohabitation						
¤ Psychologist or psychiatrist public or private						
Results significant within a 95% confidence interval are marked in bold						

Table 3.2.3. Incidence rate ratios for MHC *treatments* by education and income level stratified by MDI grade

Incidence rate ratios for *Mental health care treatments* by education and income level stratified by MDI grade

Symptoms of depression	No/few (MDI <21)		Mild (MDI 21-25)		Moderate/severe (MDI >25)	
GP consultation	IRR (crude)	IRR (Adjusted)*	IRR (crude)	IRR (Adjusted)*	IRR (crude)	IRR (Adjusted)*
Education	(N=18023)		(N=441)		(N=547)	
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	**0.82 (0.80–0.84)**	**0.87 (0.85–0.89)**	**0.79 (0.69–0.89)**	**0.88 (0.77–0.99)**	**0.81 (0.73–0.89)**	**0.81 (0.74–0.89)**
3+ years postsec. educ.	**0.77 (0.75–0.80)**	**0.84 (0.81–0.86)**	**0.74 (0.64–0.86)**	**0.83 (0.72–0.97)**	**0.76 (0.68–0.85)**	**0.77 (0.69–0.86)**
Income	(N=16295)		(N=391)		(N=479)	
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥40,250 <80,500€	**0.81 (0,80-0.83)**	**0.88 (0.85-0.90)**	**0.75 (0.66–0.85)**	0.88 (0.76–1.02)	**0.74 (0.67-0.82)**	**0.81 (0.72-0.91)**
Income ≥80,500€	**0.67 (0.66-0.69)**	**0.78 (0.76-0.81)**	**0.63 (0.55–0.73)**	**0.78 (0.65–0.94)**	**0.66 (0.59-0.75)**	**0.75 (0.65-0.86)**
GP Mental health counselling						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	0.93 (0.73–1.20)	0.93 (0.72–1.20)	1.36 (0.70–2.64)	1.22 (0.58–2.56)	1.08 (0.74–1.58)	1.13 (0.77–1.65)
3+ years postsec. educ.	0.93 (0.72–1.22)	0.93 (0.71–1.21) **	0.85 (0.44–1.61)	0.82 (0.40–1.69) **	0.76 (0.48–1.18)	0.79 (0.50–1.24) **
Income < 40,250€	Ref	Ref	Ref	Ref	Ref	Ref
Income ≥40,250 <80,500€	0.98 (0.79-1.22)	0.93 (0.74-1.18)	0.73 (0.39–1.36)	0.97 (0.49-1.91))	0.83 (0.56-1.23)	0.69 (0.42-1.14)
Income ≥80,500€	1.00 (0.80-1.25)	0.94 (0.71-1.24)	**0.45 (0.22–0.96)**	**0.39 (0.18-0.88)**	1.07 (0.69-1.64)	0.86 (0.50-1.48)
Antidepressants#						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	0.95 (0.85–1.05)	0.93 (0.84–1.03)	1.03 (0.73–1.46)	1.05 (0.73–1.50)	1.07 (0.89–1.28)	1.06 (0.88–1.27)
3+ years postsec. educ.	1.00 (0.89–1.12)	1.01 (0.90–1.13) **	1.10 (0.76–1.59)	1.11 (0.77–1.62)	1.12 (0.91–1.37)	1.08 (0.88–1.33)
Income < 40,250€	Ref	Ref **	Ref	Ref **	Ref	Ref**
Income ≥40,250 <80,500€	0.98 (0.90–1.08)	1.00 (0.90–1.11)	1.09 (0.79–1.49)	1.29 (0.90–1.84)	0.97 (0.80–1.18)	0.92 (0.73-1.16)
Income ≥80,500€	0.92 (0.83-1.02)	0.95 (0.84-1.09)	1.02 (0.71–1.46)	1.18 (0.74–1.88)	1.18 (0.94-1.47)	1.11 (0.84-1.46)
Specialized services¤						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	0.97 (0.77–1.22)	0.94 (0.75–1.19)	1.11 (0.71–1.71)	0.93 (0.58–1.48)	0.93 (0.72–1.21)	0.94 (0.72–1.22)
3+ years postsec. educ.	1.06 (0.84–1.34)	1.02 (0.80–1.29)	1.32 (0.85–2.05)	1.02 (0.63–1.66)	1.09 (0.82–1.43)	1.10 (0.83–1.46)
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥40,250 <80,500€	1.09 (0.92-1.28)	1.20 (0.99-1.45)	1.30 (0.91–1.85)	1.30 (0.88–1.94)	1.01 (0.78-1.30)	0.77 (0.57-1.06)
Income ≥80,500€	1.18 (1.00-1.39)	**1.35 (1.09-1.68)**	**1.58 (1.14–2.19)**	1.21 (0.79-1.86)	1.46 (1.12-1.92)	1.00 (0.69-1.45)

* Adjusted for age group 60 +/-, sex, present treatment of antidepressants, psychologist or psychiatrist
** Adjusted for age group 60 +/-, sex, present treatment of antidepressants, psychologist or psychiatrist, cohabitation
¤ Psychologist or psychiatrist, public or private
\# Number reimbursed prescriptions
Results significant within a 95% confidence interval are marked in bold

Table 3.2.3 shows the IRR of visits and number of prescriptions of antidepressants stratified by severity of symptoms. At all grades of symptoms of depression, fewer years of education and low income were associated with higher rates of visits to GP (crude numbers are shown in Supplementary Table 5).

Among participants with *No/few symptoms* of depression, high income was associated with more frequent visits to a specialist, compared to the low-income group (aIRR 1.35, CI 1.09–1.68); but this was not significant for education.

Among participants with *Mild symptoms* of depression, high income was associated with a lower visit rate for GP-mental health counselling compared to the low-income group (aIRR 0.39, CI 0.18–0.88).

In the group with symptoms of *Moderate to severe symptoms* of depression, there were no significant differences between income or educational groups in visit rates to services beyond GP when adjusted for age, sex, and present treatment among those using services.

Table 3.2.4 shows the highest gained treatment level within the 180-day window in crude numbers. More severe symptoms were met with a higher level of treatment; however, 10% of respondents with symptoms of moderate to severe depression had no contact at all. 47% of the 547 with symptoms of moderate to severe depression had no treatment or contacts beyond a GP consultation.

Table 3.2.4. Highest gained treatment level by grade of depression symptoms

Highest gained treatment level by MDI grade			
Final treatment level/MDI grade	**No/few**	**Mild**	**Mod./severe**
No contacts	4540 (25.2)	73 (16.6)	56 (10.2)
GP consultation	12084 (67)	257 (58.3)	259 (47.3)
GP Mental health counselling	160 (.9)	5 (1.1)	20 (3.7)
Antidepressants#	931 (5.2)	64 (14.5)	125 (22.9)
Psychologists	162 (.9)	17 (3.9)	27 (4.9)
Priv. psychiatrist	96 (.5)	18 (4.1)	39 (7.1)
Outpat. Psychiatry	17 (.1)	3 (.7)	7 (1.3)
Admission MH & EA *	33 (.2)	4 (.9)	14 (2.6)
Sum	18.023 (100)	441 (100)	547 (100)

Percentages in brackets
Reimbursed prescriptions
* MH: Mental hospital; EA: Emergency access psychiatric ward

Table 3.2.5 shows that respondents with symptoms of depression gained a significantly higher treatment level, increasing with higher symptom score, compared to those with *No/few symptoms* and no postsecondary education or low income. For the group with *No/few symptoms*, respondents with 3+ years of postsecondary education or higher income attained a lower level overall. We found no statistically significant differences between educational groups when stratified by grade of symptoms, but a significant increase in treatment level within each educational group when depression score increased from *No/few symptoms* to symptoms of *Mild* depression, and again when it increased to symptoms of *Moderate/severe* depression (results not shown). SEP measured by income had similar outcomes, but differed in the group with mild symptoms of depression, where only respondents with high income gained a higher treatment level compared to the low-income group with *No/few symptoms* (crude numbers on highest treatment level by MDI, income and education are shown in Supplementary Table 6).

Table 3.2.5. Mean level of MHC treatment by educational and income level and symptom MDI grade

Mean level of *Mental health care treatment* by educational and income level and MDI grade		
No/few symptoms of depression		β*
Education	.97 (N=19011)	
No postsecondary education	0.98 (N=2502)	(Ref)
1-3 years postsecondary education	0.94 (N=9650)	**-0.06 (-0.09; -0.03)**
3+ years postsecondary education	0.87 (N=5871)	**-0.05 (-0.08; -0.02)**
Income	.96 (N=17165)	
Income < 40,250€	1.07 (N=3850)	(Ref)**
Income ≥ 40,250 < 80,500€	0.93 (N=6207)	-0.01 (-0.04; 0.02)
Income ≥ 80,500€	0.81 (N=6238)	**-0.12 (-0.15; -0.09)**
Mild symptoms of depression		
No postsecondary education	1.49 (N=93)	**0.15 (0.01; 0.29)**
1-3 years postsecondary education	1.47 (N=225)	**0.14 (0.05; 0.24)**
3+ years postsecondary education	1.58 (N=123)	**0.22 (0.10; 0.35)**
Income < 40,250€	1.62 (N=138)	0.05 (-0.06; 0.17)
Income ≥ 40,250 < 80,500€	1.46 (N=137)	0.11 (-0.01; 0.23)
Income ≥ 80,500€	1.47 (N=116)	**0.22 (0.09; 0.34)**
Moderate/severe symptoms of depression		
No postsecondary education	2.18 (N=136)	**0.37 (0.26; 0.49)**
1-3 years postsecondary education	1.99 (N=257)	**0.35 (0.26; 0.44)**
3+ years postsecondary education	2.01 (N=154)	**0.45 (0.33; 0.56)**
Income < 40,250€	2.10 (N=208)	**0.28 (0.18; 0.37)**
Income ≥ 40,250 < 80,500€	2.06 (N=164)	**0.40 (0.29; 0.51)**
Income ≥ 80,500€	1.80 (N=107)	**0.34 (0.21; 0.47)**

* Adjusted for age group 60 +/-, sex, present treatment of antidepressants, psychologist or psychiatrist
* *Adjusted for age group 60 +/-, sex, present treatment of antidepressants, psychologist or psychiatrist, cohabitation

Treatment levels: 0; no contact; 1: GP consultation; 2: GP MHC; 3: Antidepressants; 4: psychologist;
5: priv. psychiatrist; 6: publ. psychiatrist; 7: psychiatric hospital & emergency visits

3.3 Results of Study III

Socioeconomic position and perceived barriers to accessing mental health care for individuals with symptoms of depression: Results from the Lolland-Falster Health Study.

By the end of December 2017, a total of 20,680 adults (age 18+) had been invited to the LOFUS study. A total of 5,395 adults had replied to the questionnaire. 319 did not reply on the MDI score element or failed to fill in more than two answers in the test, leaving 5,076, of whom 372 (7.3%) reported symptoms of depression and thus were prompted to answer the questions on perceived barriers to seeking MHC. 58 replied that the questions were not relevant or would not answer them; thus 314 individuals with a MDI score > 20 were included in the analyses of SEP and perceived barriers (see sampling flow chart, Figure 3.3.1).

Figure 3.3.1. Flow chart of sampling from the Lolland-Falster Health Study
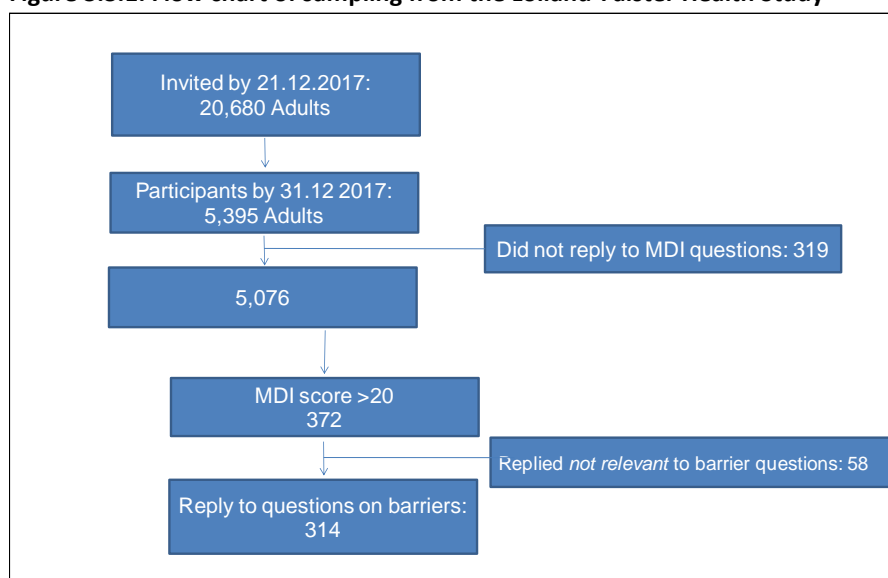
The total sample consisted of 53% women; 64.5% of the respondents were married, and 80.7% were cohabitating. For the total group, mean age was 55.7 and median age was 57.4; for individuals scoring in the depressed range on the MDI, the mean age was 50.2 and the median was 51.4 years.

Compared to the total sample, the respondents reporting symptoms of depression were younger, more likely to be living alone, and more likely to be unmarried. They were also more likely to have no postsecondary education, to be temporarily out of work (16.9% vs 3.7%), and to experience more frequent financial strain. Furthermore, their health indicators included: lower self-rated health, more reports of limited physical functioning, more reports of long-lasting disease, and former anxiety or depression diagnoses; and more reports of current pharmacological treatment for these disorders (see study sample characteristics, Table 3.3.1).

Table 3.3.1. Characteristics of study sample and respondents with symptoms of depression

Characteristics of study sample and respondents with symptoms of depression							
	Total sample				**L-F***	**Symptoms of depression**	
Age group	**Male**	**Female**	**Total**	**Pct**	**Pct**	**MDI > 20**	**Pct**
18-29	198	212	410	8.1	13.6	55	14.8
30-39	180	250	430	8.5	11.0	41	11.0
40-49	357	443	800	15.8	15.0	82	22.0
50-59	519	681	1200	23.6	18.8	84	22.6
60-69	632	666	1298	25.6	19.2	63	16.9
70-79	396	371	767	15.1	15.0	41	11.0
80+	95	76	171	3.4	3.4	6	1.6
Sum	**2377**	**2699**	**5076**			**372**	
					Marital status		
Married	1538	1708	3246	64.5	43.2	181	49.6
Partnership	73	108	181	3.6	13.9	15	4.1
Separated	12	9	21	0.4		5	1.4
Divorced	169	195	364	7.2		31	8.5
Widower	59	164	223	4.4		11	3.0
Not married	509	487	996	19.8	42.9	122	33.4
Cohabitating							
Yes	1917	2141	4058	80.7	57.1	248	67.9
Secondary schooling							
Studying	20	34	54	1.1		5	1.3
< 8 years	290	203	493	9.7		35	9.4
8 - 9 years	610	401	1011	19.9		87	23.4
10 - 11 years	751	913	1664	32.8		112	30.1
High school	522	896	1418	27.9		89	23.9
Other/foreign	163	215	378	7.4		38	10.2
Postsecondary education							
No postsecondary	415	529	944	18.6	34.9	112	30.1
1-3 years postsecondary	1307	1238	2545	50.1	47.7	172	46.2
3+ years postsecondary	495	784	1279	25.2	15.6	63	16.9
Other	143	122	265	5.2	1.7	21	5.6
Occupational status							
Work/study	1417	1526	2943	58.0		167	44.9
Temp. No work	68	121	189	3.7		63	16.9
Retired	843	966	1809	35.6		115	30.9
Other	47	77	124	2.4		27	7.3
Financial strain							
Not at all	2136	2404	4540	89.4	75	275	73.9
Few months	175	213	388	7.6	16	60	16.1
Half the months	23	22	45	0.9	9	13	3.5
Every month	25	32	57	1.1		19	5.1
Self-rated health						£	
Very good	306	328	634	12.5	29.7	7	1.9
Good	1348	1524	2872	56.6	50.1	83	22.3
Fair	616	697	1313	25.9		181	48.7
Bad	89	137	226	4.5	17.2	90	24.2
Very bad	12	6	18	0.4	3.0	9	2.4
General activity limitation						$	
Not limited at all	1561	1630	3191	63.2	63.1	114	31.0
Limited but not severely	672	906	1578	31.3	30.5	166	45.1
Severely limited	132	146	278	5.5	7.0	88	23.9
Longstanding illness. Yes	1052	1200	2252	44.7		244	66.3
Anxiety, now or earlier. Yes	110	223	333	6.6		111	29.8
Depression, now or earlier. Yes	145	230	375	7.4		138	37.1
Medication, anxiety. Yes	71	119	190	3.8		65	17.8
Medication, antidepressants. Yes	85	173	258	5.1		66	18.0

*Population of Lolland-Falster, Statistics Denmark, by 1st quarter of 2017

£ Statistics Denmark 2015, municipality of Lolland only; $ Health Survey (SUSY) of 2013 [149]

Figure 3.3.2. Responses on perceived barriers to accessing MHC, proportions

Level of difficulty with barriers to accessing mental health care by respondents with symptoms of depression. Percent.

	Stigma	Knowledge	Expense	Experience	Transport
Quite a lot +	22,3	21,2	30,1	18,8	11,7
A little	25,4	26,0	15,2	15,0	9,7
Not at all	52,2	52,7	54,7	66,2	78,6

n 270 - 291
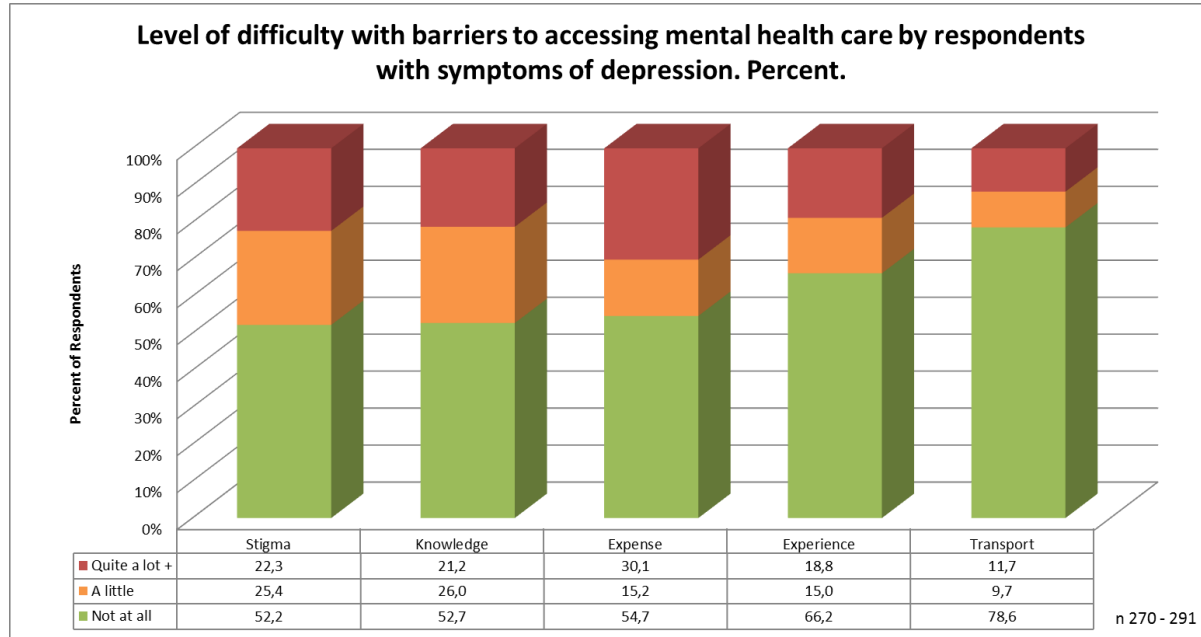
Crude numbers of perceived barriers to accessing MHC and symptoms of depression are shown in Supplementary Table 7.

Of those responding to the questions, more than half perceived *No problems at all* in accessing professional care, least of all transport (Figure 3.3.2.).

Among those who did have concerns about accessing or continuing professional MHC, *Expense* was the most common problem, as 30.1% indicated expenses had prevented, deterred, or delayed them either *Quite a lot* or *A lot* (both responses were aggregated in the *Quite a lot +* category in Figure 3.3.2). Likewise, the second-most common concern was related to *Stigma*, phrased in the questionnaire as "what others might think, say or do", which was a serious concern for 22.3%; approximately the same proportion (21.2%) had concerns related to *Knowledge*, or how to find help for a mental health problem. Transport was not a problem for 78.6%, with only 11.7% reporting that it negatively affected access.

Perceived barriers to accessing health care by SEP are shown in Table 3.3.2. Perceptions of *Stigma* did not show any significant difference across the socioeconomic groups, however measured. *Lack of Knowledge* was a significant problem for respondents without postsecondary education compared to those who had completed some postsecondary education (aOR 2.26, CI 1.1–4.6) and for respondents with occasional (*Few months*) but not regular financial strain when compared to those with no financial strain. Low SEP as measured by educational level and financial strain was associated with perceived barriers concerning *Transport* and *Expense*, whereas low SEP measured by employment status alone was associated only with concerns related to *Transport*. The retired respondents were more likely to perceive *Bad experience* as a barrier to seeking or continuing MHC compared to respondents who were working. *Transport* showed the greatest disparity across the socioeconomic groups.

Table 3.3.2. Adjusted odds ratios for perceived barriers for accessing MHC by three indicators of SEP

Adjusted odds ratios for five perceived barriers to accessing mental health care by employment status, education, and financial strain

Employment status	aOR	CI		n	Education	aOR	CI		n	Financial strain	aOR	CI		n
Stigma														
Working	1			291	3+ years	1			290	Not at all	1			289
Temp. Not working	.9201	.4880	1.735		1-3 years	1.087	.5740	2.058		Few months	.8994	.4841	1.671	
Retired	.6808	.3420	1.356		No postsecondary	1.166	.5833	2.332		Half the time+	1.749	.6933	4.410	
Other	.3815	.1431	1.017		Other	.6699	.1969	2.279						
Knowledge														
Working	1			292	3+ years	1			291	Not at all	1			290
Temp. Not working	1.204	.6390	2.268		1-3 years	1.597	.8309	3.070		Few months	**2.515**	**1.335**	**4.739**	
Retired	.5003	.2480	1.009		No postsecondary	**2.263**	**1.115**	**4.592**		Half the time +	2.372	.9404	5.985	
Other	.5004	.1884	1.329		Other	**4.752**	**1.297**	**17.412**						
Expense														
Working	1			289	3+ years	1			288	Not at all	1			289
Temp. Not working	1.700	.8911	3.323		1-3 years	1.835	.9324	3.612		Few months	**4.268**	**2.172**	**8.385**	
Retired	1.537	.7451	3.171		No postsecondary	**2.773**	**1.336**	**5.757**		Half the time +	**9.623**	**2.708**	**34.194**	
Other	.7456	.2822	1.970		Other	2.031	.5762	7.156						
Experience														
Working	1			287	3+ years	1			286	Not at all	1			286
Temp. Not working	.9581	.4820	1.905		1-3 years	1.043	.5392	2.019		Few months	1.152	.5999	2.212	
Retired	**2.143**	**1.024**	**4.485**		No postsecondary	.6435	.3073	1.347		Half the time +	2.385	.9685	5.874	
Other	1.531	.5932	3.952		Other	.7503	.2024	2.781						
Transport														
Working	1			290	3+ years	1			289	Not at all	1			288
Temp. Not working	**3.184**	**1.463**	**6.931**		1-3 years	1.603	.6502	3.954		Few months	1.746	.8392	3.634	
Retired	**4.442**	**1.900**	**10.384**		No postsecondary	**2.988**	**1.187**	**7.518**		Half the time +	**9.889**	**3.745**	**26.113**	
Other	2.169	.6948	6.773		Other	1.019	.1835	5.659						

Adjusted for: sex; age +/- 60; 95% confidence intervals (CI), significant results are marked in bold

SEP showed no association with any of the barriers or with years of schooling (not shown). Using depression as an independent variable, we found that severity of depression (both measured as a categorical variable and a score) was associated with perceived barriers in relation to *Expense* and *Transport*, but not associated with any other perceived barriers (see Supplementary Table 8).

4. Discussion

4.1 Main findings

In this thesis I used three different approaches to evaluate if the Danish healthcare system provides equal access to and treatment of patients with depressive disorders. The main findings are presented below.

4.1.1 Study I

By tracing the healthcare usage of incident users of antidepressants in national registers we found persons in low SEP (short education or low income) had significantly fewer MHC contacts as well as lower frequency of visits during the year following the first prescription of antidepressants compared to person in high SEP. Persons in low SEP had fewer contacts with psychologists particularly, but also GP-provided mental health counselling, when compared to those in high SEP. When in contact, the rates of visits to these services were also lower for patients in low SEP. Though persons in the lowest income group were more likely to have contact with outpatient psychiatrists, their rates of visits were lower than patients in high SEP.

Generally, distances to GP and outpatient mental health services are short in Denmark. As to contact with service providers, only income and contact with psychologists showed interaction with distance, and was significant for persons in low SEP only. Distance did not have a negative impact on the first visit, but did have a stronger negative impact on repeated contacts with a psychiatrist for individuals in low SEP as compared to persons in high SEP. Thus, increasing distance to mental health services seems to increase social inequality in care.

4.1.2 Study II

In the GESUS population study, the healthcare use of individuals with symptoms of depression was followed for six consecutive months; we found they were treated according to the severity of their symptoms, independent of SEP; however, more than half of the persons with moderate to severe symptoms received no treatment beyond GP consultation. Persons with no/few symptoms of depression and in low SEP were more often treated with antidepressants, whereas people with more years of education (but not higher income) used specialized services more.

