Aalborg Universitet

INEQUALITIES IN QUALITY OF CARE AND CLINICAL OUTCOMES AMONG DANISH INPATIENTS WITH MAJOR DEPRESSIVE DISORDER

BY
SØREN VALGREEN KNUDSEN

DISSERTATION SUBMITTED 2021

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ENGLISH SUMMARY

Health of individuals and populations depends on a complex interplay of factors. Social inequality in health occurs when health status is systematically unequally distributed amongst social groups. A low position in the social hierarchy is often associated with a greater exposure to harmful determinants over a lifetime. One of these determinants could be the help one can get in the healthcare system when an illness strikes. The health sector could potentially alleviate some of the social inequalities by ensuring that an equally high quality of care is provided for all patients, regardless of their social position. However, the opposite might as well be true, and the healthcare system could create or enhance social inequalities by providing patients with a low social position with a corresponding lower quality of care. Therefore, is it important to investigate whether social position is associated with the quality of care provided in the health sector. Likewise, to identify high-risk patient characteristics, it is important to know whether social position is associated with differences in clinical outcomes for inpatients, including mortality, suicide, and readmission.

The overall aim of this PhD thesis was to provide insight into the association between social position and the quality of psychiatric care as well as several clinical outcomes. By conducting a systematic review, it was revealed that very few previous papers had investigated inequalities in quality of care among mental health patients, and the need for more studies was needed.

Using the rich Danish data infrastructure, a national cohort of first time admitted inpatients with clinical depression were constructed to investigate the association between socioeconomic position (education, income, and employment status) as well as migrant status with:

i)   the quality of care received defined as meeting guideline-recommended process performance measures of care, and
ii)   clinical outcomes in terms of all-cause mortality, suicidal behaviour, and readmission at 1-year follow-up.

The overall results from this thesis showed that patients with low social position had a lower chance of receiving high quality of care as well as most individual process performance measures compared to patients with high social position. However, in general, the absolute differences in care were small to moderate. Patients with low social position had a substantially increased risk of mortality following first-time hospital contact with depression, and low-level educational were associated with a higher risk of suicidal behaviour. Furthermore, low social position was associated with a lower risk of readmittance.

The findings of this thesis suggest social inequality exist in the fulfilment of fundamental care processes and treatment recommendations for inpatients with depression as well as in several clinical outcomes. This calls for a raised awareness amongst clinicians to provide the equal treatment prescribed in the code of ethics as well as in the Danish law and a need for an improved understanding of what constitutes optimal care for these more vulnerable groups.

DANSK RESUME

Individers og befolkningers sundhed afhænger af et komplekst samspil af mange faktorer. Social ulighed i sundhed opstår, når sundhedsstatus systematisk er ulige fordelt mellem sociale grupper. En lav position i det sociale hierarki er ofte forbundet med en større eksponering for skadelige determinanter i løbet af livet. En af disse determinanter kan være den hjælp, man kan få i sundhedsvæsenet, når en sygdom rammer. Sundhedssektoren kan muligvis afhjælpe noget af den sociale ulighed i sundhed ved at sikre, at alle patienter modtager sundhedsydelser (forebyggelse, diagnostik, behandling, pleje og rehabilitering) af den højeste kvalitet uanset deres sociale position. Imidlertid kan det modsatte lige så godt være sandt, og sundhedsvæsenet kan skabe eller forstærke sociale uligheder ved at give patienter med en lav social position en tilsvarende lav behandlingskvalitet. Derfor er det vigtigt at undersøge, om social position er forbundet med kvaliteten af de ydelser, som patienter modtager i sundhedssektoren. For at identificere karakteristika forbundet med en høj risiko for dårlig prognose i forbindelse med et hospitalsforløb er det ligeledes vigtigt at vide, om social position er forbundet med forskelle i kliniske konsekvenser herunder overlevelse, selvmord og genindlæggelse.

Det overordnede sigte med denne ph.d.-afhandling var derfor at give indsigt i associationer mellem social position og kvaliteten af de ydelser, der leveres i den psykiatriske behandling, samt om social position er associeret med forskelle i en række kliniske konsekvenser i forbindelse med et hospitalsforløb. Ved at foretage et systematisk review blev det påvist, at meget få tidligere videnskabelige artikler havde undersøgt uligheder i kvaliteten af sundhedsydelserne blandt psykiatriske patienter, og at der var behov for mere viden på området.

Ved hjælp af den rige danske datainfrastruktur blev en national kohorte af førstegangsindlagte patienter med klinisk depression konstrueret for at undersøge sammenhængen mellem såvel socioøkonomisk position (uddannelseslængde, indkomststørrelse og beskæftigelsesstatus) som migrant status med:

i)   kvaliteten af sundhedsvæsenets ydelser og
ii)   kliniske konsekvenser i form af overlevelse, selvmord og genindlæggelse ved 1-års opfølgning.

De overordnede resultater fra denne afhandling viste, at patienter med en lav social position havde en lavere chance for at modtage en høj behandlingskvalitet sammenlignet med patienter med høj social position. Dog var de absolutte forskelle små til moderate. Patienter med en lav social position havde desuden en væsentligt forøget risiko for 1-års mortalitet efter deres initiale indlæggelse med depression, og kort uddannelse var associeret med en højere risiko for selvmord og selvmordsforsøg. Desuden var lav social position forbundet med en lavere risiko for genindlæggelse.