4.1.3 Study III

In the Lolland-Falster Health Study respondents with symptoms of depression were asked about their perceptions of possible barriers for accessing professional care. One out of three individuals perceived expense as a considerable problem; this perception was more prevalent among individuals without postsecondary education and individuals experiencing financial strain. Transport represented the barrier of least concern in general; however, transport also presented the greatest socioeconomic disparity, proving problematic for disadvantaged individuals.

Stigma was an issue of concern for 22% of the respondents but did not vary significantly according to SEP. Lack of knowledge about how to get help was a significantly greater problem for individuals without postsecondary education as compared to individuals with postsecondary education.

4.2 Methodological considerations

Some methodological considerations should be kept in mind when interpreting the findings. In the following, strengths and limitations of each of the three studies are described, and finally a discussion is included regarding to what extent the findings can be generalized.

4.2.1 Study designs

A major challenge in healthcare research on access and use of services is how to establish or define *need;* those who use the services are often known, but who is actually in *need* is not known. The studies were designed with the ambition of overcoming this issue.

4.2.1.1 Design of Study I

The intention of Study I was to evaluate the impact of SEP in itself and distance on the use of MHC services. The study was conducted as a nationwide prospective cohort study using the prescription of antidepressants as indication of need. A prescription relies on a professional evaluation of need and could be expected to adhere to the clinical indications for use of the drug. If any, antidepressants are the recommended medication for the treatment of depression, and anxiety disorders, including PTSD[19].

The study was entirely based on data from national registers with hardly any loss to follow-up due to the comprehensiveness of the CRS[121]. The calculations of distances from residence to the nearest healthcare facilities were done by GIS-positioned data drawn almost entirely from national registers.

We combined reliable data on MHC use and distance with individual data on SEP, as well as distance to each type of provider, which to our knowledge has not been done before.

4.2.1.2 Design of Study II

The purpose of Study II was to evaluate if the management by the healthcare system of citizens with symptoms of depression differed by patients' SEP. In the study, MDI score served as indication of need. The score was gathered from a population survey and combined with data from national registers on MHC use for four months prior and six months following the date of the MDI score. As in Study I, we observed incidences occurring within a fixed timeframe, but here the association with SEP indicators and MDI was the focus, as well as type of treatment (treatment level).

The design was well-suited for the purpose: combining perception of symptoms from the survey with data on healthcare utilization from national registers allows for high accuracy. Using a timeframe of four months prior to the depression score was a pragmatic choice, whereby we expected to catch those in active treatment. The six-month follow-up period after the symptom score was an estimated upper limit of the relevance of the symptoms, as they will eventually change over time.

4.2.1.3 Design of Study III

In Study III, we intended to explore if individuals living in a deprived and remote area with symptoms of depression perceived accessibility to professional MHC differently depending on SEP. Here MDI also served as

the indicator of need and all data were collected from the Lolland-Faster Health Study. The outcome measures were the replies to the five questions on ability to access care.

The study design was cross-sectional and well-suited to the research question, as both symptoms and perceptions were collected simultaneously and the location was a deprived and remote area.

4.2.2 Bias

Any study might be biased, either by the way participants enter the study (selection) or in the way the information is gathered. Selection bias comprises systematic error(s) in a study caused by the selection of subjects or factors influencing the study participation. Information bias is a systematic error when the information about or from the study subjects is incorrect[150], causing measurement inaccuracy or misclassification. The misclassification can be differential or non-differential, depending if it differs across the groups being compared. In the following, I will describe potential and/or known bias in each study.

Initially, it is relevant to compare the samples of the three studies — one national sample and two survey samples. In Table 4.2.1, the socioeconomic balances in the sampling for each of the three studies are shown, measured by educational levels (see table 3.1.1; 3.2.1; 3.3.1).

Table 4.2.1. Comparison of rate ratios of high versus low SEP (education) in study samples and study populations

Study	High SEP (educ.)		Low SEP (educ.)			Rate ratio
	In sample	In pop.	In sample	In pop.	Rate high/rate low	High : Low
I	21	27	32	10	(21/27)/(32/10)	0.24
II	32	21	15	30	(32/21)/(15/30)	3.05
III	25	16	19	35	(25/16)/(19/35)	2.88

The educational (im-)balance is presented as a rate ratio of the rate of high-SEP participants to the rate of low-SEP participants. Study I had one-quarter of the expected participants in high SEP, whereas the other two studies had three times more participants in high SEP than could be expected, given that the socioeconomic proportions in the samples should ideally reflect the study populations. These differences are essential when interpreting the results.

4.2.2.1 Bias in Study I

In Study I, the sample consisted of one-fifth of the 246,755 annual users of antidepressants in the age group of 20–64 years living in Denmark in the year 2013[151]. The sampling was drawn from the National Prescription Registry. Pharmacies are required by law to register reimbursed prescriptions[152], which along with the comprehensiveness and high quality of the Danish Civil Registration System[121] and the National Prescription Registry[133] imply an all-inclusive selection. However, it is not perfect: two patients were excluded as their first prescriptions were reimbursed after their date of death. In order to identify incident cases, patients treated with antidepressants in the year 2012 were not included. Those *Migrating* (686), whose whereabouts were not accountable during the entirety of the year 2012, were also not included, nor were *Terminal patients* (260) as their ability to travel for treatment was expected to be reduced.

A possible selection bias is introduced by the time limitation of the observed use of MHC. If the prescription pattern differs and individuals in high SEP more often use psychologist services only for (or prior to) treatment

with antidepressants — as we did find indication of in Study II — the effect would be an underestimation of the use of mental health services by individuals in high SEP. It would not have an impact on the evaluation of the effect of distance, though.

Information bias by misclassification is also possible. The sample represents patients who were prescribed antidepressants. By excluding tricyclic antidepressants (TCAs) we expected to avoid patients treated primarily for pain and also some with recurrent depressive episodes. Even if antidepressants are recommended for treatment of depression, anxiety, and PTSD (common mental disorders), it is not always used for those disorders. In a population study from the USA, 26% of respondents who used antidepressants in the past year did not meet any diagnostic criteria for a mental disorder; they concluded that antidepressant use among individuals without psychiatric diagnoses is common and is typically motivated by other indicators of need[153]. Another US survey found 38% of respondents in treatment with antidepressants never met criteria for a mental disorder[154]. The advertisement of drugs directly to consumers in the USA has an impact on patient requests and subsequently higher proportions treated off-label[155]. A European study found all off-label indications to be associated with clinically-relevant depressive symptoms in the middle-aged and elderly population studied; 15% of the SSRI-treated individuals were of unknown or off-label indications[156]. A Canadian study on use of antidepressants in primary care found low educational level associated with 7% higher odds for an off-label prescription. The authors presumed this to be due to higher treatment rates for insomnia and pain in this group[157]. However, the study included Trazodone, an antidepressant prescribed exclusively for sleep disorders not distributed in Denmark, and TCAs, which were excluded in our study. Results from the same study reported more than 55% were prescribed antidepressants in primary care due to depression and 22.3% due to anxiety disorders, the rest for pain and sleeping disorders and a variety of other reasons[158]. A study from the Netherlands found a decrease in depression as an indication for incident prescription of antidepressants in primary care from 1996 to 2012, ending at 47% prescribed for depressive disorders and approximately 20% for anxiety disorders. TCAs were included in that study[159]. Additionally, a large Swedish study on treatment of common mental disorders in adults in primary care reports 81% diagnosed with major depression were treated in primary care only (by GP or psychologist), whereof 76% received antidepressants[160]. This could also indicate mild symptoms are being treated with antidepressants.

Initial use of antidepressants does not classify the subjects as being depressed, or even as having a common mental disorder. We expect our study will include some off-label prescriptions; the Canadian and Dutch studies can justify an estimation of three-fifths treated for depression and one-fourth for anxiety disorders when TCAs are excluded. The exact proportion is not known, but more individuals in low SEP with no symptoms of depression or other common mental disorder are expected to be included in the sample.

Except for psychologist services, the actual reasons for treatment contacts were not known. Psychology treatment was limited to treatment of anxiety and depression. The other treatment contacts could be for reasons other than common mental disorders. Higher use of GP is to be expected by persons in low SEP due to higher morbidity in general.

We were able to obtain information on the actual GIS position of patients and their nearest outpatient psychiatrist, psychologist, and GP at an individual level for all but 301 persons (0.6%) and thereby gain precise and reliable data on distance to the services. We combined this with reliable individual data on SEP and reliable data on MHC use. The addresses were current as of January 2013 and the calculation of distance was related to that initial address. We expect the calculated distances by road to be near accurate but not fully correct, as some people will have moved in the study period; we expect this to be non-differential across the socioeconomic groups.

Information on distance could have been more detailed. The socioeconomic impact of distance on MHC contacts may vary in some – possibly remote - areas, which is not revealed by the method used. Spatial analysis, whereby local differences can be measured and visualized would have been optimal[161].

4.2.2.2 Bias in Study II
The type of selection bias called non-participant bias is evident for Study II as well as Study III — both based on population surveys. Those least likely to participate in general and in preventive health check-ups in particular are men, low-income groups, the unemployed, and the less educated[162]; Table 4.2.1 demonstrates this for Study II, as individuals with more years of education are overrepresented by three to one. A recent Danish study from an urban area found attendance at health checks increases with age, female gender, educational level, Danish or western origin compared to non-western origin, not being supported entirely on welfare benefits, and cohabitating. They found income to have no impact on attendance. For the most deprived areas, they found the same results, except only the employed had higher attendance rates compared to other occupational categories[163].

The GESUS was directed at participants with Danish citizenship, and no indicators of SEP were included in the report on participation/non-participation of the first 21,000 invited and 10,000 included, but higher participation rates were reported for women, cohabitating individuals, increasing age, and lower frequencies of cancer, cardiovascular disease, diabetes, and hypertension[134].

The bias introduced by the self-selection seen when individuals in high SEP more willingly choose to participate in surveys must be taken into consideration, but it does not rule out locating associations within the data and drawing sound conclusions thereon.

615 respondents (3%) who had not filled in the MDI scores or had missed more than two items were excluded from Study II. The 615 predominantly consisted of men, low-income, no higher education, retired, widowers, living alone, and missing several other questions. Thus, those who lacked an MDI score were also predominantly in low SEP.

Risk of information bias from difficulty in recalling information on healthcare use is often found in these types of studies on health service use[164], but this has been reduced in Study II by using high-quality and comprehensive registers for the outcome measures. Even so, it is possible not all services used are included in the registers. If a patient pays the full expense for a treatment out-of-pocket and is not referred by a GP, there will be no state reimbursement and subsequently no registration of the treatment in the registers. This would

usually indicate high-income individuals, which is also often associated with more years of postsecondary education. We do not expect this to be a common scenario; however, we have no data to support this.

As in Study I, the actual reasons for treatment contacts in Study II are not known, except for psychologists, nor were the reasons for prescriptions of antidepressants known; it could have been for disorders other than depression or other common mental disorders. More usage of GPs is to be expected by persons in low SEP due to their higher morbidity in general.

Information bias and misclassification might occur in data concerning SEP. SEP was measured by education and income, both stated by the participants. Education is not considered as sensitive as income in self-administered questionnaires and is not considered difficult to recall[88], whereas income can be a sensitive question. However, the categories were pooled into three less-specific ordinal groups, whereby minor errors would be pooled as well.

Information bias by misclassification potentially introduced by the MDI scoring system may be considered. The validity and reliability of the MDI is well documented as a diagnostic screening instrument for depressive disorder[137]. We used sum scores in Study II and Study III, and did not differentiate between core and associated symptoms. It is not known if the respondents suffered from (clinical) depression, but they did report symptoms of depression. Lower SEP was associated with higher symptom score, as the prevalence of depression usually is[28]; but whether the mere scoring differs across educational or income groups is not reported in the validation of the instrument. However, it would diminish the validity of the instrument as well as the instruments used for the validation. Cultural differences in the symptoms of depression do exist[165] and are important to consider for the instruments used; however, the MDI was validated in a Danish population. The sum-scores will categorise more respondents as depressed compared to the ICD-10 criteria, differentiating between core symptoms and associated symptoms[166]. We expect the potential misclassifications by using sum scores to be non-differential across the socioeconomic groups.

4.2.2.3 Bias in Study III

Non-participation is also an issue of relevance in Study III. Though slightly less so compared the GESUS, the Lolland-Falster Health Study still had a higher rate of high-SEP respondents compared to low SEP with a ratio of 2.88:1 when SEP was measured by education. Likewise, the questions on self-rated health (SRH) were rated higher in the sample than the national levels, even though long-term illness was more prevalent in the sample (44.7% compared to the national rate of 35.6%)[102]; the rate of respondents with *severely limited physical functioning* was close to the national proportions[149] (Table 3.3.1). In the total sample, the middle-aged to older part of the population may be overrepresented, as also seen in national surveys[167].

Information bias and misclassification may be introduced in questionnaires of low quality. Outcomes in Study III were based on five questions on ability to access MHC. The construct validity of the five-item questionnaire relies on BACE v3[168] and the generally accepted concepts of abilities by Levesque et al[75]. The items were deduced from other studies. The content validity was tested by the Panel of Relatives and Patients of Psychiatry Services of Region Zealand and the questions were found to be sound; but in retrospect, it might not measure the concept of self-efficacy very well. The content validity ought to have been tested in real life (e.g. a

pilot study) and not only in a focus group. We used the answer *Not relevant/Do not want to reply* as an indicator that the respondent preferred to handle problems without professional help. It would have been prudent, however, to ask a more direct question about perceptions of need for care; it is possible that some individuals did not find the question relevant because while they experienced mental health issues, they did not perceive a need for care at all. Some introductory questions were made in the beginning of the study based on problems experienced by the survey management team. They were: *Have you ever thought of seeking professional assistance due to sadness or anxiety but refrained from doing so?* The three possible answers were: *Yes/No/Receiving help presently*. The question turned out to be non-operational as it was not possible to have refrained from seeking treatment before <u>and</u> be in treatment presently. Consequently, we held on to the initial five questions and did not include the introductory question in the final analyses. We found no correlation between the answer to the question of relevance and SEP, except for retired respondents, who tended to state *Not relevant* less, compared to respondents working (not shown).

The question concerning transport was not clearly discriminated from the question about perceived barriers in relation to expenses, as it was not specified whether expenses included transportation-related expenses. Thus, we have no clear distinction between whether *Transport* as a barrier is primarily a logistical barrier, an economic barrier, or some combination thereof.

The questionnaire is expected to be non-differential concerning respondents' perceptions and SEP; but more respondents in low SEP may have abstained from replying, as with the MDI.

It is a limitation that the items used as dependent variables were not standardised and fully validated and comparable to other studies; however, comparisons are presently not straightforward. In a recent systematic review of tools measuring help-seeking for mental health problems, Wei, McGrath and Hayden et al. found no single tool to be preferable over others, but recommended researchers consider their tools according to the population studied. The Mental Health Literacy Scale seemed to perform best as a help-seeking measurement tool for mental health, but the authors were reluctant to give general recommendations[169]. Measuring help-seeking behaviors in mental health is a new scholarly field and is still developing.

4.2.2.4 Summing up on bias
Summing up, the sample of Study I represents a full national sample of initial users of antidepressants with a vast majority of cases in low SEP. A proportion of the prescriptions may be off-label which tends to be more common for patients in low SEP; thus, patients in low SEP with no depression or common mental disorder may be overrepresented. Estimated three-fifths of the prescriptions were prescribed for depressive disorders. Study II and Study III are based on survey data and as such respondents in high SEP are overrepresented compared to low SEP; both have data on SEP relying on participant-reported information.

4.2.3 Confounding
Confounding is a confusion or mixing of effect caused by interference of a third variable between the independent and the dependent variables. A confounder must be associated with both the dependent and the independent variable, but not an effect of the independent variable. If data are accessible, it is possible to adjust for confounders in the analyses by stratification or by using regression models[150].

In Study I, we adjusted for age, sex, country of origin, cohabitation, access to a vehicle, somatic comorbidity, and psychiatric comorbidity by multivariable logistic regression.

In Study II, we adjusted for sex, age +/- 60, and present treatment (yes/no) by multivariate logistic regression. In the analyses of income we adjusted for cohabitation status as well. The sample size did not allow for additional adjustments: age was reduced to a binary variable for the same reason. We did not adjust for chronic diseases, which would be more common for people in low SEP, and may explain the generally higher use of GP by respondents in low SEP.

In Study III, the sample size was small and the adjustments were only done for sex and age 60+/-. Confounders of relevance in Study III relate to the answers/outcomes of the five questions. Cohabitation would be relevant, as would be general activity limitation, former anxiety or depression disorder, and present use of antidepressants or anxiolytics, experience of medication side effects, and past experience with MHC. The sample size did not allow for these adjustments.

4.2.4 Effect modifiers

A factor that is an effect of the independent variable and is an intermediate step in the causal pathway from the independent to the dependent variable is called an intermediator. Causal intermediators — or effect modifiers — are not confounders, but part of the effect to be studied[150].

The modifying effect of distance on MHC contacts is analysed in Study I; however, some other intermediators do occur, such as wait time for health services, co-payment for psychologist visits, and referral bias due to expected capacity to benefit. These issues are relevant for Study I and Study II and are addressed below.

Limiting demand on health services can be accomplished in essentially two ways, either by increasing the price or by increasing wait times,[170] (given the location is stationary). The type of demand-regulation used depends on the financing and type of the healthcare service in question. In publicly financed health services, wait times regulate demand. For outpatient psychiatry, the national average wait time was 43 days in Denmark in 2013[171] but reduced to 24 days in 2015[172] for depression; for psychologist appointments it was 50 days in 2013 for treatment of anxiety and depression[173] but increased to 74 days by 2017[174]. Wait time for non-acute treatment with a private psychiatrist varies, with regional averages from 100 days to 259 days[175], but some provide access within a week for patients with private insurance or direct pay[176]. Wait times for GPs is not supposed to exceed five workdays, and acute cases are supposed to be seen the same day[177].

Waiting times for somatic health services are associated with significantly longer waits for patients in low compared to patients in high SEP[178]. These inequalities tend to be larger in both relative and absolute terms when average waiting times are high[179]. Thus wait time may act as an effect modifier for SEP and MHC use, but the size of the effect is not known. The issue of transport was addressed in Study III.

Co-payment acts as an effect modifier as well. More affluent patients — or persons covered by private insurance — may be more willing and better able to afford specialized services from a psychologist than patients in low SEP. It has been shown that co-payments may disfavor lower income groups in the Danish healthcare system[180], as well as in other healthcare systems[181]. More specifically regarding mental health

services, it is stated that co-payments restrict access to outpatient mental health services regardless of need[182], and imposing higher out-of-pocket payments decreases use of MHC services[183]. Part of the difference in utilization could also be due to easier access for patients with private insurance, which is typically provided by an employer. A Danish study on data from 2009 did not find evidence of higher use of psychologists by privately insured individuals compared to those not insured privately; however, the study was based on an internet survey and was not likely to capture more vulnerable individuals[184]. Additionally, since 2009 the remuneration for psychological treatment by insurance companies has increased dramatically[96].

Co-payment for psychologists and private insurance coverage must inevitably have an impact on use. The issue of expense was addressed in Study III and indicates this.

Capacity to benefit could be another effect modifier. The health services patients are referred to by the GP are not chosen at random, and treatment by psychologists in particular requires the capability and willingness to engage in therapeutic sessions, most often cognitive behavioral therapy. It has been hypothesized that the lower use of mental health services could be due to the fact that psychotherapy may make a heavy demand on one's cognitive capacities and this could present a greater obstacle to people with fewer years of education[57]. Lacking capacity to benefit from a treatment is a sound reason not to provide a referral to it. However, psychological therapy can improve depressive symptoms even for patients with an IQ below 70[185], though this may not be offered routinely. Intellectual disability is rare, affecting less than 4.9 cases per 1000 individuals in high-income countries[186], and even if these individuals have a point prevalence of 40% for any mental health disorder and 10% for anxiety or depression disorders[187], their overall number is so few it would hardly be visible in the outcomes.

Expected lack of *capacity to benefit* from psychological therapy due to cognitive capacity could have an effect on referral practice, but cannot explain the low usage of psychologist services in the medium income group and the group with 10–12 years education, as seen in Study I. The issue of referral practice was addressed in Study II.

4.2.5 Generalisability
In the following, I will discuss for whom these results are relevant, and their applicability to other settings.

It is evident that the three studies are covering different populations – and Study I include more *disempowered poor* people who are not represented by in Study II and Study III. The findings must be viewed in light of this.

Study I had a nationwide selection of patients treated with antidepressants and utilized information on their subsequent treatment for one year without loss to follow-up. By this approach it was possible to detect not only those who used mental health services, but also the non-users among incident users of antidepressants. The population can be generalized to adult patients with incident use of antidepressants, mostly prescribed for depressive and anxiety disorders.

The social diversity in use of services found in Study I can be generalized to public healthcare systems similar to Denmark's, in particular those where GPs act as gatekeepers and where health services are free at delivery, excluding psychologist services. The most vulnerable in contact with healthcare are included, contrary to most health surveys.

The socioeconomic impact of co-payments on use of psychologist services has not been studied directly; however, we assume the difference in use of psychologist services is best explained by co-payment. As economics can be an incentive for action it can be a disincentive as well, and this association finds support in the literature.

The uneven impact of distance on repeated visits to a psychiatrist by socioeconomic groups is a finding valid in most — if not all — high-income countries. The quality of the data is high, the measurements are at an individual level, the services are (mostly) free, and the study was conducted in a setting with very short distance to services.

A strength of Study II was the quality of data and a study design reducing risk of recall bias. The results are likewise comparable to settings where the GP acts as gatekeeper. Given the socioeconomic composition of the sample, we only see a part of the picture. The participants in low SEP are what might be termed the more *powerful poor*, and thus the results can be generalized to them and those better-off than them in Denmark and in the healthcare systems as the Danish. The disempowered persons in low SEP are not included, as they presumably are in Study I.

Strengths of Study III were that the data were gathered from a deprived and remote area, pertained to persons with symptoms of present depression, and included information on perceived barriers to accessing MHC; by this design we were able to determine the significance of different barriers to accessing MHC for potential patients in a remote and deprived area. We are not aware of similar studies. Study III can be generalized to cultures similar to Denmark's as far as the question of stigma is concerned, and to citizens in other remote areas with similar healthcare systems, as far as generalizing the concerns related to expenses and transport. The latter may be gravely underestimated, given that the respondents were in relatively better SEP compared to the study population. The results may be generalized to same groups as in Study II and to healthcare systems similar to Denmark's.

4.3 Comparisons with other studies

In the following, the results from the three studies are compared with population studies from high-income countries, where some kind of estimation of need has been associated with SEP and the utilization of mental health services.

4.3.1 Comparison with other studies, Study I

We found low income associated with higher odds for contact with a psychiatrist, contrary to a Norwegian questionnaire-based population study where they did not find income associated with outpatient visits to a psychiatric clinic for respondents with symptoms of anxiety/depression. They found higher education associated with more frequent contact (OR for trend 1.34; 1.08–1.68)[66]. Since Study I was nationwide and fully

comprehensive of service utilization, we consider our study reliable despite this difference from the Norwegian study.

In a population study from the Netherlands on severity of common mental disorders and treatment contacts with MHC and general medical care, they found the treatment contact with MHC over 12 months was less frequent for persons with fewer years of education, and that income had no impact on contacts. The rates of visits to MHC were related to the severity of the mental disorder, while the rates of visits to general medical care were not. They found no sociodemographic characteristics related to the highest treatment frequency after adjusting for the disorder severity. As for *Use* coupled with *No need*, they found 40% of MHC users did not have a disorder within the 12 months, whereas 39% of the persons with severe disorders did not have contact with MHC[188]. In the Netherlands, access to MHC is free of charge — as is treatment by psychologists, which could explain the differences between their findings and ours, if both psychiatrists and psychologists were pooled together.

A study from the British Household Panel Survey describing the impact of SEP on psychotherapy use had similar findings to ours. They studied patients with common mental disorders and treatment need based on a 12-item General Health Questionnaire. The use of private psychotherapists was significantly associated with higher education (OR 6.51) and the highest income groups (OR 3.33) as compared to the lowest. Co-payment ranged from 40–100£ per session. The use of public psychotherapists was lower for the highest income groups and the highest educational group. In the study, psychotherapists also included psychiatrists and (psycho-)analysts[189]. The finding of high SEP being associated with the use of private psychotherapy was similar to our study, given that the term 'psychotherapist' is equivalent to psychologist. The socioeconomic impact of co-payment finds support in this study as well.

A register based study from Germany on social inequalities in utilization of outpatient psychotherapy by employed persons found a strong socioeconomic gradient when education and type of occupation was used as marker of SEP[190]. However, for men, and income used as socioeconomic indicator, the utilization rates of psychologist showed no social gradient in the younger age group, and higher utilization by lowest income group for the older age group. For women the highest income group had higher utilization rates than the lower groups. This was in a setting where psychologist is free of charge. The authors consider difference in verbal skills as a possible explanation, or practical issues as transportation costs, lack of child care, or job scheduling problems might keep patients from repeated visits by psychologist. Likewise, we found education to show a stronger gradient than income for both contact and visit rates with psychologists.

We could not locate other studies combining impact of individual SEP and distance on the utilization of mental health services, which is why a comparison with other studies in this respect was not possible. However, our results did find support in the aforementioned Australian study by Meadows et al. using aggregated data[87]; they found increasing distance was associated with lower usage of MHC in socioeconomically deprived areas when compared to less deprived areas.

4.3.2 Comparison with other studies, Study II

In Study II we found needs were met, as respondents in need and in contact with health care providers were treated according to their needs. This aligns with other studies on treatment of depression[191] and a recent Swedish study designed almost similar to ours[192]. Some studies likewise found SEP to have no independent impact on the type of treatment[64 193 194] or intensity of treatment[37 188]. Yet some studies have found higher education to be associated with more use of specialized MHC, even when adjusted for need[57 195 196]. However, except for the Swedish study, all these prior studies rely on recalled service use alone.

We did find unmet needs, as 10% of those with symptoms of moderate to severe depression did not have any health care contact at all; an additional 47% did not receive any MHC treatment beyond GP consultation.

A Swedish follow-up survey study of more than 2,000 respondents with symptoms of depression or anxiety found that one-third did not seek care at all. Respondents with higher educations were less likely to seek any care at all; those who did, however, more often sought help from a psychologist[197]. Other studies report that 35–52% of respondents with symptoms of severe common mental disorders have no treatment contacts[193 198]. Similar to the Swedish study, we found respondents with the highest education or income were less likely to have contacts at all, compared to respondents without postsecondary education or with a low income; however, these differences were not significant in the groups with symptoms of depression. A German study on trends in non-help-seeking for any mental disorders found a downward trend in help-seeking: 57% of citizens with present symptoms of a mental disorder never had sought help for a mental problem in the years 2009–2012[199]. These findings are very similar to our study, given the assumption that GP contacts were not for mental health reasons.

We do not know if the 47% who had consultations with a GP were subjects of *watchful waiting* regarding their symptoms; however, under-detection of depression in primary care is a known problem[200]. When compared to ratings determined through semi-structured interviews, the detection rates for depression in primary health care are relatively low, with a sensitivity rate of 50% and a specificity rate of 81%[201] in 2009, and in 2014 a sensitivity rate of 51% and a specificity rate of 87% when compared to a standardised instrument such as the Patient Health Questionnaire-9[202]. It is worth noticing that the proportion receiving no treatment beyond a GP visit remained the same across educational groups.

Whereas we did not find differences related to SEP in MHC use among respondents with symptoms of depression, we did find differences among those with no/few symptoms. Having no/few symptoms of depression was associated with more usage of specialized mental health services for respondents with postsecondary education compared to those with no postsecondary education. Notably, when using income as an indicator of SEP, only a difference in *frequency* of contacts with a specialist was found, as in Study I. Other studies have found higher education associated with increased use of specialized services and suggest this could be due to higher-educated individuals possibly recognizing and accepting psychiatric needs more readily than individuals with fewer years of education[195]. An Australian study found that among individuals without any disorders or indication of need, only 4% were receiving MHC. Even though this group constituted a fair proportion of service users, the majority only sought brief primary care or counselling treatment rather than

consultations with psychiatrists, by whom they constituted 7% of the patients[203]. That study did not relate MHC use to SEP, however. A Canadian study did find that individuals using MHC and without symptoms of mental disorders were better educated compared to those with disorders using the services[16].

Additionally, we found prescription of antidepressants to be more common for people in low SEP in the group with no/few symptoms. Another Australian study likewise found low SEP associated with higher prescription rates that were not attributable to higher rates of depression[204].

4.3.3 Comparison with other studies, Study III

In Study III, we found expenses associated with MHC were a common problem and a concern of almost one out of three of our respondents, and a concern two- to five-fold higher for respondents without postsecondary education or experiencing financial strain. Use of MHC is sensitive to cost[205], and especially so for persons in low SEP[181]. A German study found that even with free access to a psychologist, these services are used less by people in low SEP[190], which could be explained in part by our findings; people without postsecondary education may have less knowledge of how to access professional MHC, thus leading to lower usage of available services.

Indeed, one in five experienced *Knowledge* as a barrier and had doubts about what to do to get professional help. With free access to a GP in Denmark, and the GP universally understood to be the gatekeeper for referrals, this is puzzling. Low mental health literacy[206] could be a part of the explanation, since low mental health literacy is also associated with low SEP[207]. This could also be due to the nature of the disease, but we did not find support for this, as we found no association of *Knowledge* and the severity of symptoms of depression. However, a Canadian study on perceived unmet need by respondents with symptoms of anxiety or depression found high symptom scores were associated with a higher degree of unmet need[67], and not knowing how or where to obtain help was the most frequently reported reason by those individuals.

We found perceived stigma to be of *Quite a lot* or *A lot of concern* for 22% of the respondents. This aligns with a systematic review of 44 studies, where overall 20–25% of respondents reported stigma as a barrier to accessing mental health services[208]. Stigma was not associated to SEP in our data. We were able to locate one Canadian study which likewise found no association between years of education and experiencing stigma in MHC. However, they did find perceived stigma more prevalent among respondents who were not working[209].

It could be argued that older people may be more reluctant to use MHC and feel more stigmatized by the need for psychotherapy[210 211]. We did not find support for this, as the retired group did not differ from the employed group in the perception of stigma. Likewise, older retired persons might be hypothesized to be less willing to pay for the expenses associated with treatment, but we did not find support for this either, as expense was not reported as a significant barrier for the retired group compared to the employed group.

Experience with former treatment was perceived a greater barrier for accessing MHC by retired respondents compared to the working population. This may not necessarily be due to bad experiences with healthcare professionals, though stigmatization can be a problem in health services too[212]; reports of past experience as a barrier could also indicate bad experience with side effects from a medication. Our study was not designed to capture or explore this nuance. Retired individuals are likely to have more experience with healthcare, and this

group includes people receiving early retirement pensions, which could indicate a chronic illness leading to early retirement and thus more opportunities for more bad experiences.

Transport was perceived to be a greater problem by persons in low SEP compared to individuals in high SEP. These results align with our findings in Study I, that distance has a greater impact on MHC use in individuals in low SEP.

The results were presented to the Panel of Relatives and Patients of Psychiatry Services of Region Zealand. The panel had expected stigma to be a greater problem, as patients with mental disorders are indeed concerned with what others might think. It is possible stigma applies more heavily to patients with severe mental disorders but not to patients with the common mental disorders included in the present study.

The panel was not surprised by the finding that some had doubts on how or what to do to obtain professional help, drawing attention to the fact that GPs might not know the patient that well, or the patient their GP, due to changing GPs in regional clinics. Additionally, they pointed out waiting times for appointments with the GP is a problem in Lolland-Falster. However, they were surprised transport was a minor issue for the respondents, since they viewed transport as both time-consuming and expensive.

The patient panel questioned the respondents' experience with MHC, since the rates of bad past experiences were so low. For them, bad experience was a common deterrent to accessing MHC.

4.3.4 Comparison within the three studies
In the following, I will shed light on how the three studies supplement each other.

Study I had three times more individuals with no postsecondary education compared to the age-matched Danish population; evidently, antidepressants are prescribed more to that group. This finds support in Study II, where those with no/few symptoms of depression and in low SEP had 30–40% higher odds of being prescribed antidepressants, compared to the highest education or income group.

In Study I, we found low SEP associated with overall less contact with specialized mental health services, particularly services from psychologists, where odds for contact were 45–60% lower for low-income or low-education groups. This finding was replicated in Study II, where persons with higher education used specialized mental health services more, and mostly psychologists, in the group with no/few symptoms of depression, where income showed no significant difference, notably. The selection of participants in the two studies may well explain this difference.

As for co-payment, we found expenses associated with contact with professional MHC a concern for one-third of the respondents in Study III, most so for those with no postsecondary education or in financial strain. This aligns well with the findings in Study I.

Study I showed distance to services are a greater obstacle for individuals in low SEP. This was supported by the findings in Study III, as respondents in low SEP perceived transport a greater barrier than those in high SEP.

In Study II we found GPs treated patients according to their symptoms, independent of SEP. This is a very positive finding. We have to take into consideration the sample selection, consisting of persons willing and capable of participation in the survey, the well-off and the *powerful poor*; we lack data therefore on the majority of individuals in low SEP who are not participating. The study reveals how the GP acts, but not how the population is being treated.

Study II revealed that half of the respondents with symptoms of moderate to severe depression had no treatment beyond contact with the GP, independent of SEP. We have no explanation for that, except to posit that symptoms may not be presented to the GP, or the GP may not direct appropriate attention to the symptoms. These persons did not occur in Study I.

Study III showed stigma was an issue for one out of five, but without demonstrating any difference in that finding across SEP in the group responding. The Panel of Relatives and Patients had doubts about this result: it may be valid for depressive disorders and not for more serious mental disorders or for the *disempowered poor*.

Study III also showed that lack of higher education was associated with doubts about how to obtain professional care for mental health problems. This could indicate people with fewer years of education will tend to require specialized services less and rely more on the GP, as seen in both Study I (not shown) and in Study II.

5 Conclusions

The aim was to explore if the Danish healthcare system provides equal access and treatment of patients with depressive disorders, via three objectives:

I. To determine the impact of socioeconomic position and distance to provider on outpatient mental health care utilization among incident users of antidepressants.

II. To examine if the severity of symptoms of depression was associated with the MHC treatment received, independent of SEP in both type and frequency of treatments, and highest gained treatment level within six months following a symptom score in a survey study.

III. To evaluate if the perceived barriers to access of MHC differ across individuals with symptoms of depression, according to their SEP.

When summing up the studies, we found:

Study I
* Individuals in low SEP initiated treatment with antidepressants more often than people in high SEP.
* Individuals in low SEP were more sensitive to distance for repeated visits with outpatient psychiatrists.
* Individuals in low SEP used MHC less, especially psychologist services.

Study II
* Individuals with symptoms of depression were treated according to their needs, independent of SEP.
* Individuals with few/no symptoms and in low SEP received different treatment than those in high SEP.
* More than half with symptoms of depression received no treatment beyond GP consultation.

Study III
* Individuals in low SEP with symptoms of depression perceived expenses and transport as barriers to accessing professional care.
* Individuals with no postsecondary education and with symptoms of depression more often had doubts about how to obtain professional care for mental health problems.
* Perceived stigma was a problem for one in five with symptoms of depression, but SEP had no bearing.

In short: the GPs treat patients with symptoms of depression according to their symptoms, independent of SEP. However, the Danish healthcare system does not provide equal treatment of all social groups of patients in the initiation of treatment with antidepressants. This seems to be caused by structural barriers. Distance to services and transport is a low SEP-linked problem; expenses and logically out-of-pocket payments for psychologists is also a problem for persons in low SEP.

Many with symptoms of moderate to severe depression seem to go untreated, even though they consult their GP. The missed treatment opportunities may be a shortcoming of services, thus indicating a need for greater awareness of symptoms of depression by the GPs. Or, if considered an issue of mental health literacy, the missed treatment opportunities can be viewed as an indication of a greater need to inform the public about symptoms and possibilities for treatment.

6 Implications

We identified two structural problems:
- Increasing distance to psychiatrist will increase social inequality in MHC;
- Indication that out-of-pocket payment for psychologist treatment generates social inequality in MHC;

And an actor-related problem:
- Many with moderate to severe symptoms of depression go untreated.

Clinical recommendations

Improved attention to mental health by GPs seems necessary; a more systematic approach in evaluating patients' mental health should be implemented to improve the treatment gap identified here and elsewhere.

GP mental health counselling could be directed toward patients in lower SEP to a higher extent.

The initial psychiatric evaluation may be at a distance from the patients' home, but treatment requiring frequent attendance ought to be close to the residence of the patients in low SEP in order to uphold equality in care.

Policy recommendations

For clinicians and policy makers it is of interest to know that the treatment of patients with symptoms of depression matched the severity of symptoms for those in contact with the GP, independent of SEP.

Centralizing MHC services may have a negative impact on social equality in care.

Upholding mental health services in deprived areas is essential for equality in MHC. Given that most MHC is provided by the GP, it is crucial that GPs operate in deprived areas, especially when they act as gatekeepers.

The socioeconomic imbalance in the utilization of psychologist services does not correspond to the vision of a healthcare service aiming for equal treatment for equal need. Access to psychologists free of charge would improve social equality in MHC treatment considerably. Given the fact that psychologists are distributed all over the country, free access may also affect patient issues regarding overcoming spatial distance; however, wait times are a problem when accessing psychologist services.

7 Personal reflections

Setting priorities for high quality health care in deprived areas is necessary, especially when alcohol or drug abuse is more prevalent[213]. Adverse childhood events are more common in deprived families[14][214]. Individuals exposed to adverse childhood events are much more exposed to common mental disorders[215], and in more persistent forms[23]. Prevention of mental disorders requires action on adverse childhood experiences, though actions to reduce adverse childhood events lies beyond the scope of healthcare, mental health professionals can raise awareness[216]. And resources could be allocated accordingly.

Lack of health services in deprived areas is inequality in care per se. The rate of combined mental and physical morbidity increases constantly with the grade of deprivation and occurs more than twice as often in most deprived areas compared to the most affluent areas[217]. The gatekeeper should act as gate opener for the *disempowered poor*. This is not possible when the GPs lack in numbers and drown in work[218]. Remuneration of GPs, according the socioeconomic index in the area the patients live, could be a possible way to appeal to GPs to establish clinics in deprived areas, and a way to allocate resources matching the extra need in the these areas.

Free access to treatment by a psychologist for depression and anxiety disorders is evidently necessary to gain social equality in mental health care. But even more needs to be done when, as in the German study[190], even with free access, people in low SEP use psychologists less frequently. Addressing barriers and easing access for the deprived is obviously necessary. Psychotherapy is associated with the ability to engage, which in itself could be more difficult if an individual struggles already with social and economic problems on top of mental ones — vis-à-vis the epigraph from a disempowered man's reply to his GP (p. 3) — problems pile up and interact. In order to address these interrelated barriers, additional needs must be addressed for the deprived and depressed beyond medication and psychotherapy, such as social support and domestic/workplace intervention, financial advice or assistance, peer support, and peer empowerment.

Further studies

It is possible using the existing data from Study I to evaluate if SEP has an association with the timespan from date of prescription until date of additional MHC access or contact, and if contact with a psychologist precedes the use of antidepressants by persons in high SEP. It is also possible to be more specific on type of antidepressants used in the inclusion criteria's.

Spatial analysis of our data would give insight into the socioeconomic impact of distance on the use of MHC services at a local level.

It would be of interest to know the effect of complementary private health insurance on the use of psychologist and psychiatrist services.

In a future study, it could be interesting to use the design of Study II on participants in Study III and investigate the association between depression score, perceived barriers, and use of MHC for a period of six months before and after the MDI score. This would allow for exploration of whether perceptions of barriers themselves have an impact on MHC use.

8 Summary in English

Background

The principle of the Inverse Care Law has an impact in Denmark, with a lack of general practitioners seen in remote areas and a concentration of specialists in the municipalities just north of Copenhagen. Common mental disorders such as depression and anxiety are widespread and seem to be increasing. It is known that depression is strongly associated with socioeconomic position (SEP) and deprived citizens experience a higher morbidity rate. It is not known what characterizes depressed patients who use mental health services versus those who do not use such services.

Aim

The aim of the thesis is to explore if the Danish health care system provides equal access and treatment of patients with depression, and if not, then to explore the reasons why, by addressing three objectives:

I. To determine the impact of socioeconomic position and distance to provider on outpatient mental health care utilization among incident users of antidepressants.
II. To examine if the severity of symptoms of depression is associated with mental health care (MHC) treatment received, independent of SEP, in both type and frequency of treatments and highest gained treatment level within six months following a symptom score in a survey study.
III. To evaluate if the perceived barriers to accessing MHC differ across individuals with symptoms of depression, according to their SEP.

Methods

Study I: A one-year, nationwide, Danish register-based follow-up study on the impact of distance and SEP on type and frequencies of MHC use after initial treatment with antidepressants. Analyses were conducted using multivariable logistic regression and Poisson regression.

Study II: Register-based six-month follow-up study on participants from the Danish General Suburban Population Study (GESUS) with symptoms of depression. MHC treatment of the participants was tracked in national registers for the four months prior and six months after their Major Depression Inventory (MDI) score. MHC treatment was graduated in levels; SEP was defined by years of formal postsecondary education and income categorized in three levels. Data was analysed using multivariable logistic regression and Poisson regression analyses.

Study III: Cross-sectional questionnaire-based population survey from the Lolland-Falster Health Study (LOFUS). A set of five questions on perceived barriers to accessing professional care for a mental health problem was prompted to individuals responding with symptoms of depression (MDI score > 20). Data was analysed using multivariable logistic regression.

Results

Study I: 50,374 person-years were observed. Persons in low SEP were more likely to have outpatient psychiatrist contacts (odds ratio (OR) 1.25; confidence interval (CI) 1.17–1.34), but less likely to consult a co-pay requiring psychologist (OR: 0.49; CI 0.46–0.53) and less likely to get mental health counselling from a GP (OR: 0.81; CI 0.77–0.86) compared to persons in high SEP after adjusting for socio-demographics, comorbidity, and vehicle access. Furthermore, persons in low SEP who had contact with any of these therapists tended to have lower rates of visits compared to those in high SEP.

When distance to services increased by 5 kilometres, the rate of visits to outpatient psychiatrist tended to decrease by 5% in the lowest income group (incidence rate ratio (IRR) 0.95; CI 0.94–0.95) and 1% in the highest (IRR 0.99; CI 0.99–1.00). Likewise, contact with psychologists decreased by 11% in the lowest income group (IRR 0.89; CI 0.85–0.94) when distance increased by 5 kilometres, whereas rate of visits did not interact.

Study II: Of 19,011 selected respondents from GESUS, 988 had symptoms of depression. For 547 respondents with moderate to severe symptoms of depression there was no difference across SEP in use of services, contact (yes/no), frequency of contact, or level of treatment, although respondents with low SEP had more frequent contact with their GP. However, of the 547, 10% had no treatment contacts at all, and 47% had no treatment beyond GP consultation. Among respondents with no/few symptoms of depression, postsecondary education ≥ 3 years was associated with more contact with specialized services (OR 1.92; CI 1.18–3.13); however, this difference did not apply for income; additionally, high SEP was associated with fewer prescriptions of antidepressants (education: OR 0.69; CI 0.50–0.95; income: OR 0.56, CI 0.39–0.80) compared to low SEP.

Study III: 5,076 participants had entered LOFUS by the end of 2017, whereof 372 had symptoms of depression; of these, 314 (84%) completed the survey questions regarding their experiences of barriers to MHC access. Worry about expenses related to seeking or continuing MHC was considered a barrier for 30% of the individuals responding, and as such ranked the greatest problem. 22% perceived stigma as a barrier to accessing MHC, but there was no association between perceived stigma and SEP. Transportation was the barrier of least concern for individuals in general, but also the issue with greatest and most consistent socioeconomic disparity (OR 2.99; CI 1.19–7.52) for lowest versus highest educational groups, and likewise concerning expenses (OR 2.77; CI 1.34–5.76) for the same groups.

Conclusions

Study I: Patients in low SEP treated with antidepressants have relatively lower utilization of mental health services even when services are free at delivery; it is likely that co-payments aggravate disparities in healthcare utilization between patients in high and low SEP; increasing distance to MHC seems to increases social inequality in care.

Study II: Participants with symptoms of depression were treated according to the severity of their symptoms, independent of SEP; however, more than half with moderate to severe symptoms received no treatment beyond GP consultation. People with low SEP and no/few symptoms of depression were more often treated with antidepressants.

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Study III: Issues associated with *Expenses* and *Transport* are more frequently perceived as barriers to accessing MHC for people in low SEP compared to people in high SEP. Stigma showed no association to SEP.

All three studies in brief: GPs treat patients with symptoms of depression according to the symptoms, independent of SEP. However, the Danish healthcare system does not provide equal treatment across socioeconomic groups initiating treatment with antidepressants. This seems to be caused by structural barriers. Distance to services and transport is a problem correlated with low SEP; expenses and most likely out-of-pocket payments for psychologists is also a problem for persons in low SEP.

Many with symptoms of moderate to severe depression seem to go untreated even though they consult their GP. The missed treatment opportunities may be a shortcoming of service and thus indicate a need for greater awareness of symptoms of depression by the GPs. Or, if considered an issue of mental health literacy, these missed opportunities can be viewed as an indication of a need to inform the public about symptoms and possibilities for treatment.

9 Resumé på dansk (Summary in Danish)

Det er vanskeligere at nå en behandler, når man bor i et udkantsområde – omvendt er det ikke attraktivt at have praksis i de områder, hvor sygeligheden er høj. Tilgængelighed til god medicinsk behandling har tendens til at variere omvendt med behovet i befolkningen; *The Inverse Care Law,* gør sig også gældende i Danmark, dels ved mangel på praktiserende læger i udkantsområderne, dels ved en stærk koncentration af speciallæger nord for København. Hvorvidt adgang til behandling er uafhængig af socioøkonomisk position (SP), er således fortsat et relevant emne.

Formål og mål

Formålet med projektet var at afdække hvorvidt det danske sundhedsvæsen giver lige adgang til behandling af patienter med depression – og hvis ikke, så hvorfor. Studiet havde tre mål:

I. At afdække betydning af SP og afstand til behandler for behandlingskontakt og type af behandling af som patienter modtager i året efter påbegyndt behandling med antidepressiva.
II. At afdække om depressions-symptomernes sværhedsgrad er forbundet med de modtagne sundhedsydelser, uafhængigt af SP, både med hensyn til type af ydelser, hyppighed af kontakt og graden af specialisering, i seks måneder efter symptom-scoren.
III. At afdække om oplevelse af barrierer for at kontakte professionel hjælp blandt borgere med symptom på depression har en sammenhængen med deres SP.

Metode

Studie I: Et etårigt nationalt dansk registerstudie af betydningen af SP og afstand til behandler for type og hyppighed af kontakt til sundhedsydere i året efter påbegyndt behandling med antidepressiva. Analyseret ved multivariabel logistisk regression og Poisson regression.

Studie II: Registerbaseret seks måneders opfølgningsstudie af deltagere fra Befolkningsundersøgelsen i Næstved (BEFUS), der scorede til symptom på depression i MDI. De anvendte sundhedsydelser blev fulgt i nationale registre fire måneder før og seks måneder efter scoren var foretaget. Ydelserne blev gradueret efter specialiseringsgrad. SP blev vurderet ved uddannelse og indkomst. Data blev analyseret ved multivariabel logistisk regression og Poisson regression.

Studie III: Tværsektorielt studie på data fra *Befolkningsundersøgelsen i Lolland-Falster* (LOFUS) fra respondenter med symptomer på depression (MDI), som modtog fem spørgsmål vedrørende oplevede barrierer for at opsøge professionel hjælp for mentale problemer. Svarene blev sammenholdt med SP og analyseret ved multivariabel logistisk regression.

Resultater

Studie I: Vi observerede i alt 50.374 person-år. Personer i lav SP havde større sandsynlighed for at have ambulant kontakt til en psykiater (odds ratio (OR) 1,25 confidens interval (CI) 1,17-1,34), men mindre sandsynlig kontakt til psykolog med ledsagende egenbetaling (OR 0,49; CI 0,46-0,53) og for samtaleterapi ved

egen læge (OR 0,81; CI 0,77 – 0,86), sammenlignet med personer i høj SP, efter justering for samlivsforhold, comorbiditet, adgang til bil. Dertil fandt vi, at personer i lav SP som havde kontakt til et af disse tilbud havde tendens til lavere besøgshyppighed, sammenlignet med personer i høj SP.

Når afstanden til sundhedsyderne steg med 5 km, faldt besøgsraten ved ambulante psykiatri (offentlig/privat) med 5% i den laveste indkomstgruppe (incidens rate ratio (IRR) 0,95; CI 0,94-0,95) og 1% i den højeste (IRR 0,99; 0,99-1,00). Tilsvarende faldt kontakt til psykologer med 11% i den laveste indkomstgruppe (IRR 0,89; CI 0,85-0,94) hvorimod besøgshyppigheden ikke her viste sammenhæng med afstand.

Studie II: Af 19.011 respondenter fra BEFUS, som havde udfyldt MDI score, havde 988 symptomer på depression. For de 547 respondenter med symptomer svarende til moderat til svær depression var der ikke forskel mellem de socioøkonomiske grupper i kontakt til sundhedsydere, hyppighed af kontakt eller behandlings-niveau, bortset fra at respondenter i lav SP havde hyppigere kontakt til egen læge. Blandt respondenter med ingen/få symptomer på depression var længere uddannelse forbundet med mere udbredt kontakt til specialiserede ydelser (OR 1,92; CI 1,18-3,13); denne forskel kunne imidlertid ikke findes for indkomst. Dertil kom for denne gruppe, at høj SP var forbundet med færre recepter på antidepressiv medicin, når der var justeret for alder, køn og aktuel behandling sammenlignet med respondenter i lav SP (uddannelse: OR 0,69; CI 0,50-0,95; indkomst: OR 0,56; CI 0,39-0,80).

Studie III: 5.076 deltagere havde udfyldt spørgeskemaet i LOFUS, da trækket blev foretaget. Heraf havde 372 symptomer på depression, af disse havde 314 (84%) udfyldt tillægsspørgsmålene vedr. oplevelse af barrierer for at opsøge professionel hjælp for mentale problemer. Bekymring vedr. udgifter forbundet med at opsøge eller fortsætte behandling ved mentale problemer var en betydelig barriere for 30% af respondenterne og således det mest udbredte problem. 22% oplevede stigma som en barriere for at opsøge professionel hjælp, men der var ingen sammenhæng mellem oplevelse af stigma og SP. De færreste personer oplevede transport som en barriere, men transport var til gengæld den faktor med størst forskel mellem de socioøkonomiske grupper: OR 2,99; CI 1,19-7,52 for lav uddannelse vs høj - og tilsvarende OR 2,77; CI 1,34 – 5,76 for lav vs høj indkomst.

Konklusioner
Studie I: Patienter i lav SP har relativ mindre forbrug af sundhedsydelser relateret til mentale problemer, selv når ydelserne er gratis; mest sandsynligt øger egenbetaling til psykolog uligheden i forbrugsmønsteret mellem personer i høj og lav SP. Øget afstand til mentale sundhedsydelser synes at øge den sociale ulighed i behandling.

Studie II: Deltagere med symptomer på depression blev behandlet svarene til alvorsgraden af symptomerne, uafhængigt af SP. Imidlertid modtog mindre end halvdelen med symptomer på moderat til svær depression ingen behandling ud over kontakt til egen læge. Patienter i lav SP med få eller ingen symptomer på depression påbegyndte oftere behandling med antidepressiva.

Studie III: Forhold forbundet med udgifter og transport blev oftere oplevet som barrierer for at opsøge sundhedsprofessionel hjælp for mentale problemer blandt personer i lav SP. Oplevelse af stigma var ikke forbundet med SP. Personer uden uddannelse rapporterede hyppigere at være i tvivl om hvor man kan søge hjælp.

Sammenfattende: Egen læge behandler patienter med symptomer på depression i forhold til symptomernes sværhedsgrad og uden forskel mellem patienters SP. Imidlertid synes det danske sundhedsvæsen ikke at levere ens behandling på tværs af sociale skel til patienter der påbegynder behandling med antidepressiva. Dette tilsyneladende pga. strukturelle forhold/barrierer. Afstand til behandler og transport er problemer forbundet med lav SP; udgifter forbundet med behandling er et problem for mindrebemidlede og ligesom egenbetaling til psykolog synes at have negativ effekt.

Mange med symptomer på moderat til svær depression går uden behandling, selv om de har konsultation ved egen læge. Den uudnyttede behandlingsmulighed kan være udtryk for suboptimal behandling – og således indikere et behov for større opmærksomhed på symptomer på depression ved egen læge; eller, hvis det anskues som patient-opmærksomheds problem, indikere behov for folkelig opmærksomhed på depressionssymptomer og muligheder for behandling.

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Supplementary Materials

Supplementary Table 1. Codes for services provided in primary care

Type of health care service	Code in the Danish National Register for Primary Care
GP MHS (talk therapy)	804003 +(804021–804027)+ (804247–804249) + 806101
Psychologist contacts	(630110–630211) + (630214–630340)
Psychiatrist consultations	(240110–240140) + (240210–240236) + 241401

Supplementary Table 2. Major Depression Inventory

From: Bech et al. BMC Psychiatry (2015) 15:190

Supplementary Table 3. Definition of treatment levels

Level	Primary health care	Additional health care	Defined by source and code
0	*No contact*		Not in NPR, NHSR, NPrR
1	*GP*	Consultation	+ NHSR GP (800101 + 800120 +(800411–800491) + 804001)
2	*GP*	Mental health counselling by GP	+ NHSR GP & contact concerning mental health (806101)
3	*GP*	Antidepressants	+ NPrR by ATC: NO6A – excluding N06AX12
4	*GP*	Private psychologist	+NHSR (630110–630211) + (630214–630340)
5	*GP*	Private psychiatrist	+NHSR (240110–240140) + (240210–240236) + 241401
6	*GP*	Outpatient psychiatry	+NPR by ICD-10: F 00–F99.99
7	*GP*	Mental hospital & Emergency visits	+NPR by ICD-10: F 00–F99.99

NPR: The National Patient Register; NHSR: the National Health Service Register; NPrR: the National Prescription Registry; ATC: Anatomical Therapeutic Chemical classification.

Supplementary Table 4. The BACE v3 questionnaire, covering concepts and the question number covering the item

Condensation of the *Barriers to Access to Care Evaluation scale (BACE v3)*

Q no	BACE v3 Question	Abilities#		Covered by question ¤
1	Being unsure where to go to get professional care	Perceive		1
2.	Wanting to solve the problem on my own	Perceive		(6)
3.	Concern that I might be seen as weak for having a mental health problem	Seek		2
4.	Fear of being put in hospital against my will	Seek		2
5.	Concern that it might harm my chances when applying for jobs	Seek		2
6.	Problems with transport or travelling to appointments	Reach		3
7.	Thinking the problem would get better by itself	Perceive		
8.	Concern about what my family might think or say	Seek		2
9.	Feeing embarrassed or ashamed	Seek		2
10.	Preferring to get alternative forms of care (e.g. spiritual care, non-Western healing / medicine, complementary therapies)	Perceive		
11.	Not being able to afford the financial costs involved	Pay		4
12.	Concern that I might be seen as 'crazy'	Seek		2
13.	Thinking that professional care probably would not help			(6)
14.	Concern that I might be seen as a bad parent	Seek		2
15.	Professionals from my own ethnic or cultural group not being available			
16.	Being too unwell to ask for help			
17.	Concern that people I know might find out	Seek		2
18.	Dislike of talking about my feelings, emotions or thoughts	Seek		
19.	Concern that people might not take me seriously if they found out I was having professional care	Seek		2
20.	Concerns about the treatments available (e.g. medication side effects)	Perceive		
21.	Not wanting a mental health problem to be on my medical records	Seek		2
22.	Having had previous bad experiences with professional care for mental health	Engage		5
23.	Preferring to get help from family or friends	Seek		
24.	Concern that my children may be taken into care or that I may lose access or custody without my agreement	Seek		2
25.	Thinking I did not have a problem	Perceive		6
26.	Concern about what my friends might think or say	Seek		2
27.	Difficulty taking time off work	Reach		
28.	Concern about what people at work might think, say or do	Seek		2
29.	Having problems with childcare while I receive professional care	Reach		3
30.	Having no one who could help me get professional care	Reach		

Clement et al. BMC Psychiatry 2012, 12:36

Development and psychometric properties theDevelopment and psychometric properties the Barriers to Access to Care Evaluation scale (BACE)

- related to people with mental ill health

According to model of Levesque et al. International Journal for Equity in Health 2013, 12:18

Patient-centred access to health care: conceptualising access at the interface of health systems and populations

¤ The questions in the questionnaire of the present study

Supplementary Table 5. Number and mean number of MHC treatments by MDI

Number and mean number of *Mental health care treatments* by MDI grade				
Symptoms of depression	**No/few**	**Mild**	**Moderate/severe**	**Total**
Persons n (Pct.)	18023 (100)	441 (100)	547 (100)	19011 (100)
No contact				
Persons n (Pct.)	4540 (25.2)	73 (16.6)	56 (10.2)	4669 (24.6)
GP consultation				
Persons n (Pct.)	13329 (74.0)	356 (80.7)	474 (86.7)	14159 (74.5)
Visits n	45044	1433	2252	48729
Visit rates¤	3.38	4.03	4.75	3.44
GP MHC				
Persons n (Pct.)	329 (1.8)	28 (6.3)	64 (11.7)	421 (2.2)
Visits n	611	57	168	836
Visit rates¤	1.86	2.04	2.63	1.99
Antidepressants#				
Persons n (Pct.)	1056 (5.9)	87 (29.7)	186 (34.0)	1329 (7.0)
Prescriptions n	2769	227	670	3666
Prescrip rates¤	2.62	2.61	3.60	2.76
Psychologists				
Persons n (Pct.)	167 (0.9)	19 (4.3)	31 (5.7)	217 (1.1)
Visits n	706	112	144	962
Visit rates¤	4.23	5.89	4.65	4.43
Private psychiatrist				
Persons n (Pct.)	100 (0.6)	20 (4.5)	42 (7.7)	162 (0.9)
Visits n	274	57	201	532
Visit rates¤	2.74	2.85	4.79	3.28
Outpatient Psychiatry				
Persons n (Pct.)	22 (0.1)	4 (0.9)	9 (1.6)	35 (0.2)
Visits n	103	34	46	183
Visit rates¤	4.68	8.50	5.11	5.23
Specialized services*				
Persons n (Pct.)	283 (1.6)	40 (9.1)	76 (13.9)	399 (2.1)
Visits n	1083	203	391	1677
Visit rates¤	3.83	5.07	5.14	4.20
Admission MH & EA **				
Persons n (Pct.)	33 (0.2)	4 (0.9)	14 (2.6)	51 (0.3)
Visits n	49	11	37	97
Visit rates¤	1.48	2.75	2.64	1.90

¤ Mean number of visits by respondents using the service/prescriptions
Reimbursed prescriptions
* Contact to either psychologist or psychiatrist, public or private
** MH: Mental hospital; EA: Emergency access psychiatric ward

Supplementary Table 6. Highest treatment level gained, crude numbers

Highest treatment level gained within six months by education and income, crude numbers and percentage

Crude — Education

Crude	0	1	2	3	4	5	6	7	
No postsec. education									
MDI <21	512	1783	17	162	5	11	6	6	2502
MDI 21-25	9	62	2	13	3	3	0	1	93
MDI >25	9	63	5	39	3	11	2	4	136
Missing	15	208	2	27	2	0	1	2	257
1-3 years postsecondary education									
MDI <21	2361	6512	84	515	93	54	10	21	9650
MDI 21-25	39	134	1	31	6	9	3	2	225
MDI >25	28	122	8	59	14	20	2	4	257
Missing	42	177	5	22	2	3	0	0	251
3+ years postsecondary education									
MDI <21	1667	3789	59	254	64	31	1	6	5871
MDI 21-25	25	61	2	20	8	6	0	1	123
MDI >25	19	74	7	27	10	8	3	6	154
Missing	25	68	0	12	1	1	0	0	107

Pct — Education

Pct	0	1	2	3	4	5	6	7		Spec#
No postsec. education										
MDI <21	20	71	0,7	6,5	0,2	0,4	0,2	0,2		0,9
MDI 21-25	10	67	2,2	14,0	3,2	3,2	0,0	1,1	100	6,5
MDI >25	7	46	3,7	28,7	2,2	8,1	1,5	2,9	100	11,8
1-3 years postsecondary education										
MDI <21	24	67	0,9	5,3	1,0	0,6	0,1	0,2		1,6
MDI 21-25	17	60	0,4	13,8	2,7	4,0	1,3	0,9	100	8,0
MDI >25	11	47	3,1	23,0	5,4	7,8	0,8	1,6	100	14,0
3+ years postsecondary education										
MDI <21	28	65	1,0	4,3	1,1	0,5	0,0	0,1	100	1,6
MDI 21-25	20	50	1,6	16,3	6,5	4,9	0,0	0,8	100	11,4
MDI >25	12	48	4,5	17,5	6,5	5,2	1,9	3,9	100	13,6

Crude — Income

Crude	0	1	2	3	4	5	6	7		Spec#
Income < 40,250€										
MDI <21	649	2809	28	292	26	27	7	12	3850	1,6
MDI 21-25	19	80	2	20	9	6	1	1	138	11,6
MDI >25	17	99	4	58	7	16	1	6	208	11,5
Missing	33	204	3	26	2	3	1	1	273	
Income ≥ 40,250 <80,500€										
MDI <21	1586	4113	74	318	62	34	6	14	6207	
MDI 21-25	22	83	1	19	4	7	0	1	137	
MDI >25	22	73	7	32	8	13	5	4	164	
Missing	20	81	2	13	1	1	0	0	118	
Income ≥80,500€										
MDI <21	1969	3923	44	209	63	26	0	4	6238	
MDI 21-25	27	62	2	12	4	5	2	2	116	
MDI >25	10	61	5	15	7	7	0	2	107	
Missing	13	24	0	1	1	0	0	0	39	

Pct — Income

Pct	0	1	2	3	4	5	6	7		Spec#
Income < 40,250€										
MDI <21	17	73	1	8	1	1	0	0		1,6
MDI 21-25	14	58	1	14	7	4	1	1	100	11,6
MDI >25	8	48	2	28	3	8	0	3	100	11,5
Income ≥ 40,250 <80,500€										
MDI <21	26	66	1	5	1	1	0	0	100	1,6
MDI 21-25	16	61	1	14	3	5	0	1	100	8,0
MDI >25	13	45	4	20	5	8	3	2	100	15,9
Income ≥80,500€										
MDI <21	32	63	1	3	1	0	0	0	100	1,4
MDI 21-25	23	53	2	10	3	4	2	2		9,5
MDI >25	9	57	5	14	7	7	0	2		13,1

Treatment level: 0: none; 1: GP (general practitioner); 2: GP-mental health consultations; 3: antidepressants; 4: psychologist; 5: private psychiatrist; 6: public psychiatrist; 7: mental hospital

#Spec: Specialized services includes 4+5+6

Supplementary Table 7. Perceived barriers to accessing MHC, crude numbers

Perceived barriers to accessing MHC & symptoms of depression, crude numbers					
Stigma	**Mild**	**Mod.**	**Severe**	**Sum**	**Pct (resp)**
Not at all	73	50	29	152	52.2
A little	39	20	15	74	25.4
Quite a lot	16	13	10	39	13.4
A lot	10	6	10	26	8.9
NA	11	6	6	23	
Sum	149	95	70	314	291
Knowledge	**Mild**	**Mod.**	**Severe**	**Sum**	**Pct (resp)**
Not at all	77	50	27	154	52.7
A little	41	21	14	76	26.0
Quite a lot	20	13	16	49	16.8
A lot	2	4	7	13	4.5
NA	9	7	6	22	
Sum	149	95	70	314	292
Expense	**Mild**	**Mod.**	**Severe**	**Sum**	**Pct (resp)**
Not at all	84	47	27	158	54.7
A little	20	14	10	44	15.2
Quite a lot	15	14	15	44	15.2
A lot	18	13	12	43	14.9
NA	12	7	6	25	
Sum	149	95	70	314	289
Experience	**Mild**	**Mod.**	**Severe**	**Sum**	**Pct (resp)**
Not at all	98	58	34	190	66.2
A little	22	11	10	43	15.0
Quite a lot	15	9	8	32	11.1
A lot	4	10	8	22	7.7
NA	10	7	10	27	
Sum	149	95	70	314	287
Transport	**Mild**	**Mod.**	**Severe**	**Sum**	**Pct (resp)**
Not at all	117	66	45	228	78.6
A little	10	11	7	28	9.7
Quite a lot	6	4	9	19	6.6
A lot	6	6	3	15	5.2
NA	10	8	6	24	
Sum	149	95	70	314	290

Supplementary Table 8. Adjusted odds ratios for barriers to MHC

Adjusted odds ratios for five perceived barriers to accessing mental health care by severity of symptoms of depression																			
	Stigma				**Knowledge**				**Expense**				**Experience**				**Transport**			
Dep. Grade	**aOR**	**CI**		**n**	**aOR**	**CI**		**n**	**aOR**	**CI**		**n**	**aOR**	**CI**		**n**	**aOR**	**CI**		**n**
Mild	1			291	1			292	1			289	1			287	1			290
Moderate	.8463	.4903	1.461		.9464	.5510	16.256		1.350	.7722	2.359		1.220	.6854	2.172		1.684	.8614	3.294	
Severe	1.259	.6867	2.309		1.723	.9420	3.151		**2.043**	**1.097**	**3.804**		1.739	.9220	3.279		**2.225**	**1.098**	**4.512**	
MDI score#	1.005	.9628	1.050		1.030	.9864	10.750		**1.063**	**1.016**	**1.112**		1.035	.9891	1.083		**1.076**	**1.024**	**1.130**	

Adjusted for: sex; age +/- 60; 95% confidence intervals (CI), marked bold
Major Depression Inventory scale > 20 ≤ 50, ungrouped

Study I

Impact of socioeconomic position and distance on mental health care utilization: a nationwide Danish follow-up study

Aake Packness, Frans Boch Waldorff, René dePont Christensen, Lene Halling Hastrup, Erik Simonsen, Mogens Vestergaard, Anders Halling

CrossMark

ORIGINAL PAPER

Impact of socioeconomic position and distance on mental health care utilization: a nationwide Danish follow-up study

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Abstract

Purpose To determine the impact of socioeconomic position (SEP) and distance to provider on outpatient mental health care utilization among incident users of antidepressants.

Method A nationwide register-based cohort study of 50,374 person-years.

Results Persons in low SEP were more likely to have outpatient psychiatrist contacts [odds ratio (OR) 1.25; confidence interval (CI) 1.17–1.34], but less likely to consult a co-payed psychologist (OR 0.49; CI 0.46–0.53) and to get mental health service from a GP (MHS-GP) (OR 0.81; CI 0.77–0.86) compared to persons in high SEP after adjusting for socio-demographics, comorbidity and car ownership. Furthermore, persons in low SEP who had contact to any of these therapists tended to have lower rates of visits compared to those in high SEP. When distance to

services increased by 5 km, the rate of visits to outpatient psychiatrist tended to decrease by 5% in the lowest income group (IRR 0.95; CI 0.94–0.95) and 1% in the highest (IRR 0.99; CI 0.99–1.00). Likewise, contact to psychologists decreased by 11% in the lowest income group (IRR 0.89; CI 0.85–0.94), whereas rate of visits did not interact.

Conclusion Patients in low SEP have relatively lower utilization of mental health services even when services are free at delivery; co-payment and distance to provider aggravate the disparities in utilization between patients in high SEP and patients in low SEP.

Keywords Socioeconomic factors · Mental health services · Access to health care · Antidepressants · Geographic information system

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Introduction

In a health care system responding adequately to need, patients in most need would be expected to receive more health care service and more specialized care. Inequalities in health and the ability of health care systems to address this issue remain of concern in European countries [1].

A study of OECD countries concludes that people with higher incomes are significantly more likely to see a specialist than people in lower SEP [2]. This is supported by population surveys in Denmark which show a linear correlation between increasing education and increasing use of specialist services [3]. In Holland, the same pattern exists as the more educated people are less likely to use primary care in the event of emotional problems and more likely to use mental health care services compared to people with shorter education [4]. Since common mental health problems are significantly more frequent in populations in

lower SEP [5, 6], the utilization of services would be expected to reflect this. However, surprisingly it does not. It could be argued that distance to the services may explain the difference in use, since the specialists primarily live and practice close to people in high SEP [7]. Indeed, distance to mental health services matters.

The impact of distance on the utilization of mental health care services has been subject to analyses for more than 150 years. In 1853, Edgar Jarvis described how the utilization of mental hospitals was inversely proportional to the travel distance in the catchment area [8]. This has been proven repeatedly since then and has also been shown to be relevant for outpatient treatments [9] and within cities too [10]. Compared to somatic health care, the utilization of mental health care services is more sensitive to travel distance [11]. Distance has an impact on the type of treatment chosen by patients with depression, as longer distance is associated with less therapy and more antidepressants and thus sub-standard treatment [12, 13]. In Australia, distance to mental health services has proven to be a barrier in itself, affecting persons in low SEP more strongly [14].

Knowing that SEP and distance to mental health services are of importance to utilization makes it likely that the remote areas would be underserved. The Inverse Care Law, stating that remote areas are drained for jobs, healthy citizens, and subsequently health services, is an issue of concern [15]. In fact, ecological data show that the remote and most deprived municipality in Denmark received 20% less outpatient mental health care services in 2013 than what would be expected for the population size (psychologist, private or public psychiatry; unpublished data). Except for the Australian study mentioned, no previous studies had examined the socioeconomic impact of distance to outpatient mental health service utilization at an individual level.

The aim of the study is to determine the impact of socioeconomic position and distance to provider on outpatient mental healthcare utilization among incident users of antidepressants.

Method

Study design

The study was conducted as a register-based one-year follow-up study on mental health service utilization after initiated treatment with antidepressants.

Settings

The Danish health care system is tax-funded and free at delivery for both primary and secondary care except for

dental care and treatments at psychologists, which are only partly subsidized [16]. The general practitioner (GP) has a gatekeeper function, and specialized care is only free after referral. Treatment by a psychologist is subsidized for patients referred from a GP, for some specific conditions: reaction to specific traumatic events, mild to moderate depression and, specifically, for citizens between 18 and 38 years old, also mild to moderate anxiety disorders. In 2014, the down payment was equivalent to $52 \in$ for the first consultation and $44 \in$ for the following sessions [17]. The psychologist needs a special authorization by The Danish Supervisory Board of Psychological Practice in order to be subsidized.

Study population and study period

The study population consisted of all individuals aged 20–64 years living in Denmark who were prescribed antidepressants (Anatomical Therapeutic Chemical (ATC) classification system N06A) in 2013, according to data extracted from The Danish National Prescription Registry [18, 19]. Only patients with no previous prescription of antidepressants in 2012 were included. Bupropion (ATC N06AX12) was not included since it is only prescribed for smoking cessation in Denmark. Tricyclic antidepressants (ATCs N06AA) were not included either as they are not recommended as the first choice for treatment of depression and are frequently used as a secondary analgesic [20, 21]. All persons migrating in 2012 were excluded as they could not be accounted for during the full study period. Finally, all patients coded as terminally ill at first prescription, and thereby specially subsidized, were excluded [22]. The resulting population was followed for 12 months per individual.

All persons with permanent residence in Denmark are registered in the Danish Civil Registration System (CRS) [23]. They are assigned a unique 10-digit personal identification number, called the CPR number (Central Personal Register Number). By this number, it is possible to identify an individual in all public registers.

Independent variables

Data on family income were drawn from the Danish registers on personal income and transfer payments [24] from Statistics Denmark [25]. Family income was chosen since the household represents shared common resources, and because, as far as income is concerned, it is more strongly and consistently associated with health than individual income [26]. In this study, we used equivalent disposable family income. (see Supplement).

Highest completed educational level was drawn from the Population's Education Register [27].

The home addresses of the study population were drawn from CRS and GIS positioned (geographic information system). Addresses for all GPs, psychologists and private psychiatrists were drawn from The Danish National Health Provider Register. Addresses for outpatient mental health care services (public psychiatric services) were drawn from homepages and confirmed by regional officials. The distances in metres by road from the participant's home address to the nearest located health provider at the time of the first prescription have been calculated by Statistics Denmark in ESRIs ArcMap 10.3 using Network Analyst.

Access to a motorized vehicle was verified through The Digital Motor Register, Statistics Denmark. If a vehicle was registered to an individual in the study population or a member of the family, it was considered as positive access. Vehicle registration was categorized into none, car owners, motorcycle and 45 mopeds. If a car and a motorcycle and/or 45 mopeds were owned by the same person or family, only the car was included.

Data concerning age, sex, address, marital status, cohabitation status, country of origin and vital status were gathered from the CRS.

Country of origin was grouped into (1) Denmark; (2) the EU and other European countries, North America and Oceania as Europe/Western countries; and (3) Africa, South and Latin America, stateless and unknown as non-western countries.

Information on comorbidity was drawn from The Danish National Patient Register [28] and The Danish Psychiatric Central Research Register [29] (see Supplement). These registers provide information on morbidity and comorbidity in secondary health care.

Information on psychiatric comorbidity was obtained for patients who had received inpatient or outpatient hospital services.

Dependent variables

Data on the utilization of private psychiatrist, psychologist and general practitioner (GP) were drawn from The Danish National Health Service Register for Primary Care [30] (see Supplement).

Only mental health services by GPs (GP-MHS) were analysed. GP-MHS covers talk therapy by a GP. It consists of at least two talks within the first 6 months and not more than seven talks within 1 year. The service triggers additional pay.

Information on public inpatient and outpatient psychiatric treatment was drawn from The Danish National Patient Register; ICD-10 coded F00–F99.

Data on outpatient public psychiatric services and services by private outpatient psychiatrists were grouped together in the analyses as public outpatient psychiatric services are used instead of private services, in areas with no access to a private psychiatrist. The grouping was termed outpatient psychiatrist.

One-day psychiatric hospital admissions were re-categorized into emergency contacts and termed emergency and short admissions.

The collection and handling of the data have been approved by The Danish Data Protection Agency J. no. 2015-41-3984. Approval by an ethic committee is not required for register studies.

Statistical analyses

Logistic regression was used to calculate the odds ratio (OR) for the association between SEP and contact to a health service provider. Among those who had contact to a mental health service provider, Poisson regression was used to calculate the incidence rate ratio (IRR) for the association between SEP and the frequency of contacts. Both analyses were adjusted for gender, age, cohabitation status, country of origin, somatic as well as psychiatric comorbidity, and access to a vehicle.

A logistic as well as a Poisson regression analysis of interaction between income and distance, and education and distance, was performed for each outcome measure. For interactions significant at a level of 0.01 or less, further analyses were performed; the impact of distance on contact to the identified mental health service was analysed by logistic regression on income and/or education stratified within groups. Distance was measured in 5 km intervals. The analysis of the impact of distance within different educational and/or income groups on the frequencies of contacts was done by Poisson regression. These analyses were done for each type of health care service showing interaction.

OR and IRR were estimated at 95% confidence intervals (CI), and p-values were reported.

Results

We followed a cohort of 50,636 incident users of antidepressants for 50,374 person-years at risk. Nearly 60% of the study population were female, and 50% were older than 41 years. The age distribution was close to that of the national distribution (Table 1).

A total of 9476 individuals (19%) of the study population used services provided by psychologists within the one-year follow-up (Table 2). Among persons in contact with public psychiatrists, 603 (9%) were in contact with private psychiatrists, and 1143 persons (16%) were in contact with a psychologists (not shown).

Table 1 Characteristics of the study population

	Total	
	N	Pct
Gender	50,374	
Male	21,736	43
Female	28,638	57
Age at entrance		
20–29	11,065	22
30–39	11,750	23
40–49	12,734	25
50–59	10,819	21
60–64	4006	8
Family type		
Single	21,769	43
Cohabiting	28,605	57
Education		
\10 years	16,256	32
10–12 years	21,100	42
[12 years	10,827	21
NA	2191	4
Country of origin		
Denmark	42,519	84
Europe and Western countries	4137	8
Non-western countries and unknown	3718	7
Vehicle		
None	29,387	58
Car	20,375	40
MC	320	1
45 moped	292	1
Comorbidity, somatic		
Cancer (latest 10 years)	1467	3
Diabetes	1333	3
Ischaemic heart disease	2881	6
COPD	720	1
Arthrosis	484	1
No chronic somatic		
0	44,308	88
1	5308	11
2	698	1
3	59	0
4	1	0
Comorbidity psychiatric		
Former mental disorder	12,027	24

MC motor cycle, *COPD* chronic obstructive pulmonary disease, *Chron* chronical diseases

SEP and contact and rates of contact to mental health care services

Persons with the lowest incomes established contact to outpatient psychiatrists more often (OR 1.25; CI 1.17–1.34) compared to persons in the highest income group (Table 3); contact to a psychologist was less for lower income groups (OR 0.49; CI 0.46–0.53) and fewer years of education (OR 0.37; CI 0.35–0.40), compared to higher income and educational groups. The same picture was seen for contact to GP-MHS as for psychologist related to income (OR 0.81; CI 0.77–0.86) and to education (OR 0.71; CI 0.67–0.75) compared to the highest groups.

No significant association with education or income and contact to emergency or inpatient psychiatric services was found.

Among patients who had contact to mental health care services, persons in lower SEP had lower rates of visits to outpatient psychiatrist (Income IRR 0.83, CI 0.81–0.84; education IRR 0.75, CI 0.74–0.76), psychologist (Income IRR 0.94, CI 0.91–0.96; education IRR 0.80, CI 0.79–0.82) and visits to GP-MHS (Income IRR 0.94, CI 0.92–0.97; education IRR 0.93, CI 0.91–0.96) compared to those in higher SEP when adjusted for socio-demographics, comorbidity and access to a vehicle (Table 3).

Rates of contact to emergency or inpatient psychiatric services did not differ across SEP.

Distance to outpatient mental health services

Distances to health care services were short for most persons (Table 2). The average distance was 2 km to a GP, 4.4 km to the nearest psychologist and 9 km to the nearest outpatient psychiatrist. Only 10% had more than 12 km to the nearest psychologist or more than 20 km to the nearest outpatient psychiatrist.

We found an interaction between income, education, distance and rate of visits to outpatient psychiatrists. The incidence rate ratio of contacts decreased by 1% for the highest and 5% for the lowest income group for each additional 5 km travel distance to an outpatient psychiatrist; likewise the rate decreased by 3% for patients with less than 10 years of education and 5% for patients with 10–12 years of education. There was no significant association between distance and use of outpatient psychiatrist among patient with the longest education (Table 4). There was no interaction between income, education, distance and contact versus no contact to outpatient psychiatrist.

We found interaction between income, distance and contact versus no contact to psychologist; contact decreased by 11% per additional 5 km travel distance for the lowest income group. The lowest income group was the only group significantly affected by distance, when adjusted for age, gender, cohabiting status, country of origin, psychiatric emergency visits, somatic and psychiatric comorbidity. We did not find interactions between income, education, distance and rates of visits to a psychologist, nor

Table 2 Total number of contacts to mental health care services and distance to outpatient services

Type of health care service used	N	Pct	Total sum of contacts
Public psychiatrist (outpatient mental health clinic)	7035	14	75,209
Admission mental hospital [1 day	1783	4	2619
Psych. emergency ward =\1 day	1811	4	2599
Private psychiatrist	4681	9	31,279
Psychologist	9476	19	64,865
GP-MHS	17,638	35	56,692
GP consultation	48,711	97	3,72,265
Person-years			50,374

Distance to outpatient provider in kilometres

Type	Mean	Median	90%	Min	Max
GP	2.1	1.1	5.6	0	26.3
Psychologist	4.4	2.1	12.0	0	56.0
Private psychiatrist	10.6	4.7	25.6	0	191.9
Public psychiatrist	10.7	6.7	25.6	0	87.2
Outpatient psychiatrist[a]	7.8	3.8	19.9	0	85.6

GP general practitioner, GP-MHS GP mental health services, equivalent to talk-therapies provided by GP

[a] Outpatient psychiatrist combines public psychiatrist and private psychiatrist—distance calculated to the nearest one

did we find interactions on contact or rates of visits to GP-MHS.

Discussion

Overall, our large population-based cohort study showed that persons with short education or low income had significantly fewer mental health care visits during the year following a first prescription of antidepressants, compared to person with long education or high income. Persons with shorter education had fewer contacts to outpatient psychiatrists, psychologists and GP-MHS. Persons in the lowest income group were more likely to have contact to outpatient psychiatrists, but then their rates of visits were lower. Low income was associated with less contact to a psychologist and, to some extent, also with less mental health care services provided by the GP compared to high income.

Distances to all outpatient mental health services were short. It is notable that, concerning contact to service providers, only income and contact to psychologist showed interaction with distance. Distance was a socioeconomic differentiating obstacle to rates of visits to outpatient psychiatrists, but not to contact.

Who are affected by this study?

The study population consisted of one-fifth of the 246,755

annual users of these antidepressants in the age group of 20–64 years in Denmark in the year 2013 [31]. By this selection, we expected to embrace patients with what is called common mental disorders (CMD) defined by the National Institute for Health and Care Excellence as depression and anxiety disorders, including OCD and PTSD, which may affect up to 15% of the population at any given time [32]. For all of these disorders, the recommended pharmacological treatment is antidepressants, if any [33]. These patients are often seen in general practice.

Treatment by outpatient psychiatrists

Outpatient psychiatrists more often had contact to patients in the lowest income group than to patients in the highest income group, but the incidence rate ratios of contacts decreased in the lower income groups. Even though longer education was not associated with increased contact, the rates of visits to outpatient psychiatrist decreased in the shorter educational groups.

It is not likely that a higher need for outpatient psychiatric services should come with higher SEP, nor is it likely that the few patients in high SEP referred to mental health services are in more need when referred. We expected that prescriptions of antidepressants were based on symptoms and independent of SEP. While distance was found to have impact on rates of contacts to outpatient psychiatrists, these findings could also indicate a different therapeutic approach to persons in higher SEP. It is possible that persons in higher SEP had a shorter delay in

Table 3 Incidence rate ratios of contact among patients who had one visit or more

Poisson	Outpatient psychiatrist				Psychologist				GP-MHS				Psych. emergency clinic				Admissions			
	IRR	p	CI	N	IRR	p	CI	N	IRR	p	CI	N	IRR	p	CI	N	IRR	p	CI	N
Family equivalent income[a]																				
Highest third	1			11,113	1			9033	1			17,638	1			1752	1			1783
Middle third	**0.90**	**<0.001**	**0.88 0.91**		**0.93**	**<0.001**	**0.91 0.95**		1.00	0.639	0.98 1.02		1.02	0.734	0.91 1.15		1.03	0.614	0.92 1.14	
Lower third	**0.83**	**<0.001**	**0.81 0.84**		**0.94**	**<0.001**	**0.91 0.96**		**0.94**	**<0.001**	**0.92 0.97**		1.06	0.364	0.94 1.14		0.95	0.382	0.84 1.07	
Education[a]																				
12+ years	1			10,659	1			8869	1			17,038	1			1677	1			1709
years 10–12	**0.92**	**<0.001**	**0.90 0.93**		**0.92**	**<0.001**	**0.90 0.93**		0.99	0.395	0.97 1.01		0.98	0.729	0.87 1.10		1.00	0.988	0.89 1.12	
<10 years	**0.75**	**<0.001**	**0.74 0.76**		**0.80**	**<0.001**	**0.79 0.82**		**0.93**	**<0.001**	**0.91 0.96**		1.06	0.370	0.94 1.19		1.04	0.511	0.92 1.17	

Two separate analyses of correlation of income or education with type of mental health service used

Psychiatric emergency clinic includes emergency contacts and admissions up to 1 day

Results significant within a 95% confidence interval are marked in bold

[a] Adjusted for age, gender, country of origin, cohabitating status, access to vehicle, comorbidity psychiatric, comorbidity somatic

GP-MHS mental health services by general practitioner (talk therapy), Admission MH admission to mental hospital, IRR incidence rate ratio, CI confidence interval, p 0.05

referral to a psychiatrist, and thereby gained a wider timeframe for visits within the 12 months after initiated antidepressant treatment. Thus, this finding could be a possible result of the referral pattern by the GP.

Treatments by a psychologist

Contact to a psychologist was strongly associated with SEP. We found a significant increase in utilization for each upward step in the income category and likewise for increasing length of education. The impact of income was most likely due to the required co-payment. Contacts to psychologists dropped significantly for the age groups above 40 in the study population (not shown), which underlines the economic impact as treatment of anxiety disorders is not subsidized beyond the age of 38. Additionally, it has been documented that co-payment is associated with disfavouring the lower income groups in the Danish health care system, as in other health care systems [34, 35]. More specifically regarding mental health services, it is stated that co-payments restrict access to outpatient mental health services regardless of need [36]. Part of the differences in utilization could also be due to easier access for patients with a private insurance, typically provided by an employer.

It has been argued that mental health therapies make heavy demands on the clients' cognitive capacities, and this could increase the obstacles for people with less education [4]. This may explain some of the difference in utilization between highest and lowest educational groups, but probably not the difference from high to the middle income or middle educational group.

The GP's role

The GP is very accessible in Denmark, and mostly there are no waiting periods. There are clinics close by, and the service is free at delivery. The GP could potentially compensate for social inequality in the use of mental health care by giving more therapeutic consultations to patients in low SEP. However, we did not find evidence of this as the GP offered less mental health services to people in low SEP. In addition, the frequency of MHS (talk therapy) offered by the GP was lower among patients in low SEP.

The GPs were in contact with 97% of the study population during the year following the initial prescription, and 35% received GP-MHS (Table 2). Relevant methods are expected to be used, when a GP performs MHS, but it has not been documented which ones are actually used [37]. In this study, 45% had two GP-MHS visits or less (not shown), which could indicate that a supportive approach was common.

Table 4 Impact of distance and income and education on mental health care utilization—stratified by SE groups

Outpatient psychiatrist				Psychologist			
Incidence rate ratio of contact[a]				Contact to health service y/n[a]			
Income	Each additional 5 km			Income	Each additional 5 km		
IRR	CI	p		OR	CI	p	
Highest income	0.99	(0.98; 1.00)	0.005	Highest income	0.98	(0.94; 1.02)	0.256
Medium income Low	0.95	(0.94; 0.95)	\0.001	Medium income	0.98	(0.94; 1.02)	0.299
income Education	0.95	(0.94; 0.95)	\0.001	Low income	0.89	(0.85; 0.94)	\0.001
12? years	IRR	CI	p	Stratified log reg			
10–12 years	0.99	(0.98; 1.00)	0.81				
\10 years Stratified	0.95	(0.94; 0.95)	\0.001				
Poisson	0.97	(0.96; 0.98)	\0.001				

SE socioeconomic, *OR* odds ratio, *IRR* incidence rate ratio, *CI* confidence interval; *p* 0.05

[a] Adjusted for age, gender, cohabitating status, country of origin, psychiatric emergency visits, comorbidity somatic, comorbidity psychiatric

Comparison with other studies

We have compared our findings with population studies from European countries, where some kind of estimation of need has been associated with SEP and the utilization of mental health services.

In a Norwegian questionnaire-based, cross-sectional population study, income was not associated with outpatient visits to a psychiatric clinic, among those who reported anxiety/depression. Higher education, however, was associated with more frequent contact (OR for trend 1.34; 1.08–1.68) [38]. Being nationwide and fully comprehensive of service utilization, we consider our study reliable.

A population study from the Netherlands focused on CMD severity and treatment contact to mental health care (MHC) and general medical care. They found that 12 months of treatment with contact to MHC was less frequent for shorter educated persons, and that income had no impact on contact. The rates of visits to MHC were related to the severity of the mental disorder, while the rates of visits to general medical care were not. There were no sociodemographic characteristics related to the highest treatment frequency, not even after adjusting for the disorder severity. 40% of the MHC users did not have a 12-month disorder, and 39% of the persons with severe disorders did not have contact to MHC [39]. In the Netherlands, access to MHC is free of charge, which could explain the difference to our findings, if both psychiatrist and psychologist had been pooled together.

A study from the UK, describing the impact of SEP on psychotherapy use, had similar findings to ours. They studied patients with treatment needs defined as common mental disorder based on a 12-item General Health Questionnaire (GHQ-12). The use of private psychotherapists was closely associated with higher education (OR 3.08–6.51) and highest income groups (OR 1.65–3.33), as compared to the lowest. Co-payment ranged from 40 to 100£ per session. The use of public psychotherapists was lower for the highest income groups and the highest educational group. In the study, psychotherapists also included psychiatrists and (psycho-)analysts [40]. The finding of high SEP being associated with the use of private psychotherapy was similar to our study, given that the term psychotherapist is equivalent to psychologist. Our anticipated socioeconomic impact of co-payment finds support in this study.

To our knowledge, there are no other studies of the combined impact of SEP and distance on the utilization of mental health services, so a comparison with other studies was not possible.

Among the strengths of this study were the nationwide selection of patients with a professionally evaluated need for antidepressants drugs and the possibility of following their subsequent treatment for 1 year without loss to follow-up. By this method, it was possible to detect not only the users of mental health services but also the non-users, among incident users of antidepressants.

The comprehensiveness of the national registers on social and health data was a strength. The validity and completeness of the outcome data from The Danish National Health Service Register for Primary Care is high [30]. Because the data are connected to reimbursement, the coverage is assumed to be good. Data gathered from continuously updated registers are independent of memory errors and free of recall bias.

We were able to identify actual GIS-positioned distances by road to the nearest outpatient psychiatrist,

psychologist and GP at an individual level for all but 301 persons (0.6%) and thereby gained precise and reliable data on distance to the services. We combined this with SEP, which, to our knowledge, has not been done before.

There were some limitations of this study. Our selection of study population is based on patients receiving antidepressants. If the prescription pattern differs, and individuals in high SEP more often use psychologist services instead of antidepressants, they would not be included in the selection. This could partly explain the high proportion of persons with a short education in our study. If this potential selection bias was present, it would aggravate the unequal use of mental health services found, whereas it would not have an impact on the evaluation of the effect of distance. Distance is relative to time travelling. A short distance in a large city may require longer time to cover than the same distance elsewhere. At some places using public transport is faster than using a car and vice versa. The study could have obtained higher precision on the obstacle of travel, if travel time by car and public transport were obtained and combined. Unfortunately, travel time by public transport was not accessible at Statistics Denmark.

The distance was measured to the nearest outpatient psychiatrist/psychologist/GP, but not to the ones actually used. Except for waiting periods for the GP, waiting periods could be an obstacle for access. The general waiting periods for private and public psychiatrists were 4–6 weeks in 2013 [41], whereas the general waiting period for psychologist were 9–10 weeks [42]. The "true" impact of distance could be blurred by the effect of waiting periods, especially if the services are associated with additional barriers as e.g. co-payment. The more affluent patients would probably not wait and would be willing and capable to pay for a specialized service by a psychologist or to travel to services further away. Thus, the socioeconomic difference in contacts to mental health care services seen in the study could be explained by the additional distance to accessible services affecting people in low SEP stronger. The fact that we did not find distance of importance to contact to outpatient psychiatrist, but only to rates of visits, shows a limit to this residual confounder.

The full impact of distance on mental health services utilization is probably not revealed in this study. Distance could still be a serious local problem. Spatial analyses would be a more potent method to analyse the impact of distance since all localities would be shown by this method, and the density of services could be accounted for as well [43].

In summary, we found that higher SEP was strongly associated with contact to outpatient mental health services and with higher rates of contacts, overall. Psychiatric services were used more by the less affluent patients, but used more frequently by patients in high SEP. The psychologist services were used more by patients in high SEP, as were GP-MHS.

Increasing distance to a health care provider did show a modest adverse socioeconomic impact on service utilization, in a national setting with short distances to mental health services.

Clinical recommendations

The social inequality in the utilization of mental health services seen in this study calls for actions. The GP-MHS could be directed towards patients in lower SEP to a higher extent.

The initial psychiatric evaluation may be at a distance from patients home, but treatment requiring frequent attendance ought to be closer to the residence of the patients in low SEP.

Policy recommendation

The grave socioeconomic imbalance in the utilization of psychologist services does not correspond to a health service aiming at equal treatment to equal need. Access to psychologists free of charge would improve social equality in health care treatment considerably.

Author contributions The statistical analyses were performed by statistician Maria Reimert Munch at The Research Unit for General Practice in Odense. The protocol can be obtained by sending an e-mail to the first author (apackness@health.sdu.dk). AP conceived the research and wrote the first draft of the manuscript. AH, RC and MV contributed substantially to the study design. All authors contributed to the data analysis, interpretation of results and critical revision of the manuscript. All authors approved the final manuscript.

Compliance with ethical standards

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CORRECTION

CrossMark

Correction to: Impact of socioeconomic position and distance on mental health care utilization: a nationwide Danish follow-up study

Aake Packness[1] · Frans Boch Waldorff[1] · René dePont Christensen[1] · Lene Halling Hastrup[2] · Erik Simonsen[2,5] · Mogens Vestergaard[3] · Anders Halling[4]

Correction to:
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In the original publication of this article, Table 3 was published incorrectly. The corrected table is shown below.

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Table 3 Separate analyses of correlation of income or education with mental health service used, in odds ratios and incidence rate ratios of contact

Odds ratio of contact to services[a]

Logit	Contact out-patient psychiatrist				Contact psychologist			Contact GP-MHS			Psychiatric emergency clinic			Admission MH >1 day		
	OR	P	CI	N	OR	P	CI	OR	P	CI	OR	P	CI	OR	P	CI
Family equivalent income[b]																
Highest third	1			50,373	1			1			1			1		
Middle third	1.03	0.414	0.97 1.09		0.71	<0.001	0.67 0.75	0.90	<0.001	0.86 0.95	0.94	0.344	0.82 1.07	0.92	0.224	0.81 1.05
Lower third	1.25	<0.001	1.17 1.34		0.49	<0.001	0.46 0.53	0.81	<0.001	0.77 0.86	0.82	0.007	0.71 0.95	0.86	0.041	0.74 0.99
Education (years)[b]																
12+	1			48,183	1			1			1			1		
10–12	0.92	0.005	0.86 0.97		0.67	<0.001	0.63 0.71	0.89	<0.001	0.85 0.94	0.99	0.888	0.86 1.13	1.06	0.377	0.93 1.22
<10	0.95	0.103	0.89 1.01		0.37	<0.001	0.35 0.40	0.71	<0.001	0.67 0.75	0.90	0.147	0.78 1.04	0.94	0.403	0.81 1.09

Incidence rate ratios of contact among patients who had one visit or more[a]

Poisson	Out-patient psychiatrist				Psychologist				GP-MHS				Psych emergency clinic				Admission MH>1 day			
	IRR	P	CI	N	IRR	P	CI	N	IRR	P	CI	N	IRR	P	CI	N	IRR	P	CI	N
Family equivalent income[b]																				
Highest third	1			11,113	1			9033	1			17,638	1			1752	1			1783
Middle third	0.90	<0.001	0.88 0.91		0.93	<0.001	0.91 0.95		1.00	0.639	0.98 1.02		1.02	0.734	0.91 1.15		1.03	0.614	0.92 1.14	
Lower third	0.83	<0.001	0.81 0.84		0.94	<0.001	0.91 0.96		0.94	<0.001	0.92 0.97		1.06	0.364	0.94 1.14		0.95	0.382	0.84 1.07	
Education (years)[b]																				
12+	1			10,659	1			8869	1			17,038	1			1677	1			1709
10–12	0.92	<0.001	0.90 0.93		0.92	<0.001	0.90 0.93		0.99	0.395	0.97 1.01		0.98	0.729	0.87 1.10		1.00	0.988	0.89 1.12	
<10	0.75	<0.001	0.74 0.76		0.80	<0.001	0.79 0.82		0.93	<0.001	0.91 0.96		1.06	0.370	0.94 1.19		1.04	0.511	0.92 1.17	

Psychiatric emergency clinic includes emergency contacts and admissions up to 1 day

Results significant within a 95% confidence interval are marked in bold

GP-MHS mental health services by general practitioner (talk therapy), Admission MH admission to mental hospital, IRR incidence rate ratio, CI confidence interval, P 0.05

[a] Two separate analyses of correlation of income or education with mental health service used

[b] Adjusted for age, gender, country of origin, cohabitating status, access to vehicle, comorbidity psychiatric, comorbidity somatic

Study II

Socioeconomic position, symptoms of depression, and subsequent mental health care treatment: a Danish register-based six-month follow-up study on a population survey.

A Packness, A Halling, LH Hastrup, E Simonsen, S Wehberg, FB Waldorff

Socioeconomic position, symptoms of depression, and subsequent mental health care treatment: a Danish register-based six-month follow-up study on a population survey.

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Abstract

Objective: Examine whether the severity of symptoms of depression were associated with the type of mental health care treatment (MHCT) received, independent of socioeconomic position (SEP).

Design: Register-based six-month follow-up study on participants from the Danish General Suburban Population Study (GESUS) 2010-2013, who scored the Major Depression Inventory (MDI).

Participants: 19,011 respondents from GESUS.

Interventions: MHCT of the participants was tracked in national registers four months prior and six months after their MDI score. MHCT was graduated in levels. SEP was defined by years of formal postsecondary education and income categorised in three levels. Data was analysed using logistic and Poisson regression analyses.

Outcomes: MHCT included number of contacts to: general practitioner (GP), GP mental health counselling, psychologist, psychiatrist, emergency contacts, admissions to mental hospital, and prescriptions of antidepressants.

Results: For 547 respondents with moderate to severe symptoms of depression there was no difference across SEP in use of services, contact (y/n), frequency of contact, or level of treatment, except respondents with low SEP had more frequent contact with their GP. However, of the 547, 10% had no treatment contacts at all, and 47% had no treatment beyond GP consultation. Among respondents with no/few symptoms of depression, postsecondary education ≥ 3 years was associated with more contact with specialized services (adjusted odds ratio aOR 1.92; 95% confidence interval (CI) 1.18-3.13); however, this difference did not apply for income; additionally, high SEP was associated with fewer prescriptions of antidepressants (education aOR 0.69; CI 0.50-0.95; income aOR 0.56, CI 0.39-0.80) compared to low SEP.

Conclusion: Participants with symptoms of depression were treated according to the severity of their symptoms, independent of SEP; however, more than half with moderate to severe symptoms received no treatment beyond GP consultation. People with low SEP and no/few symptoms of depression were more often treated with antidepressants.

The study was approved by The Danish Data Protection Agency Journal number 2015-41-3984.

Strengths and limitations of this study

- The design of this study, combining data from a population survey on depression symptom-scores with prospective register data on health care use and medication, is unique in health service research on treatment of people with symptoms of depression.

- The study design made it possible to reduce the inherent problem of recall bias in these types of studies.

- The actual reasons for treatment contacts or for prescription of antidepressants were not known, they could have been caused by other disorders than depression.

- The study sample was generally better educated than the population they were sampled from

Introduction

Equal access to health care based on need and the reduction of health inequalities are major policy objectives in most OECD countries[1]. Similarly, the World Health Organization states that addressing social inequalities contributes significantly to health and well-being of individuals and countries[2].

Sustained economic hardship can lead to poorer physical, psychological, and cognitive functioning[3], and is furthermore associated with a higher prevalence of mental health problems[4]. Specifically, depressive disorders are more prevalent among people with a low socioeconomic position (SEP)[5] and enhanced by worsening socioeconomic circumstances[6]. Whereas low SEP is an outcome of schizophrenia low SEP is a determinant for depression[7][8]. Additionally, depression is a major health problem, globally ranked as the single largest contributor to non-fatal health loss, accounting for 7.5% overall in years lived with disability[9]. It is estimated that life expectancy is reduced by 14 years for men and 10 years for women treated for severe depression[10].

Equity in access to health care is commonly defined as equal access for equal need. However, both access and need are ambiguous concepts[11]. It has been documented that patients with a high SEP use more specialized health care services[12][13], also within mental health care[14]; yet there remains a gap between those in need of mental health care and those who receive it[15-17]. Additionally, not all users of mental health care are in clinical need[18]. As for depression and anxiety disorders, some studies have found access to specialist care to be reflective of clinical need, with little inequity in SEP[19][20], whereas others report specialized mental health services are not provided to persons with low SEP according to need[21][22], or that higher SEP is associated with more use of specialized mental health services[23][24]. This uncertainty and the fact that depressive disorders are widespread and more common among persons with lower SEP makes these disorders both relevant and well suited to evaluate the capability of health care systems to address the needs of economically deprived citizens. Depression is a serious disorder with extensive personal, social and economic consequences, which makes its treatment an important issue and health equality an urgent cause.

Objectives

We aimed to evaluate whether the Danish health care system delivers equal treatment to patients with symptoms of depression. We defined mental health care treatment (MCHT) as the use of specific health care services related to the treatment of depressive disorders, as well as treatment with antidepressants.

The objective was to examine if the severity of symptoms of depression (need) was associated with the mental health care treatment received, independent of SEP in both type and frequency of treatments, and highest gained treatment level within six months following a symptom score in a survey study.

Method

Design

A six-month follow-up study on respondents with symptoms of depression, combining survey data with register data on mental health care treatment.

Setting: Danish health care system

Health care is tax-funded in Denmark and free at delivery, except for dental care and visits to psychologists for adults, which are both partly subsidized[25]. The general practitioner (GP) acts as a gatekeeper to more specialized

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care. Treatment by a psychologist is subsidized for patients with specific conditions, such as reaction to specific traumatic events, moderate depression, and, specifically for citizens between 18 and 38 years, also moderate anxiety disorders. In 2014, the co-payment for a psychologist appointment was equivalent to 44€ per session[26]. Each psychologist is obliged to obtain a special authorization from the Danish Supervisory Board of Psychological Practice in order to be subsidized.

Study population and data sources
The study was conducted as a follow-up study on mental health care utilization and use of antidepressants, examining participants who scored high on symptoms of depression in the Danish General Suburban Population Study (GESUS)[27] in the municipality of Næstved, Denmark. The municipality of Næstved is located 90 kilometres south of the capital Copenhagen. It has a total population of 81,000 and a socioeconomic index score 4% lower than the 2013 national average[28]. The GESUS data was collected from January 2010 through October 2013. The aim of GESUS was facilitate epidemiologic and genetic research by using information from questionnaires, health examinations, biochemical measurements, genetic variants and public registers to analyze the occurrence of co-morbidities (e.g. diabetes, cardiovascular disease, pulmonary disease and cancer) and mortality. All citizens over the age of 30 were invited, as were a random selection of one-quarter of citizens between 20 and 30 years of age. The study consists of 21,253 participants, equivalent to 43% of the invited citizens, the median age of participants were 56 years and 52 years for the non-participants. Data from the self-administered GESUS questionnaire was used in the present study.

Persons with permanent residence in Denmark are registered in the Danish Civil Registration System (CRS)[29] and are assigned a unique 10-digit identification number, the Central Personal Register Number (CPR). The CPR number was registered in the survey data and thus provided a way to match respondents with information on their age and gender, and also made it is possible to identify the individuals in all public data registers in Denmark. In addition to the data sources already mentioned, data concerning vital status and dates of migration were gathered from the CRS as well.

Using the CPRs from GESUS, we linked to national registers and tracked the use of healthcare services and antidepressants for four months (120 days) prior and six months (180 days) after the respondents entered the GESUS study, or until their death or migration, if that occurred before. Data from national registers covered the years 2010-2014 in order to fit a timeframe of four months prior to index date; however, the sample was reduced to include only respondents entering the GESUS study from May 2010, due to lack of data availability from 2009. The period of four months prior to the study was chosen assuming active treatment would include a treatment appointment or renewed prescription at least every three to four months.

Independent variables
Data on independent variables came from GESUS.

Measure of need
Depression was chosen as an expression of need, with the Major Depression Inventory (MDI) as a measurement tool, extracted from the GESUS questionnaire. The MDI is based on the 12-item Likert scale and has been found to have an adequate internal and external validity for defining different stages of depression[30]. The MDI is also based on the ICD-10 diagnostic criteria for depressive disorder[31], with scores ranging from 0 to 50: scores ≤20 do

not indicate depression; mild depression is defined as a score from 21-25; moderate depression from 26-30; and severe depression from 31-50[32]. In the study, we collapsed moderate and severe depression into the same category, reducing the categories to three in order to gain statistical power: no/few symptoms (summed MDI 0 – 20), mild symptoms (summed MDI 21-25), and moderate/severe symptoms (summed MDI 26+). This splitting of symptomatic individuals into only two groups (mild or moderate/severe) was supported by the recommended therapeutic approach at the time: patients with mild symptoms were recommended "watchful waiting" and perhaps supportive consultations, whereas patients with moderate to severe depression were recommended antidepressants and therapy by a psychologist or a psychiatrist[33]. If more than two items were missing in the MDI, the score was categorized as missing[34].

Socioeconomic position
SEP is commonly measured by income, occupation, housing tenure, or education; higher education in particular is known to predict higher response rates in questionnaires[35]. Education and income were chosen as measures of SEP in this study due to the respondents' age distribution skewing older than the general population; older age groups tend to have lower education, and they also have lower incomes, but occupation is not a useful SEP measurement for retired individuals. Education was classified as, No postsecondary education: if the respondent did not complete any postsecondary education; 1-3 years postsecondary education: for vocational education of 1 - 3 years; or for academy/professional graduates of 1 - 3 years; 3+ postsecondary education: for baccalaureate who completed 3 - 4 years, and Academic for those who completed graduate study of ≥ 5 years. Students were categorized at the level that their studies would end in, e.g. students in doctoral programs would be categorized as Academics even though they had not yet completed 5 years of graduate study.

Information on income was also extracted from the GESUS questionnaire, where it was reported in Danish Kroner (DDK). 100 DDK equals 13.42€, a fixed exchange rate for many years. Income was grouped into three equal groups: Less than 300,000 DDK; 300,000-599,999 DDK; and 600,000+ DDK and reported as: <40,250€; ≥40,250< 80,499€; or ≥ 80,500€.

When both income and education show the same association to an outcome, it will be addressed as an association to SEP; otherwise the association will be addressed to the variable in question (income/education).

Extrinsic variables
Sociodemographic data included age, gender, marital status, and cohabitation status.

Information on somatic comorbidity included: previous acute myocardial infarction (AMI), arteriosclerosis, angina pectoris, stroke, cancer, diabetes mellitus, hyper- or hypo-thyroidism. The somatic disorders were all grouped into one variable. Previous depressive episodes were registered separately.

Present medication covered self-reported use of antidepressants. Respondents defined as being in present treatment included both participants who reported use of antidepressants and participants identified in registers, as described below, who had redeemed a prescription for antidepressants and/or had contact with a psychiatrist and/or a psychologist within four months prior to the date of returning the questionnaire (in the following termed the index date) with the depression score.

Dependent variables

Data on dependable variables was drawn from national registers.

The outcome variables were graded according to the stepwise treatment of increasing intensity for depression as was recommended in the Danish national guidelines at the time[25]. The guidelines start with #1) counselling and # 2) therapy provided by the GP, followed by # 3) prescription of antidepressants, followed by # 4) referral to therapy with a psychologist, then # 5) referral to treatment by a psychiatrist, and finally referral to # 6) outpatient public psychiatrist or eventually #7) inpatient treatment at a psychiatric hospital (see code definitions in Supplement Table 1; an additional #0 refer to no treatment contact). Emergency visits to a mental hospital were included in the category of hospital contacts. The more severe or non-respondent the depression is to the proscribed treatment, the higher the patient is supposed to move in the recommended treatment hierarchy. Treatment by psychologists (#step 4) or psychiatrists (#steps 5 # and #6), whether private or public, were pooled into one group in some analyses due to low numbers of observations. Data on the utilization of private psychiatrists, psychologists, and general practitioners (GPs) was drawn from the Danish National Health Service Register for Primary Care[36]. For psychologists, only subsidized services are in the register. Respondents covered by private insurance and treated for depression or anxiety are included in the data, as insurance agencies require referral from GPs to compensate the patient.

Mental health counselling provided by a GP consists of at least two talks within the first six months and up to seven talks within one year. This type of therapeutic counselling is registered and paid as additional reimbursement to the GP. In the study, this service was termed mental health counselling by a GP (MHC by GP). Topics for ordinary consultations by GP are not registered in the national registers.

Data on prescriptions for antidepressants (Anatomical Therapeutic Chemical (ATC) classification system N06A) were extracted from the Danish National Prescription Registry[37 38]. However, bupropion (ATC N06AX12), which is approved for the treatment of depression in some countries, was excluded from this study since it is only prescribed for smoking cessation in Denmark.

Information concerning public in- and outpatient psychiatric treatment was drawn from the Danish National Patient Register[39] (ICD-10 coded F00 – F99).

Statistical analyses

First, we estimated the association between SEP and the different binary outcome variables (that is, the five different types of health care contact: No health care contact, GP consultation, Mental health counselling by GP, Antidepressants, and Specialized mental health services) in separate logistic regression models, both uni- and multivariable. Each model was stratified into three MDI categories: no/few symptoms (MDI < 21), symptoms of mild depression (MDI 21-25), and symptoms of moderate to severe depression (MDI ≥ 26). The SEP category 'No postsecondary education and income <40,250€' was used as the reference category. To examine a possible interaction between SEP and MDI category, we employed logistic regression models for each outcome, with patients having No postsecondary education / <40,250€ and no/few depression symptoms as key reference.

Second, in order to evaluate differences in visits and prescription rates, we estimated incidence rate ratios (IRR) by Poisson regression models for each type of contact (GP consultation, Mental health counselling by GP, Antidepressants, and Specialized mental health services). For each type of contact, analyses were restricted to

those patients who had at least one contact. For exposure, death and emigration within 180 days after index date were taken into consideration. As above, analyses were stratified into MDI category, and the SEP category 'No education and < 40,250€' was used as a reference category.

Finally, we performed a linear regression analysis for the effect of combined SEP and MDI category on the highest reached treatment level (see treatment progression described above). The treatment levels were categorized as shown in Supplementary Table 1 (0: no treatment/contact; 1: GP consultation; 2: MHC by GP; 3: antidepressants; 4: psychologist; 5: private psychiatrist; 6: public psychiatrist; 7: psychiatric hospital). Patients having No postsecondary education / < 40,250€ and no/few depression symptoms were the key reference groups.

All multivariable regression models included age (20-59 versus 60+), gender, present treatment with antidepressants, and psychologist or psychiatrist (yes/no), in addition to the variable studied in the univariate (crude) analysis. In analyses including income, cohabitation was also included.

The significance level was 5% throughout, and all reported confidence intervals were 95%. All statistical analyses were performed using Stata 14[40].

Patient and public Involvement
The study did not involve patients or public in planning or execution.

Ethics
Access to data from the GESUS was approved by the GESUS board in December 2015. The data were stored at a server at Statistics Denmark. The collection and handling of the data has been approved by the Danish Data Protection Agency, Journal number: 2015-41-3984. Approval by an ethics committee is not required for register studies in Denmark.

Results
The study included 19,011 respondents from the GESUS study; the original 21,253 were reduced by 1,627 respondents who entered before May 2010 due to data unavailability for 2009. The respondents were further reduced by an additional 615 who did not have a valid MDI score (see flowchart, Supplement Figure 1). 29 deaths and four persons emigrating were included in the analysis only until death or migration. In all, 988 (5.2%) had symptoms of depression. Of these, 441 had symptoms of mild depression and 547 had symptoms of moderate and severe depression, and of the latter group 271 were rated severe.

The baseline characteristics of the study sample are shown in table 1, in total, and stratified by severity of symptoms of depression. Respondents with symptoms of mild to severe depression tended to be: younger, more singles, living without a partner, and without formal education, compared to those with no/few symptoms.

In the study sample respondents with no education beyond the secondary level were underrepresented by one-third when compared to the total study population, according to Statistics Denmark; those with only 1-3 years of postsecondary education had a little higher representation, and the proportion with more than 3 years of

postsecondary education had an almost 30 percent higher representation compared to the population in Næstved[41].

Table 1. Baseline characteristics of the study sample by MDI grade					
MDI score	All	MDI < 21	MDI 21 - 25	MDI 26+	MDI missing
Symptoms of depression	n (pct.)	None/few	Mild	Moder./sev§	NA
All	19626 (100)	18023 (100)	441 (100)	547 (100)	615 (100)
In treatment*					
No	18076 (92.1)	16860 (93.5)	334 (75.7)	335 (61.2)	547 (88.9)
Yes	1550 (7.9)	1163 (6.5)	107 (24.3)	212 (38.8)	68 (11.1)
Gender					
Male	8927 (45.5)	8349 (46.3)	162 (36.7)	168 (30.7)	
Female	10699 (54.5)	9674 (53.7)	279 (63.3)	379 (69.3)	
Age group					
20-29	294 (1.5)	266 (1.5)	10 (2.3)	17 (3.1)	
30-39	2382 (12.1)	2206 (12.2)	79 (17.9)	86 (15.7)	
40-49	4186 (21.3)	3891 (21.6)	106 (24)	146 (26.7)	
50-59	4417 (22.5)	4100 (22.7)	115 (26.1)	144 (26.3)	
60-69	5123 (26.1)	4771 (26.5)	74 (16.8)	93 (17)	
70+	3224 (16.4)	2789 (15.5)	57 (12.9)	61 (11.2)	
Marital status					
Married	13398 (68.3)	12519 (69.5)	234 (53.1)	259 (47.3)	
Separated/divorced	2174 (11.1)	1936 (10.7)	71 (16.1)	117 (21.4)	
Widow/er	1385 (7.1)	1172 (6.5)	37 (8.4)	45 (8.2)	
None of the above	2669 (13.6)	2396 (13.3)	99 (22.4)	126 (23)	
Cohabitating					
No	4342 (22.1)	3745 (20.8)	147 (33.3)	217 (39.7)	
Yes (incl missing)	15284 (77.9)	14278 (79.2)	294 (66.7)	330 (60.3)	
Education					
None (No postsecondary)	2988 (15.2)	2502 (13.9)	93 (21.1)	136 (24.9)	
Vocational/1-3yrs (1-3 years postsecondary)	8227 (41.9)	7645 (42.4)	169 (38.3)	199 (36.4)	
Academy/professional <3yrs (1-3 yrs postsecund.)	2156 (11)	2005 (11.1)	56 (12.7)	58 (10.6)	
Baccalaureate /3-4yrs (3+ years postsecondary)	5024 (25.6)	4706 (26.1)	104 (23.6)	137 (25)	
Academic/5+yrs (3+ years postsecondary)	1231 (6.3)	1165 (6.5)	19 (4.3)	17 (3.1)	
Income					
less than 150.000DDK (< 40,250€)	1063 (5.4)	847 (4.7)	38 (8.6)	69 (12.6)	
150.000 - 299,999DDK (<40,250€)	3406 (17.4)	3003 (16.7)	100 (22.7)	139 (25.4)	
300,000 - 449,999 DDK (≥40,250 <80,500€)	3601 (18.3)	3344 (18.6)	73 (16.6)	98 (17.9)	
450,000 - 599,000DDK (≥40,250 <80,500€)	3025 (15.4)	2863 (15.9)	64 (14.5)	66 (12.1)	
600,000 - 749,999DDK (≥80,500€)	3245 (16.5)	3086 (17.1)	74 (16.8)	64 (11.7)	
750,000 - 899,999DDK (≥80,500€)	1856 (9.5)	1794 (10)	22 (5)	29 (5.3)	
900,000 - 1,049,999DDK (≥80,500€)	693 (3.5)	667 (3.7)	12 (2.7)	9 (1.6)	
1,050,000DKR + (≥80,500€)	706 (3.6)	691 (3.8)	8 (1.8)	5 (.9)	
Missing	2031 (10.3)	1728 (9.6)	50 (11.3)	68 812.4)	
Comorb. former depression					
No	16755 (85.4)	15826 (87.8)	255 (57.8)	210 (38.4)	
Yes	2484 (12.7)	1917 (10.6)	173 (39.2)	319 (58.3)	
Missing	387 (2)	280 (1.6)	13 (2.9)	18 (3.3)	
Comorbidity somatic, all ¤					
No	13791 (70.3)	13109 (72.7)	195 (44.2)	168 (30.7)	
Yes	5835 (29.7)	4914 (27.3)	246 (55.8)	379 (69.3)	
Medication antidepressants #					
No	18537 (94.5)	17213 (95.5)	363 (82.3)	385 (70.4)	576 (93.7)
Yes	1089 (5.5)	810 (4.5)	78 (17.7)	162 (29.6)	39 (6.3)

§ Moderate or servere
* In treatment at index date or 120 days before by psychologist, psychiatrist, or antidepressant prescription, according to GESUS or registers
¤ Somatic comorbidities: Ischemic heart disease, diabetes, cancer, metabolic diseases
replied in questionnaire

Table 2 shows odds ratios for mental health care treatment contacts. Among respondents with no/few symptoms, the group with three or more years of postsecondary education were 30% more likely to have no healthcare contacts at all when compared to the group without postsecondary education (adjusted odds ratio (aOR) 1.32, confidence interval (CI) 1.18 - 1.49). Similarly were respondents in the highest income group 66% more likely to have no healthcare contacts at all when compared to the lowest income group (aOR 1.66, CI 1.46-1.89). Higher education (3+ years) as well as high income was associated with fewer consultations with a GP and

fewer prescriptions of antidepressants, compared to those without postsecondary education or with low income. However, increased educational level was associated with more contact with specialized services (aOR 1.81, CI 1.13 - 2.88; aOR 1.92, CI 1.18 - 3.13); a difference not seen between the income groups.

Among respondents with symptoms of mild depression, there was no statistically significant difference across educational groups or income groups in odds for contacts and prescriptions in the adjusted analyses, except those with 1-3 years of postsecondary education had a lower use of mental health counselling by GP (aOR 0.30, CI 0.10 - 0.91) compared to respondents without any postsecondary education.

In the group with symptoms of moderate to severe symptoms of depression there was no difference across socioeconomic categories in any type of health care contact, when adjusted for age, gender and present treatment.

Table 2: Odds ratios for type of *Mental health care treatment* by educational- and income level stratified by MDI grade

Symptoms, depression	No/Few (MDI <21)		Mild (MDI 21-25)		Moderate/severe (MDI >25)	
No contact at all	Crude OR	OR (adjusted)*	Crude OR	OR (adjusted)*	Crude OR	OR (adjusted)*
Education	(N=18023 pts.)		(N = 441 pts.)		(N = 547 pts.)	
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	**1.26 (1.13–1.40)**	1.10 (0.98–1.23)	1.96 (0.91–4.22)	1.62 (0.71–3.67)	1.73 (0.79–3.77)	1.62 (0.72–3.65)
3+ years postsec. educ.	**1.54 (1.38–1.72)**	**1.32 (1.18–1.49)**	**2.38 (1.05–5.38)**	2.01 (0.84–4.83)	1.99 (0.87–4.55)	1.79 (0.76–4.23)
Income	(N=16295)		(N=391)		(N=479)	
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥ 40,250 <80,500€	**1.69 (1.53-1.87)**	**1.39 (1.24-1.56)**	1.20 (0.62-2.33)	0.79 (0.36-1.76)	1.74 (0.89–3.40)	1.59 (0.72-3.52)
Income ≥80,500€	**2.27 (2.06-2.51)**	**1.66 (1.46-1.89)**	1.90 (0.99-3.63)	1.35 (0.55-3.33)	1.16 (0.51–2.63)	1.04 (0.38-2.82)
GP consultation						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	0.80 (0.72–0.89)	0.92 (0.82–1.02)	0.52 (0.26–1.06)	0.64 (0.31–1.35)	0.68 (0.35–1.31)	0.70 (0.36–1.37)
3+ years postsec. educ.	0.66 (0.59–0.74)	**0.77 (0.68–0.86)**	**0.46 (0.21–0.97)**	0.54 (0.24–1.19)	0.69 (0.34–1.41)	0.74 (0.36–1.53)
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥ 40,250 <80,500€	**0.60 (0.54-0.66)**	**0.72 (0.64-0.80)**	0.90 (0.48-1.67)	1.25 (0.60-2.61)	0.55 (0.30-1.00)	0.53 (0.27-1.07)
Income ≥80,500€	**0.45 (0.41-0.50)**	**0.60 (0.53-0.68)**	0.63 (0.34-1.84)	0.79 (0.34-1.84)	0.94 (0.44-1.97)	0.81 (0.33-2.01)
GP Mental health counselling						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	1.20 (0.84–1.71)	1.09 (0.76–1.57)	**0.34 (0.12–0.97)**	**0.30 (0.10–0.91)**	1.20 (0.61–2.33)	1.27 (0.65–2.50)
3+ years postsec. educ.	1.31 (0.90–1.89)	1.21 (0.83–1.76)	1.26 (0.50–3.17)	1.03 (0.38–2.81)	1.23 (0.59–2.55)	1.30 (0.62–2.73)
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥ 40,250 <80,500€	1.07 (0.80-1.43)	1.09 (0.78-1.53)	1.14 (0.43-3.05)	1.40 (0.44-4.47)	**2.06 (1.05-4.02)**	1.79 (0.81-3.97)
Income ≥80,500€	0.84 (0.62-1.14)	0.85 (0.57-1.28)	1.20 (0.44-3.31)	1.33 (0.34-3.96)	1.66 (0.77-3.59)	1.35 (0.52-3.53)
Antidepressants						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	0.85 (0.71–1.01)	0.75 (0.55–1.01)	0.96 (0.52–1.77)	1.11 (0.47–2.65)	0.72 (0.47–1.10)	0.82 (0.43–1.56)
3+ years postsec. educ.	**0.69 (0.57–0.83)**	**0.69 (0.50–0.95)**	1.17 (0.60–2.29)	1.40 (0.54–3.63)	0.65 (0.40–1.05)	0.86 (0.42–1.77)
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥ 40,250 <80,500€	**0.67 (0.57-0.78)**	**0.71 (0.52-0.95)**	0.77 (0.43-1.39)	1.29 (0.51-3.25)	0.67 (0.43-1.03)	0.53 (0.25-1.11)
Income ≥80,500€	**0.44 (0.37-0.52)**	**0.56 (0.39-0.80)**	0.63 (0.33-1.20)	1.25 (0.39-3.96)	**0.53 (0.32-0.89)**	0.53 (0.20-1.36)
Specialized services¤						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	**1.94 (1.24–3.03)**	**1.81 (1.13–2.88)**	1.34 (0.52–3.46)	0.79 (0.27–2.36)	1.30 (0.70–2.43)	1.73 (0.87–3.41)
3+ years postsec. educ.	**1.91 (1.20–3.05)**	**1.92 (1.18–3.13)**	2.01 (0.75–5.41)	1.41 (0.45–4.36)	1.25 (0.63–2.49)	1.67 (0.78–3.57)
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥ 40,250 <80,500€	1.03 (0.75-1.42)	1.11 (0.76-1.64)	0.67 (0.30-1.49)	0.79 (0.36-1.76)	1.32 (0.73-2.37)	1.47 (0.69-3.14)
Income ≥80,500€	0.89 (0.64-1.23)	0.99 (0.63-1.55)	0.96 (0.44-2.09)	1.35 (0.55-3.33)	1.05 (0.53-2.11)	1.36 (0.52-3.56)

* Adjusted for age- group 60 +/-, gender, present treatment of antidepressants, psychologist or psychiatrist
** Adjusted for age-group 60 +/-, gender, present treatment of antidepressants, psychologist or psychiatrist, cohabitation
¤ Psychologist or psychiatrist public or private
Results significant within a 95% confidence interval are marked in bold

Table 3 shows the rate (incidence rate ratios (IRR)) of visits and number of prescriptions of antidepressants stratified by severity of symptoms. At all grades of symptoms of depression short education and low income were associated higher rates of visits to GP.

Among participants with no/few symptoms of depression, high income was associated with more frequent visits to a specialist, compared to the low income group (aIRR 1.35, CI 1.09-1.68).

Among participants with mild symptoms of depression high income was associated with a lower visit rate for GP-MHC than the low-income group (aIRR 0.39, CI 0.18-0.88).

In the group with symptoms of moderate to severe depression there were no significant differences between income- or educational groups in visit rates to services beyond GP, when adjusted for age, gender, and present treatment among those using services.

Table 3 Incidence rate ratios for *Mental health care treatments* by education- and income level stratified by MDI grade

Symptoms of depression	No/few (MDI <21)		Mild (MDI 21-25)		Moderate/severe (MDI >25)	
GP consultation	IRR (crude)	IRR (Adjusted)*	IRR (crude)	IRR (Adjusted)*	IRR (crude)	IRR (Adjusted)*
Education	(N=18023)		(N=441)		(N=547)	
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	**0.82 (0.80–0.84)**	**0.87 (0.85–0.89)**	**0.79 (0.69–0.89)**	**0.88 (0.77–0.99)**	**0.81 (0.73–0.89)**	**0.81 (0.74–0.89)**
3+ years postsec. educ.	**0.77 (0.75–0.80)**	**0.84 (0.81–0.86)**	**0.74 (0.64–0.86)**	**0.83 (0.72–0.97)**	**0.76 (0.68–0.85)**	**0.77 (0.69–0.86)**
Income	(N=16295)		(N=391)		(N=479)	
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥40,250 <80,500€	**0.81 (0,80-0.83)**	**0.88 (0.85-0.90)**	**0.75 (0.66–0.85)**	0.88 (0.76–1.02)	**0.74 (0.67-0.82)**	**0.81 (0.72-0.91)**
Income ≥80,500€	**0.67 (0.66–0.69)**	**0.78 (0.76–0.81)**	**0.63 (0.55–0.73)**	**0.78 (0.65–0.94)**	**0.66 (0.59-0.75)**	**0.75 (0.65-0.86)**
GP Mental health counseling						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	0.93 (0.73–1.20)	0.93 (0.72–1.20)	1.36 (0.70–2.64)	1.22 (0.58–2.56)	1.08 (0.74–1.58)	1.13 (0.77–1.65)
3+ years postsec. educ.	0.93 (0.72–1.22)	0.93 (0.71–1.21) **	0.85 (0.44–1.61)	0.82 (0.40–1.69) **	0.76 (0.48–1.18)	0.79 (0.50–1.24) **
Income < 40,250€	Ref	Ref	Ref	Ref	Ref	Ref
Income ≥40,250 <80,500€	0.98 (0.79–1.22)	0.93 (0.74-1.18)	0.73 (0.39–1.36)	0.97 (0.49–1.91))	0.83 (0.56-1.23)	0.69 (0.42-1.14)
Income ≥80,500€	1.00 (0.80-1.25)	0.94 (0.71-1.24)	**0.45 (0.22–0.96)**	**0.39 (0.18-0.88)**	1.07 (0.69-1.64)	0.86 (0.50-1.48)
Antidepressants#						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	0.95 (0.85–1.05)	0.93 (0.84–1.03)	1.03 (0.73–1.46)	1.05 (0.73–1.50)	1.07 (0.89–1.28)	1.06 (0.88–1.27)
3+ years postsec. educ.	1.00 (0.89–1.12)	1.01 (0.90–1.13) **	1.10 (0.76–1.59)	1.11 (0.77–1.62)	1.12 (0.91–1.37)	1.08 (0.88–1.33)
Income < 40,250€	Ref	Ref **	Ref	Ref **	Ref	Ref**
Income ≥40,250 <80,500€	0.98 (0.90–1.08)	1.00 (0.90–1.11)	1.09 (0.79–1.49)	1.29 (0.90–1.84)	0.97 (0.80-1.18)	0.92 (0.73-1.16)
Income ≥80,500€	0.92 (0.83-1.02)	0.95 (0.84-1.09)	1.02 (0.71–1.46)	1.18 (0.74–1.88)	1.18 (0.94-1.47)	1.11 (0.84-1.46)
Specialized services¤						
No postsecondary educ.	Ref	Ref	Ref	Ref	Ref	Ref
1-3 years postsec. educ.	0.97 (0.77–1.22)	0.94 (0.75–1.19)	1.11 (0.71–1.71)	0.93 (0.58–1.48)	0.93 (0.72–1.21)	0.94 (0.72–1.22)
3+ years postsec. educ.	1.06 (0.84–1.34)	1.02 (0.80–1.29)	1.32 (0.85–2.05)	1.02 (0.63–1.66)	1.09 (0.82–1.43)	1.10 (0.83–1.46)
Income < 40,250€	Ref	Ref**	Ref	Ref**	Ref	Ref**
Income ≥40,250 <80,500€	1.09 (0.92-1.28)	1.20 (0.99–1.45)	1.30 (0.91–1.85)	1.30 (0.88-1.94)	1.01 (0.78-1.30)	0.77 (0.57-1.06)
Income ≥80,500€	1.18 (1.00-1.39)	**1.35 (1.09-1.68)**	**1.58 (1.14–2.19)**	1.21 (0.79-1.86)	1.46 (1.12-1.92)	1.00 (0.69-1.45)

* Adjusted for age-group 60 +/-, gender, present treatment of antidepressants, psychologist or psychiatrist
** Adjusted for age-group 60 +/-, gender, present treatment of antidepressants, psychologist or psychiatrist, cohabitation
¤ Psychologist or psychiatrist, public or private
\# Number reimbursed prescriptions
Results significant within a 95% confidence interval are marked in bold

Table 4 shows the highest gained treatment level within the 180 day window in crude numbers. (Supplementary table 2 shows Number and mean number of mental health care treatment by MDI grade). More severe symptoms were met with a higher level of treatment, though 10% of the respondents with symptoms of

moderate to severe depression had no contact at all. 47% of the 547 with symptoms of moderate to severe depression had no treatment or contacts beyond a GP consultation.

Table 4. Highest gained treatment level by MDI grade			
Final treatment level\MDI grade	**No/few**	**Mild**	**Mod./severe**
No contacts	4540 (25.2)	73 (16.6)	56 (10.2)
GP consultation	12084 (67)	257 (58.3)	259 (47.3)
GP MHC	160 (.9)	5 (1.1)	20 (3.7)
Antidepressants#	931 (5.2)	64 (14.5)	125 (22.9)
Psychologists	162 (.9)	17 (3.9)	27 (4.9)
Priv psychiatrist	96 (.5)	18 (4.1)	39 (7.1)
Out-pat. Psychiatry	17 (.1)	3 (.7)	7 (1.3)
Admission MH & EA *	33 (.2)	4 (.9)	14 (2.6)
Sum	18.023 (100)	441 (100)	547 (100)

Percent's in brackets
Reimbursed prescriptions
* MH: Mental hospital; EA: Emergency access psychiatric ward

Table 5 shows that respondents with symptoms of depression gained a significantly higher treatment level, increasing with higher symptom score, compared to those with no/few symptoms and no postsecondary education or low income. (Supplementary table 3 shows highest treatment level gained within six months by education, income and severity of symptoms, in crude numbers and percentage.) For the group with no/few symptoms, respondents with 3+ years of postsecondary education or higher income reached a lower level overall.

We found no statistically significant differences between educational groups stratified by grade of symptoms, but a significant increase in treatment level within each educational group when depression score increased from no/few symptoms to symptoms of mild depression, and again when it changed to symptoms of moderate/severe depression (results not shown). SEP measured by income had similar outcomes, but differed in the group with mild symptoms of depression, where only respondents with high income gained a higher treatment level compared to the low income group with no/few symptoms.

Table 5. Mean level of *Mental health care treatment* by educational and income level and MDI grade

No/few symptoms of depression		β*
Education	.97 (N=19011)	
No postsecondary education	0.98 (N=2502)	(Ref)
1-3 years postsecondary education	0.94 (N=9650)	**-0.06 (-0.09; -0.03)**
3+ years postsecondary education	0.87 (N=5871)	**-0.05 (-0.08; -0.02)**
Income	.96 (N=17165)	
Income < 40,250€	1.07 (N=3850)	(Ref)**
Income ≥40,250 <80,500€	0.93 (N=6207)	-0.01 (-0.04; 0.02)
Income ≥80,500€	0.81 (N=6238)	**-0.12 (-0.15; -0.09)**
Mild symptoms of depression		
No postsecondary education	1.49 (N=93)	**0.15 (0.01; 0.29)**
1-3 years postsecondary education	1.47 (N=225)	**0.14 (0.05; 0.24)**
3+ years postsecondary education	1.58 (N=123)	**0.22 (0.10; 0.35)**
Income < 40,250€	1.62 (N=138)	0.05 (-0.06; 0.17)
Income ≥40,250 <80,500€	1.46 (N=137)	0.11 (-0.01; 0.23)
Income ≥80,500€	1.47 (N=116)	**0.22 (0.09; 0.34)**
Moderate/severe symptoms of depression		
No postsecondary education	2.18 (N=136)	**0.37 (0.26; 0.49)**
1-3 years postsecondary education	1.99 (N=257)	**0.35 (0.26; 0.44)**
3+ years postsecondary education	2.01 (N=154)	**0.45 (0.33; 0.56)**
Income < 40,250€	2.10 (N=208)	**0.28 (0.18; 0.37)**
Income ≥40,250 <80,500€	2.06 (N=164)	**0.40 (0.29; 0.51)**
Income ≥80,500€	1.80 (N=107)	**0.34 (0.21; 0.47)**

* Adjusted for agegr 60 +/-, gender, present treatment of antidepressants, psychologist or psychiatrist
* *Adjusted for agegr 60 +/-, gender, present treatment of antidepressants, psychologist or psychiatrist, cohabitation
Treatment levels: 0; no contact; 1: GP consultation; 2: GP MHC; 3: Antidepressants; 4: psychologist;
        5: priv. psychiatrist; 6: publ. psychiatrist; 7: psychiatric hospital & emergency visits

Discussion

Participants with symptoms of depression were treated according to the severity of the symptoms, independent of SEP; however, more than half with moderate to severe symptoms received no treatment beyond GP consultation. People in low SEP and with no/few symptoms of depression were more often treated with antidepressants.

Symptoms of depression & use of services

Respondents in need and in contact with health care providers were treated according to their needs. This finding aligns with other studies on treatment of depression[42] and a recent Swedish study designed as ours [43]. Some studies likewise found SEP had no independent impact on the type of treatment[19 44 45] or intensity of treatment[37 46]. Yet some studies have found that higher education was associated with more use of specialized mental health care, even when adjusted for needs[47-49]. However, beside the Swedish study all these prior studies rely on recalled service use only, however, and thus may be subject to recall bias.

Symptoms of depression & no use
A Swedish follow-up study of more than 2,000 respondents with symptoms of depression (MDI>20) or anxiety likewise found that one-third did not seek care at all. People with a higher education were less likely to seek care at all, and if they did, they more often sought help from a psychologist[50]. Other studies report that 35-52% of respondents with symptoms of severe common mental disorders have no treatment contacts[36;51]. As in the Swedish study, we found respondents with 3+ years of postsecondary education or high income were less likely to have contacts at all, compared to respondents without postsecondary education or low income, but these differences were not significant in the groups with symptoms of depression.

GPs' ability to detect depression could be questioned, since only half the respondents with moderate to severe symptoms of depression are treated. When compared to ratings determined through semi-structured interviews, the detection rates for depression in primary health care are relatively low, with a sensitivity rate of 50% and a specificity rate of 81%[52] in 2009, and more recently in 2014, a sensitivity rate of 51% and a specificity rate of 87%, when compared to a standardised instrument as the Patient Health Questionnaire-9[53]. The use of depression scoring tools validated for primary care could improve detection rates; if self-administered, it would be less time-consuming for GPs and perhaps a more realistic approach49. It is noteworthy that the proportion receiving the highest treatment level from a GP was the same across educational groups.

A German study on trends in non-help-seeking for mental disorders found a downward trend, finding that 57% of the citizens with present symptoms of a mental disorder had never sought help for a mental problem in the years 2009-2012[54]; this result is very similar to the findings of our study.

No/few symptoms of depression & use of services
The group that was treated, but scored with no/few symptoms of depression, may indicate emerging needs or an overuse of services. Since respondents did not each undergo additional screening by a professional, there is a lack of verification for the level of need beyond the self-reported symptoms on the inventory. However, we consider a comparison across socioeconomic groups relevant in this group, as in the other symptoms groups.

Firstly, we found no/few symptoms of depression was associated with more use of specialized mental health services for respondents with postsecondary education when compared to those with no postsecondary education, adjusting for age, gender, and present treatment. Notably, when income was used as an indicator of SEP, no difference in use of specialist services was found. Other researchers have found higher education is associated with more use of specialized services and suggest it could be due to the fact that higher-educated individuals might recognize and accept psychiatric needs more than lower-educated individuals[47]; or that mental health treatment makes heavy demands on a client's cognitive capacities and this presents a greater obstacle for people with less education[48]. What is seen in the group with no/few symptoms could be the treatment of emerging mental health problems, and a result of specialized services being requested more by patients with postsecondary education, or that specialized services are a more evident first choice by the GP for some patients. We had also expected the expenses associated with the use of psychologists in Denmark[55] would have an impact, but it did not.

An Australian study found that only a small proportion (4%) of individuals without any disorders or need indicators were among those receiving mental health care. Though this group comprised a fair proportion of

service users, the vast majority only sought brief primary care or counselling treatment rather than consultations with psychiatrists, where they constituted only 7% of psychiatry patients56. That study did not relate the use of services to SEP. However, a Canadian study did find that individuals using mental health care and having no symptoms of mental disorders were better educated compared to those with mental disorders using the services[16].

Secondly, we found that prescription of antidepressants was more common in the group with no/few symptoms and in low SEP. Similar findings were shown in another Australian study, where low SEP was associated with higher prescription rates not attributable to higher rates of depression[57]. The most plausible reason for this association is that depressive disorders are more prevalent in this group and antidepressants are the first choice of treatment, or that antidepressants are more commonly used as analgesic medications in this group, as chronic pain is more common for persons with low SEP[58].

Strengths and limitations

A major strength of this study was that we were able to obtain reliable data on need from a large sample of people in the GESUS as well as high-quality data on healthcare contacts and prescriptions of antidepressants from national registers, addressing challenges common in studies of equality in health care9. To our knowledge, this is the first study combining survey data of depression scores and SEP with register data on mental health care treatment. Thus we managed to avoid the inherent problem of recall bias, which is a common problem in these types of studies[59].

SEP may be defined in different several ways[35], but in the present study we used education and income as indicators of SEP. The span of respondents seen in the sample, from a few students to a high proportion of older and retired persons, indicated that income and employment status would be less potent to differentiate the resources that respondents could be expected to have. For that reason, education was the first choice, paired with income, even though older age is associated with lower educational attainment[27]. Additionally, education seems a particularly important factor when evaluating the use of health care specialists[10].

The study related respondents' use of services based on an indication of need (MDI score) that might not capture the fluctuations in all six months afterwards, which is a potential limitation. Even though need will change over time, such change would not be expected to differ among the socioeconomic groups; however, if it did, it would be expected to trend towards higher need for those in low SEP.

The actual reasons for treatment contacts were not known, nor were the reasons for prescriptions of antidepressants known; both could have been for disorders other than depression, indicating a potential limitation of the study design. The variety of other possible disorders would tend to be more common for people in low SEP, and may explain the generally higher use of GP by respondents in low SEP.

Another potential limitation is that not all services used are included in the registers. If a patient is not referred by a GP and pays the full expense for a treatment out of pocket, there is no state reimbursement and subsequently no registration of the treatment in the registers. This would usually indicate high-income individuals, which is often associated with more years of postsecondary education. We do not expect this to be a common scenario, though we have no data to support this.

Implications

For clinicians and policy makers it is of particular interest to know that the treatment of patients with symptoms of depression matched the severity of symptoms and was independent of the SEP of the patient.

A high proportion with symptoms of depression was not treated. Initiatives to improve mental health literacy might help people with symptoms of depression to address mental health problems when consulting their GP and thereby increase treatment rates. Better attention to mental health by the GP is also necessary, and probably a more systematic approach in evaluating patients' mental health should be implemented.

An interesting disparity between education and income on use of specialized services was found in the group with no/few symptoms. Are specialized services – most likely psychologists – the first choice for the GP when the patient has more years of postsecondary education? Is the initial treatment of patients with depressive symptoms different depending on their education, and why are the prescription rates of antidepressants much higher for persons in low SEP compared to those in high SEP? These issues deserve in-depth exploration in order to more fully address issues of health inequity.

Conclusion

We found no differentiation between socioeconomic groups in the treatment of respondents with symptoms of moderate to severe depression when looking at treatment contact, frequency of contacts, or level of treatment. However, more than half the respondents with moderate to severe symptoms had no treatment beyond GP consultation. Respondents with no/few symptoms of depression used services differently; people with low SEP were more often treated with antidepressants than people with high SEP, whereas people with postsecondary education were more likely to receive specialist services compared to those without postsecondary education, though this association was not found for income.

Author contributions

The statistical analyses were performed by statistician SW. AP conceived the research and wrote the first draft of the manuscript assisted by FBW. FBW contributed substantially to the study design and choice of analysis. AH, ES, and LH contributed to the data analysis, interpretation of results and critical revision of the manuscript.

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Study III

Socioeconomic position and perceived barriers to accessing mental health care for individuals with symptoms of depression: Results from the Lolland-Falster Health Study.

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Submitted manuscript

Socioeconomic position and perceived barriers to accessing mental health care for individuals with symptoms of depression: Results from the Lolland-Falster Health Study.

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Abstract

Objective: To evaluate if perceived barriers to accessing mental health care (MHC) among individuals with symptoms of depression are associated with their socioeconomic position (SEP).

Design: Cross-sectional questionnaire-based population survey from the Lolland-Falster Health Study (LOFUS) 2016-17 including 5,076 participants.

Participants: The study included 372 individuals who scored positive for depression in the Major Depression Inventory (MDI).

Interventions: A set of five questions on perceived barriers to accessing professional care for a mental health problem was prompted to individuals responding with symptoms of depression (MDI score >20).

Outcomes: The association between SEP (as measured by education, employment status, and financial strain) and five different types of barriers to accessing MHC were analysed in separate multivariable logistic regression models adjusted for gender and age.

Results: 314 out of 372 (84%) completed the survey questions and reported experiencing barriers to MHC access. Worry about expenses related to seeking or continuing MHC was a considerable barrier for 30% of the individuals responding, and as such the greatest problem. 22% perceived stigma as a barrier to accessing MHC, but there was no association between perceived stigma and SEP. Transportation was the barrier of least concern for individuals in general, but also the issue with greatest and most consistent socioeconomic disparity (odds ratio (OR) 2.99; confidence interval (CI) 1.19 – 7.52) for lowest vs highest educational groups, and likewise concerning expenses (OR 2.77, CI 1.34 – 5.76) for the same groups.

Conclusion: Issues associated with Expenses and Transport are more frequently perceived as barriers to accessing MHC for people in low SEP compared to people in high SEP. Stigma showed no association to SEP.

Strengths and limitations of this study:
• A strength of this study is that it is a population study in a socioeconomically-deprived area and combines data on present depression scores and SEP with proportions of perceived barriers to accessing mental health care services; thus, the study can shed light on factors that deter individuals with symptoms of depression from seeking MHC services.
• The questions used to assess barriers to accessing mental health care are not standardized, although they were validated for content and do have external validity.
• There was a potential overlap in the questions, between transportation barriers and barriers of expenses related to seeking or continuing mental health care services. Thus it was not clear whether "expenses" included "transport expenses" and whether transport was a logistical or economical barrier.

Introduction

Major depressive disorders (MDD) rank third among leading causes of years lived with disability (YLD) in high-income countries, as MDD is common and has an early onset.[1] Mental health problems in early age can have a profound impact on educational achievements[2], on income[3], and on later unemployment[4]. Additionally, having a diagnosis of depression is associated with a substantially shorter life expectancy [5].

In spite of this, far from all people suffering from depression are treated. In a Norwegian survey study only 12% of respondents with symptoms of depression had ever sought help [6], and a Canadian study found that 40% with symptoms of depression or anxiety perceived an unmet need for care[7]. Generally, treatment of patients suffering from depression is insufficient even in high-income countries, as only one in five receives adequate treatment[8].

Depressive disorders are closely associated with socioeconomic position (SEP). A dose response relationship has been found between income as well as education on incidence, prevalence, and persistence of depression[9]. Likewise, studies have found negative socioeconomic changes increase the risk of incidents of mental disorders, particularly of mood disorders [10], and financial strain in itself is associated with depressive disorder[11][12].

Thus, people in low SEP may have a higher need for mental health care due to increased incidence and prevalence of depression. A recent study found predictors of need for highly-specialized MDD care to be: depression severity, younger age at onset, prior poor treatment response, psychiatric comorbidity, somatic comorbidity, childhood trauma, psychosocial impairment, older age, and a socioeconomically disadvantaged status[13]. Although people in low SEP have an increased need for mental health services, it is not evident that they use more specialized care. Some studies have found access to specialist care to be based on clinical need, with little inequity in SEP[14][15][16], whereas others report specialized mental health services are not provided equally to persons in low SEP according to need [17][18][7][19] or that higher SEP is associated with more usage of specialized mental health services [20][21].

The background for initiating the present study was that health care statistics (unpublished) in 2013 revealed a significant disparity, as the most socioeconomically deprived municipality in Denmark (Lolland), had 20% fewer individuals in contact with out-patient mental health care (psychologist, private or public psychiatry) than could be expected for the population size (unpublished). Several reasons may account for this discrepancy between expected need and actual use of mental health care services, one of them being perceptions of barriers that affect patients' choices or preferences, which we aimed to address in this study.

The study objective was to evaluate if perceived barriers to accessing mental health care differ across individuals with symptoms of depression according to SEP. We thereby expected to gain knowledge valuable to addressing inequity in the use of mental health care services.

Method

Study design
The study was conducted as a cross-sectional questionnaire-based population survey.

Setting

The Danish health care system is tax-funded and free at delivery for both primary and secondary care; for adults, dental care and psychotherapy are only partly subsidized[22]. The general practitioner (GP) fulfills a gatekeeper function, as specialized care is only free after GP referral. Psychotherapy by a psychologist is subsidized for patients referred by a GP for specific conditions: reaction to specific traumatic events; moderate depression; and, specifically for citizens between 18 and 38 years old, moderate anxiety disorders. In 2014, the out of pocket cost to individuals at time of service was equivalent to 52€ for the first consultation and 44€ for the following sessions [23].

Study population and data sources

The Lolland-Falster Health Study (LOFUS) is a population survey conducted in the two remote municipalities of Lolland and Guldborgsund, located in a socioeconomically deprived area of Denmark that is a 1½-2 hours' drive south from the capital Copenhagen. In the 2017 national ranking of all 98 municipalities these two were ranked the most deprived and the 8th most deprived municipalities[24]. Together, the municipalities comprise 103,000 citizens, 50% being 50 years of age or older[25] in 2017. The study aims to enroll 25,000 participants of all ages and will be conducted from 2016 to 2020. Participants are randomly selected by civil registration numbers[26], invited by mail, and re-invited by phone. The study covers several health areas: mental health, health literacy, social issues, genetics, kidney, ear nose & throat problems, and more. Beyond questionnaire responses, LOFUS data contains blood samples and biometrics. The study is described in detail elsewhere[27]. The present study relies on responses to the questionnaire from adults, with data drawn from LOFUS at the end of 2017, while data collection was still ongoing.

The subjects included in this study are respondents with symptoms of depression. All respondents who scored >20 on the Major Depression Inventory (MDI) were prompted the specific questions on perceived barriers to seeking help for mental health problems, which are described below.

Independent variables

Major Depression Inventory

As part of the LOFUS questionnaire, the respondents filled out the Major Depression Inventory (MDI). The MDI is based on the 12-item Likert scale and has been found to have an adequate internal and external validity for defining different stages of depression[28]. The MDI is based on the ICD-10 diagnostic criteria for depressive disorder[29], with scores ranging from 0 to 50. We used the sum score after excluding the lowest score on question 8 or 9 and likewise the lowest score on item 11 or 12, which measured increased/decreased restlessness and increased/decreased appetite, respectively. Mild depression is covered by scores from 21 – 25, moderate depression from 26 – 30 and severe depression by scores from 31 – 50[30]. If more than two items were missing in the MDI, the score was categorized as missing[31].

Socioeconomic position

SEP was measured by employment status, educational attainment, and financial strain.

Employment status was gathered using 14 different items in the questionnaire. Respondents over the age of 67 were categorized as retired, unless they were employed. The categories of employment were reduced to four in the analyses: Working (employee; self-employed; combined employee and self-employed; military; secondary

school pupil; postsecondary student; apprentice; house-wife/husband); Temporary not working (unemployed; rehabilitation; sickness leave 3 months or more); Retired (retired due to age; disability benefit; early retirement); and Other (Other).

Educational attainment was measured and classified as the following: no postsecondary education if the respondent did not complete any postsecondary education; 1-3 years postsecondary education for vocational or academy/professional graduates of 1 - 3 years; 3+ postsecondary education for baccalaureate matriculants who completed 3 - 4 years; and academic for those who completed graduate study of ≥5 years.

The questionnaire gathered responses concerning financial strain with the following question: How often within the last 12 months have you had problems paying your bills? With possible answers: Never; Few months; Approximately half the months in the year; Every month. In the analysis, the categories were reduced to three to gain power, merging Approximately half the months in the year and Every month into one category.

Extrinsic variables:
Sociodemographic variables included were gender, age, marital status, and cohabitation.

Questions on Self-perceived general health (SRH) were provided to respondents with a five-point Likert scale from very good to very bad. In addition, the presence of a Long-standing health problem was posed as a binary question and General activity limitation was gauged in three grades from severely limited to not at all. These questions were adopted from the European Health Status Module32.

The questionnaire included inquiries regarding past and present medical problems; specifically concerning mental health status, the respondents were asked if they presently suffered or had ever suffered from anxiety disorder and/or depression.

Dependent variables
We developed a short list of questions to be included in the LOFUS questionnaire for respondents who scored positive for symptoms of depression. The questions were inspired by the Barriers to Access to Care Evaluation questionnaire by Sara Clement et al.[33]. Their questionnaire contains 30 items, which was too many to include in the LOFUS study. The number of questions was reduced and grouped to cover the individual abilities in approaching care as described by Levesque et al.[34]: ability to perceive; ability to seek; ability to reach; ability to pay; and ability to engage (see further description in the supplementary material). A preliminary question on whether considering seeking care had ever been a problem was prompted before the five questions related to the abilities/perceived barriers:

Have any of the reasons listed below prevented, delayed, or discouraged you from getting or continuing professional care for a mental health problem?

It has had an impact, that I ..
      1) … have been unsure what to do to get professional care. ("Knowledge" in the following)
      2) … have been concerned for what others might think, say or do. ("Stigma")
      3) … have had difficulty with transport or travelling for treatment. ("Transport")
      4) … have not been able to afford the expenses that followed. ("Expense")

5) … have had bad experiences with professional care for mental health problems. ("Experience")

6) These questions are not relevant for me/I do not want to answer.

Answers to question 1 – 5 were listed in four grades ranging from Not at all to Quite a lot; question 6 was binary.

In a preliminary form, the questions were evaluated for content validity in a focus group interview consisting of a group of ten patients and relatives of psychiatric patients (the Panel of Relatives and Patients of Psychiatry Services in Region Zealand) in December 2014. The group found the themes relevant and the questions understandable. They offered some suggestions for rephrasing, which were subsequently followed. The same panel commented on the preliminary results of the study in December 2017.

Statistical analysis

For respondents with symptoms of depression we estimated the association between SEP and the outcome variables (five types of barriers to MHC: knowledge; stigma; transport; expense; experience) in separate multivariable logistic regression models after excluding respondents replying Not relevant. Likewise, we performed the same analyses with the three grades of depression (mild, moderate and severe) and depression score uncategorized (MDI score) as independent variables, which is presented as supplementary material. The SEP categories were employment status, education, and financial strain. Working, postsecondary education, and no economic distress were used as reference categories.

The logistic regression models were adjusted for age (18-59 versus 60+) and gender in addition to the variables studied in the univariate (crude) analysis.

The significance level used was 5% throughout, and all reported confidence intervals were 95%. All statistical analyses were done in Stata 1535.

Patient and public Involvement

The study objectives were discussed with the members of the Panel of Relatives and Patients of Psychiatry Services in Region Zealand along with the validation of the questions in December 2014. The preliminary results were discussed with the group again in December 2017. The final results were distributed to the group in February 2018 along with an invitation for additional comments. One member of the patient panel responded to the invitation and provided additional comments/discussion. Comments from patients are included in the discussion.

The published article will also be distributed to the patient panel.

Ethics

Informed, written consent was obtained from all participants. The study – along with the Lolland-Falster Health Study – was approved by Region Zealand's Ethical Committee on Health Research (SJ-421) and the Danish Data Protection Agency (REG-24-2015).

Results

Figure 1: Flow chart of sampling
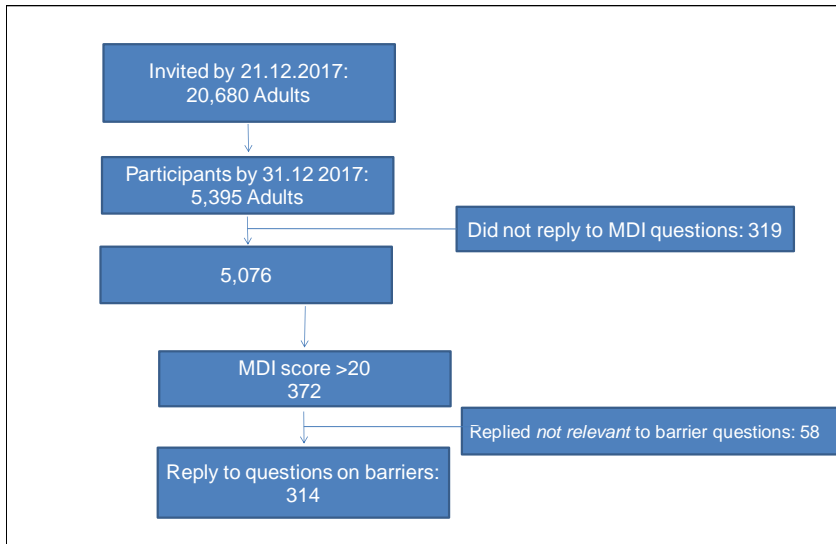
By December 21, 2017, a total of 20,680 adults (age 18+) had been invited to the LOFUS study. By December 31, 2017, a total of 5,395 adults had replied to the questionnaire. 319 did not reply on the MDI score element or failed to fill in more than two answers in the test, leaving 5,076, of whom 372 (7.3%) reported symptoms of depression and thus were prompted the questions on perceived barriers to seeking mental health care. 58 replied that the questions were not relevant or would not answer them, thus 314 individuals with a MDI score >20 were included in the analyses of SEP and perceived barriers.

The total sample consisted of 53% women; 64.5% of the respondents were married, and 80.7% were cohabitating. For the total group, mean age was 55.7 and median age was 57.4; for individuals scoring in the depressed range on the MDI, the mean age was 50.2 and the median was 51.4 years.

Compared to the total sample, the respondents reporting symptoms of depression were younger, and more likely to be living alone, and to be unmarried. They were also more likely to have no postsecondary education, to be temporarily out of work (16.9% vs 3.7%), and to experience more frequent financial strain. Furthermore, their health indicators included: lower self-rated health, more reports of limited physical functioning, more reports of long lasting disease, and former anxiety or depression diagnoses; and more reports to be currently in pharmacological treatment for these disorders.

Table 1. Characteristics of study sample and respondents with symptoms of depression

Table 1. Characteristics of study sample and respondents with symptoms of depression

Age group		Total sample				Symptoms of depression	
		Male	Female	Total	Pct	MDI > 20	Pct
	18-29	198	212	410	8,1	55	14,8
	30-39	180	250	430	8,5	41	11,0
	40-49	357	443	800	15,8	82	22,0
	50-59	519	681	1200	23,6	84	22,6
	60-69	632	666	1298	25,6	63	16,9
	70-79	396	371	767	15,1	41	11,0
	80+	95	76	171	3,4	6	1,6
	Sum	**2377**	**2699**	**5076**		**372**	
Marital status							
	Married	1538	1708	3246	64,5	181	49,6
	Partnership	73	108	181	3,6	15	4,1
	Separated	12	9	21	0,4	5	1,4
	Divorced	169	195	364	7,2	31	8,5
	Widower	59	164	223	4,4	11	3,0
	Not married	509	487	996	19,8	122	33,4
Cohabitating							
	Yes	1917	2141	4058	80,7	248	67,9
Secondary schooling							
	Studying	20	34	54	1,1	5	1,3
	< 8 years	290	203	493	9,7	35	9,4
	8 - 9 years	610	401	1011	19,9	87	23,4
	10 - 11 years	751	913	1664	32,8	112	30,1
	High school	522	896	1418	27,9	89	23,9
	Other/foreign	163	215	378	7,4	38	10,2
Postsecondary education							
	No postsecondary	415	529	944	18,6	112	30,1
	1-3 years postsecondary	1307	1238	2545	50,1	172	46,2
	3+ years postsecondary	495	784	1279	25,2	63	16,9
	Other	143	122	265	5,2	21	5,6
Occupational status							
	Work/study	1417	1526	2943	58,0	167	44,9
	Temp. No work	68	121	189	3,7	63	16,9
	Retired	843	966	1809	35,6	115	30,9
	Other	47	77	124	2,4	27	7,3
Financial strain							
	Not at all	2136	2404	4540	89,4	275	73,9
	Few months	175	213	388	7,6	60	16,1
	Half the months	23	22	45	0,9	13	3,5
	Every month	25	32	57	1,1	19	5,1
Self-rated health							
	Very good	306	328	634	12,5	7	1,9
	Good	1348	1524	2872	56,6	83	22,3
	Fair	616	697	1313	25,9	181	48,7
	Bad	89	137	226	4,5	90	24,2
	Very bad	12	6	18	0,4	9	2,4
General activity limitation							
	Not limited at all	1561	1630	3191	63,2	114	31,0
	Limited but not severely	672	906	1578	31,3	166	45,1
	Severely limited	132	146	278	5,5	88	23,9
Longstanding illness. Yes		1052	1200	2252	44,7	244	66,3
Anxiety, now or earlier. Yes		110	223	333	6,6	111	29,8
Depression, now or earlier. Yes		145	230	375	7,4	138	37,1
Medication anxiety. Yes		71	119	190	3,8	65	17,8
Medication antidepressants. Yes		85	173	258	5,1	66	18,0

Level of difficulty with barriers to accessing mental health care by respondents with symptoms of depression. Percent.

	Stigma	Knowledge	Expense	Experience	Transport
Quite a lot +	22,3	21,2	30,1	18,8	11,7
A little	25,4	26,0	15,2	15,0	9,7
Not at all	52,2	52,7	54,7	66,2	78,6

n 270 - 291

Of those responding to the questions, more than half perceived no problems at all in accessing professional care, least of all transport.

Among those who did have concerns about accessing or continuing professional mental health care, Expense was the most common problem, as 30.1% indicated expenses had prevented, deterred, or delayed them either Quite a lot or A lot (both responses aggregated in the Quite a lot + category in Figure 2). Likewise, the second most common concern was related to Stigma, phrased in the questionnaire as "what others might think, say or do", which was a serious concern for 22.3%; approximately the same proportion (21.2%) had concerns related to Knowledge, or how to find help for a mental health problem. Transport was not a problem for 78.6%, with only 11.7% reporting it negatively affected access.

Perceived barriers to accessing health care by SEP are shown in Table 2 (crude numbers are shown in Supplementary Table 2). Perceptions of Stigma did not show any significant difference across the socioeconomic groups, however measured. Lack of Knowledge was a significant problem for respondents without postsecondary education compared to those who had completed some postsecondary education (adjusted odd ratio (aOR) 2.26 confidence interval (CI) 1.1- 4.6) and for respondents with occasional (Few months), but not regular, financial strain when compared to those with no financial strain. Low SEP as measured by educational level and financial strain was associated with perceived barriers concerning Transport and Expense; whereas low SEP measured by employment status alone was associated with concerns related to Transport. The retired respondents were more likely to perceive Bad Experience as a barrier to seeking or continuing MHC compared to respondents who were working. Transport showed the greatest disparity across the socioeconomic groups.

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Table 2. Adjusted odds ratios for perceived barriers for accessing MHC by three indicators of SEP

Table 2. Adjusted odds ratios for five perceived barriers accessing mental health care by employment status, education, and financial strain

	Employment status			n	Education	aOR	CI		n	Financial strain	aOR	CI		n
Stigma	aOR	CI												
Working	1			291	3+years	1			290	Not at all	.8994	.4841	1.671	289
Temp. Not working	.9201	.4880	1.735		1 – 3 years	1.087	.5740	2.058		Few months	.8994	.4841	1.671	
Retired	.6808	.3420	1.356		No postsecondary	1.166	.5833	2.332		Half the time+	1.749	.6933	4.410	
Other	.3815	.1431	1.017		Other	.6699	.1969	2.279						
Knowledge														
Working	1			292	3+ years	1			291	Not at all	1			290
Temp. Not working	1.204	.6390	2.268		1-3 years	1.597	.8309	3.070		Few months	**2.515**	**1.335**	**4.739**	
Retired	.5003	.2480	1.009		No postsecondary	**2.263**	**1.115**	**4.592**		Half the time+	2.372	.9404	5.985	
Other	.5004	.1884	1.329		Other	**4.752**	**1.297**	**17.412**						
Expense														
Working	1			289	3+ years	1			288	Not at all	1			289
Temp. Not working	1.700	.8911	3.323		1-3 years	1.835	.9324	3.612		Few months	**4.268**	**2.172**	**8.385**	
Retired	1.537	.7451	3.171		No postsecondary	**2.773**	**1.336**	**5.757**		Half the time+	**9.623**	**2.708**	**34.194**	
Other	.7456	.2822	1.970		Other	2.031	.5762	7.156						
Experience														
Working	1			287	3+ years	1			286	Not at all	1			286
Temp. Not working	.9581	.4820	1.905		1-3 years	1.043	.5392	2.019		Few months	1.152	.5999	2.212	
Retired	**2.143**	**1.024**	**4.485**		No postsecondary	.6435	.3073	1.347		Half the time+	2.385	.9685	5.874	
Other	1.531	.5932	3.952		Other	.7503	.2024	2.781						
Transport														
Working	1			290	3+ years	1			289	Not at all	1			288
Temp. Not working	**3.184**	**1.463**	**6.931**		1-3 years	1.603	.6502	3.954		Few months	1.746	.8392	3.634	
Retired	**4.442**	**1.900**	**10.384**		No postsecondary	**2.988**	**1.187**	**7.518**		Half the time+	**9.889**	**3.745**	**26.113**	
Other	2.169	.6948	6.773		Other	1.019	.1835	5.659						

Adjusted for: gender; age +/- 60; 95% confidence intervals (CI), significant results are marked in bold

SEP showed no association with any of the barriers or with years of schooling (not shown). Using depression as independent variable, we found that severity of depression (both measured as a categorical variable and a score) was associated with perceived barriers in relation to Expense and Transport, but not associated with any other perceived barriers (see Supplementary Material Table 3).

Discussion

Principal findings

In this study of perceived barriers to accessing mental health care by respondents with present symptoms of depression, we found that expense was a considerable problem for almost 1/3 of the respondents; this perception was more prevalent among individuals without postsecondary education and individuals experiencing financial strain. Transport presented the least difficult barrier in general; but on the other hand, transportation also presented the greatest and most consistent socioeconomic disparity. Transport and expenses associated with mental health care are a problem for disadvantaged individuals.

Stigma was an issue of concern for 22% of the respondents but did not vary significantly according to SEP, whereas lack of knowledge about how to get help was a significantly greater problem for individuals without postsecondary education as compared to individuals with postsecondary education.

Lack of knowledge about how get to help and bad experience were perceived as a problem for 1/5 of the individuals overall as well.

Strengths and weaknesses of the study

A strength of this study was its use of information from a population study from a deprived area in combination with data on present depression score, information on SEP, and perceived barriers to accessing MHC; by this design we were able determine the significance of different barriers to access for potential MHC patients in a deprived area. We are not aware of similar studies.

In a recent systematic review of tools measuring help-seeking for mental health problems, Wei, McGrath and Hayden et al. found no single tool to be preferable over others, but recommended researchers consider tools according to the population studied. It seemed that the Mental Health Literacy Scale performed best as a help-seeking measurement tool for mental health, but the authors were reluctant to give general recommendations[36]. Measuring help-seeking behaviors in mental health is a relative new scholarly field and is still developing. A limitation in our study was that the items used as dependable variables were not fully validated; validation would be preferable in order to compare to other studies. The BACE-3, at 30 questions, was too extensive to use in the LOFUS study, which already consisted of close to 100 questions; this was also the reasoning behind our focus on five central concepts of barriers to access. The external validity of the questions is supported by the use of generally accepted and validated concepts of abilities and as such is comparable to other studies. The content validity was tested by the panel of patients and patients' relatives and the questions found to be sound, but in retrospect, might not measure the concept of self-efficacy very well. We used the answer Not relevant/Do not want to reply as an indicator that the individual preferred to handle problems without help. It would have been prudent, however, to ask a more direct question about perceptions of need for care; it is possible that some individuals did not find the question relevant because while they experienced mental health issues, they did not perceive a need for further care. We found no correlation between the answer to the question of relevance and SEP, except for retired respondents, who tended to state Not relevant less, compared to respondents working (not shown).

The question about transport was also not clearly separated from the question about perceived barriers in relation to expenses, as it was not specified whether expenses included transportation-related expenses. Thus, we have no clear distinction between whether Transport as a barrier is primarily a logistical or economical barrier, or some combination thereof.

Comparison with other studies
The total sample contained more respondents in the age group 50 – 69 and fewer in the age groups younger and older compared to the study population; additionally, the group without any postsecondary education was under-represented by a factor of 3, compared to the age group 15-64 in the two municipalities studied, according to general population statistics drawn from Statistics Denmark[25]. For the total sample, questions on self-rated health (SRH) were rated higher in the sample than the national levels[37] even though long-lasting illness was more prevalent in the sample (44.7% compared to national rate of 35.6%)[37]; the rate of respondents with severely limited physical functioning was close to the national proportions[38]. The group with symptoms of depression had scores well below national levels in all health-related variables. The total sample may overrepresent the middle-aged to older part of the population, an issue seen in national surveys, too[39].

7.3% had symptoms of depression when the summed MDI score was used, which is a considerably higher rate than found by any other survey in Denmark; however, a recent national survey reported that 7.0% adults suffer from depressed mood, including 7.8% in the Region of Zealand[37]. Eurostat reported a prevalence of 6.3% adults

with depressive symptoms and 3% with major depression symptoms in Denmark[40]. In the present study, 225 respondents reported both a core symptom of depression Most of the time or more and a summed MDI score >20, equivalent to a MDD prevalence of 4.4%. A comparable study by Ellervik et al. found 2.5% with a summed MDI score >25; we found 3.8%[41]. The present data is a subsample from a population survey in a deprived area, which could explain the high rate of depression symptoms found.

We found perceived stigma to be of Quite a lot or A lot of concern for 20% of the respondents. This corresponds with findings in a systematic review, where overall 20 – 25% respondents in 44 studies reported stigma as a barrier to accessing mental health services[42]. Stigma showed no association to SEP in our data. We have not been able to verify this in other studies except for one Canadian study, which likewise found no association between years of education and experiencing stigma in mental health care. However, they did find perceived stigma more prevalent among respondents not working[43]. In the Panel of Relatives and Patients of Psychiatry Services of Region Zealand, it was said that patients with mental disorders, and their relatives, pull the curtains together when they meet with each other privately, and that patients are indeed concerned with what others might think.

One in five experienced Knowledge as a barrier and had doubts about what to do to get professional help. With free access to a GP in Denmark, and the GP universally understood to be the gatekeeper for referrals, this is puzzling. Among respondents with symptoms of depression, 138 reported former or present depression, and 35 of them (25%) still answered that they experienced Knowledge to be a barrier Quite a lot or A lot of the time. Of those with symptoms of depression and presently taking antidepressant medication, 8 (12%) had doubts about what to do to get help. This could be due to the nature of the disease, but we did not find support for this, as we found no association to Knowledge with the severity of symptoms of depression. However, a Canadian study on perceived unmet need by respondents with symptoms of anxiety or depression found high symptom scores were associated with a higher degree of unmet need[7], and not knowing how or where to get help was the most reported reason. The Panel of Relatives and Patients of Psychiatry Services of Region Zealand was not very surprised by this finding: despite free access to a GP, one individual reported that he could not get a family-GP, but had to meet changing doctors in a regional clinic (due to lack of GP's in the area). Another mentioned the waiting time for an appointment with the GP could be weeks (due to lack of GP's).

It could be argued that older people may be more reluctant to use MHC and feel more stigmatized by the need for psychotherapy[44 45]. We did not find support for this, as the retired group did not differ in perception of stigma from employed persons. Likewise, older retired persons might be less willing to pay for the expenses associated with treatment, but we did not find support for this either, as expense was not a significant barrier for the group retired compared to the group working.

The expenses associated with mental health care were a common problem and concern of almost 1/3 of our respondents, and by two- to five-fold more by respondents without postsecondary education or in financial strain. Use of mental health care is sensitive to cost[46], and especially so for persons in low SEP[47]. A German study found that even with free access to a psychologist these services are used less by people in low SEP[19], which could be explained in part by our findings; people without postsecondary education may have less knowledge of how to access professional MHC, thus leading to lower usage of available services.

Experience with former mental health care treatment made retired respondents more reluctant to seek MHC as compared to the working population. This may not necessarily be due to bad experiences with health care professionals, though stigmatization can be a problem in health services too[48]; reports of past experience as a barrier could also indicate bad experience with side effects from a medication. Our study was not designed to capture or explore this nuance. Retired individuals are more likely to have more experience with health care, and this group includes people receiving early retirement pensions, which could indicate a chronic illness leading to early retirement and thus more opportunities for more bad experiences. The patient panel questioned the respondents' experience with MHC, since the rates of bad past experiences were so low; one remarking: "*Those who are really feeling bad have not participated in this survey*". For the panel, bad experience was a common deterrent to MHC, which may indicate an important area of future study.

Transport was perceived to be a greater problem by persons in low SEP compared to individuals in high SEP. This aligns well with our previous findings of the impact of distance and SEP on MHC use by patients in antidepressant treatment[21]. However, the question was not well distinguished from the question on expenses. Difficulty with transport or travelling includes the time spent to reach services and coordinate with other obligations – taking care of family duties or take time off at work, etc. Reliance on infrequent or inadequate public transportation could also be a reason to answer positively to this question, but the study was not designed to capture information regarding public versus private transportation, e.g. The patient panel was surprised that transport was a minor issue for the respondents, since it was viewed by them to be both time-consuming and expensive.

Meaning of the study and possible explanations and implication for policymakers
The study aimed to evaluate why mental health services were used less in a deprived area of Denmark and if this was due to perceived barriers for the patients and furthermore was correlated to SEP. The answer is quite clear: lack of postsecondary education was linked to greater perceived barriers to mental health care and expenses are a barrier to mental health care for those with no postsecondary education and in financial strain. Low mental health literacy, defined as knowledge and beliefs about mental disorders which aid in their recognition, management and prevention[49], could be a part of the explanation, since low mental health literacy is also associated with low SEP[50]. Thus, empowering the community to take action for better mental health literacy[51] can lead to increased help-seeking by individuals in low SEP. In Denmark, two programs on improving mental health literacy exist: Mental Health First Aid[52] and the ABC mental health initiative[53], both adopted from Australia. An approach directed more specifically toward deprived areas within such programs might improve SEP equity in mental health care treatment.

Addressing barriers and easing access for the deprived is obviously necessary. Lack of postsecondary education is associated with greater prevalence of perception of barriers to mental health care, in addition to an increased prevalence of mood disorders. Clearly, our results showed that Expense is a barrier for people in low SEP, but as found in the German study[19], people in low SEP use psychologists less frequently even with free access. Psychotherapy is associated with the ability to engage, which in itself could be more difficult if an individual struggles with social and economic problems on top of mental ones. In order to address these related barriers, the deprived and depressed probably have additional needs beyond medication and psychotherapy, such as social supports and social/domestic/workplace intervention.

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In a future study it could be interesting to investigate the association between depression score, perceived barriers and use of MHC for a period after the score. Future research could also investigate which experiences cause retired respondents with symptoms of depression to hesitate to access mental health care. Further improvements and validation of a short form questionnaire as the present could be beneficial.

Author contributions

AP conceived the research and developed and validated the questions on barriers supervised by AH. AP wrote the first draft of the manuscript assisted by LHH. AH, ES, and FBW contributed to the data analysis, interpretation of results and critical revision of the manuscript.

Data sharing: No additional data available

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Supplementary

Conceptual frame

Patients' choice of care will relate to personal preferences and abilities to access care. In a comprehensive theoretical approach by Levesque et al* they combine several theories on access to health care and final treatment outcome. The model is patient-centered and based on service demand and service supply between which they describe the stepwise fulfilment of needs in the process from recognizing a health care need to a finalized treatment. The model has five central concepts associated with enforcing or inhibiting access on the supply-side, and five corresponding abilities on the demand-side, likewise with associated enforcing or inhibiting factors.

Figure 1: Model of a conceptual framework of access to health care*
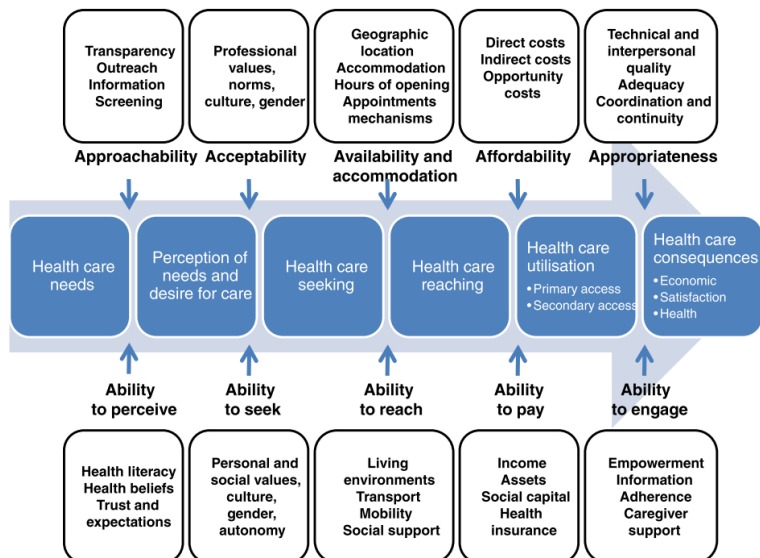
* Levesque JF, Harris MF, Russell G. Patient-centred access to health care: conceptualising access at the interface of health systems and populations. *Int J Equity Health* 2013;12:18. doi: 10.1186/1475-9276-12-18.:18-12.

Table 1. Questionnaire

Supplementary table: **Condensation of the *Barriers to Access to Care Evaluation scale (BACE v3)***

Q no	BACE v3 Question	Abilities #	Covered by question ¤
1	Being unsure where to go to get professional care	Perceive	1
2.	Wanting to solve the problem on my own	Perceive	(6)
3.	Concern that I might be seen as weak for having a mental health problem	Seek	2
4.	Fear of being put in hospital against my will	Seek	2
5.	Concern that it might harm my chances when applying for jobs	Seek	2
6.	Problems with transport or travelling to appointments	Reach	3
7.	Thinking the problem would get better by itself	Perceive	
8.	Concern about what my family might think or say	Seek	2
9.	Feeing embarrassed or ashamed	Seek	2
10.	Preferring to get alternative forms of care (e.g. spiritual care, non-Western healing / medicine, complementary therapies)	Perceive	
11.	Not being able to afford the financial costs involved	Pay	4
12.	Concern that I might be seen as 'crazy'	Seek	2
13.	Thinking that professional care probably would not help		(6)
14.	Concern that I might be seen as a bad parent	Seek	2
15.	Professionals from my own ethnic or cultural group not being available		
16.	Being too unwell to ask for help		
17.	Concern that people I know might find out	Seek	2
18.	Dislike of talking about my feelings, emotions or thoughts	Seek	
19.	Concern that people might not take me seriously if they found out I was having professional care	Seek	2
20.	Concerns about the treatments available (e.g. medication side effects)	Perceive	
21.	Not wanting a mental health problem to be on my medical records	Seek	2
22.	Having had previous bad experiences with professional care for mental health	Engage	5
23.	Preferring to get help from family or friends	Seek	
24.	Concern that my children may be taken into care or that I may lose access or custody without my agreement	Seek	2
25.	Thinking I did not have a problem	Perceive	6
26.	Concern about what my friends might think or say	Seek	2
27.	Difficulty taking time off work	Reach	
28.	Concern about what people at work might think, say or do	Seek	2
29.	Having problems with childcare while I receive professional care	Reach	3
30.	Having no one who could help me get professional care	Reach	

Clement et al. BMC Psychiatry 2012, 12:36

Development and psychometric properties the Development and psychometric properties the Barriers to Access to Care Evaluation scale (BACE) - related to people with mental ill health

\# According to model of Levesque et al. International Journal for Equity in Health 2013, 12:18
Patient-centered access to health care: conceptualizing access at the interface of health systems and populations

¤ The questions in the questionnaire of the present study

Suppl. Table 2: Perceived barriers accessing MHC & symptoms of depression, crude numbers

Stigma	Mild	Mod.	Severe	Sum	Pct (resp)
Not at all	73	50	29	152	52,2
A little	39	20	15	74	25,4
Quite a lot	16	13	10	39	13,4
A lot	10	6	10	26	8,9
NA	11	6	6	23	
Sum	149	95	70	314	291

Knowledge	Mild	Mod.	Severe	Sum	Pct (resp)
Not at all	77	50	27	154	52,7
A little	41	21	14	76	26,0
Quite a lot	20	13	16	49	16,8
A lot	2	4	7	13	4,5
NA	9	7	6	22	
Sum	149	95	70	314	292

Expense	Mild	Mod.	Severe	Sum	Pct (resp)
Not at all	84	47	27	158	54,7
A little	20	14	10	44	15,2
Quite a lot	15	14	15	44	15,2
A lot	18	13	12	43	14,9
NA	12	7	6	25	
Sum	149	95	70	314	289

Experience	Mild	Mod.	Severe	Sum	Pct (resp)
Not at all	98	58	34	190	66,2
A little	22	11	10	43	15,0
Quite a lot	15	9	8	32	11,1
A lot	4	10	8	22	7,7
NA	10	7	10	27	
Sum	149	95	70	314	287

Transport	Mild	Mod.	Severe	Sum	Pct (resp)
Not at all	117	66	45	228	78,6
A little	10	11	7	28	9,7
Quite a lot	6	4	9	19	6,6
A lot	6	6	3	15	5,2
NA	10	8	6	24	
Sum	149	95	70	314	290

Suppl. Table 3. Adjusted odds ratios for five perceived barriers accessing mental health care by severity of symptoms of depression

Dep. Grade	Stigma aOR	CI		n	Doubt how aOR	CI		n	Expense aOR	CI		n	Experience aOR	CI		n	Transport aOR	CI		n
Mild	1			291	1			292	1			289	1			287	1			290
Moderate	.8463	.4903	1.461		.9464	.5510	16.256		1.350	.7722	2.359		1.220	.6854	2.172		1.684	.8614	3.294	
Severe	1.259	.6867	2.309		1.723	.9420	3.151		**2.043**	**1.097**	**3.804**		1.739	.9220	3.279		**2.225**	**1.098**	**4.512**	
MDI-score#	1.005	.9628	1.050		1.030	.9864	10.750		**1.063**	**1.016**	**1.112**		1.035	.9891	1.083		**1.076**	**1.024**	**1.130**	

Adjusted for: gender; age +/- 60; 95% confidence intervals (CI), marked bold
Major Depression Inventory scale > 20 ≤ 50, ungrouped