Resultaterne af denne afhandling tyder således på, at social ulighed eksisterer i såvel kvaliteten af de ydelser, som patienter indlagt med depression modtager i det danske psykiatriske hospitalsvæsen såvel som for de kliniske konsekvenser efter et hospitalsforløb. Dette fordrer til en øget opmærksomhed blandt klinikere om at sikre den lige behandling, der er foreskrevet i de sundhedsetiske kodekser såvel som i den danske lovgivning samt et behov for at få en bedre forståelse af, hvordan man sikrer optimal behandling for disse mere sårbare grupper.

LIST OF PAPERS

This PhD thesis was based on the following three papers:

PAPER I

<u>Knudsen SV</u>, Rasmussen LR, Valentin JB, Mainz J, Johnsen SP. Are there inequities in the clinical quality of mental health care? A systematic review. Under preparation.

PAPER II

<u>Knudsen SV</u>, Valentin JB, Videbech P, Mainz J, Johnsen SP. Socioeconomic inequality in quality of care and clinical outcomes among incident inpatients with Major depressive disorder. Conditionally accepted by Clinical Epidemiology. 2021.

PAPER III

<u>Knudsen SV</u>, Valentin JB, Norredam M, Videbech P, Mainz J, Johnsen SP. Differences in quality of care, readmission, suicidal behaviour, and mortality among migrants and Danish-born inpatients with major depressive disorder. Submitted. 2021.

LIST OF ABBREVIATIONS

OECD   Organisation for Economic Co-operation and Development

WHO   World Health Organization

MDD   Major depressive disorder

RKKP   National Clinical Registries

DDD   The Danish Depression Database

CRP   Central Person Register number

RR   Relative risk

CI   Confidence interval

PDD   Percentage point difference

HR   Hazard rate ratio

csHR   Cause-specific hazard rate ratio

ACKNOWLEDGEMENTS

In the final year of my education as a medical doctor, I found myself quite frustrated. On the one hand, I loved working with people and found the medical profession deeply meaningful. On the other hand, I continued to find myself drawn more to investigate the structures surrounding the patient pathways than to follow the latest developments in pharmaceuticals and technology. It was probably my past as a sociologist that had caught up with me. Did I have to choose between my passion for the medical profession and my passion for working at a structural and systemic level?

Fortunately, a clever teacher sensed my frustration and put me in touch with Prof. Jan Mainz, the main PhD supervisor on this thesis. This meeting introduced me to the wonderful field of health services research, health care quality, and health equity studies. For that, for your mentorship and for the continuous inspiration you provide, I would like to express my sincerest appreciation.

To my co-supervisors, Prof. Søren Paaske Johnsen and chief statistician Jan Brink Valentin, I would also like to express my deepest gratitude. You have introduced me to clinical epidemiology and statistical modelling, and I thank you for your patience and for always providing notable, thoughtful, and constructive feedback.

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My gratitude also goes to Aalborg University and the granting agencies, including the A.P. Moller Foundation, whose financial support made it possible for me to present my research findings nationally and internationally.

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Søren Valgreen Knudsen

Aalborg, 2021.

TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION

Good health is a prerequisite for people's freedom to live the life they value, and the right to the highest attainable level of health is a fundamental human right (1). Furthermore, if large groups of citizens are hindered in their ability to participate and contribute to societal production and development because of bad health, it constitutes a substantial economic burden for society (2). This implies an imperative for society to ensure that the health of all groups should be advanced and inequalities in health should be addressed.

The need for health equality has been underpinned by global institutions like the Organisation for Economic Co-operation and Development (OECD), the World Health Organization (WHO), and the World Bank (3–5). In Denmark, reducing social inequality in health has been a specific core objective for decades, emphasized by changing governments (6–9). However, despite the year-long focus, research indicates that inequality exist in almost every aspect of health investigated (2,10–13), including mental disorders (14–16).

Depression represents one of the most prevalent health problems globally as well as in Denmark. Clinical depression, also termed major depressive disorder (MDD), is associated with an increased risk of early death, suicide, and considerable economic burden for society (17). Identifying and reducing potential inequalities in relation to depression could alleviate some of the clinical and social burdens related to the disease.

The Danish health care system provides a quite unique setting to investigate potential inequalities in MDD hospital care as well as clinical outcomes after hospital admittance. Universal health coverage ensures, in principle, free and equal access to hospital care for all Danish residents regardless of their social position (18). In addition, no private psychiatric hospitals exist (19). This singular setting creates an opportunity to assess whether equal access also implies equal quality of care for patients with a serious mental disorder such as MDD. In addition, the national health databases contain high-quality data covering the whole population during long periods of time with a unique patient identifier enabling complete follow-up, providing good opportunities to investigate potential inequalities in clinical outcomes.

CHAPTER 2. AIMS AND HYPOTHESES

2.1. OVERALL AIM AND HYPOTHESIS

The overall aim of this thesis is to examine how social factors in terms of socioeconomic position (education, income, and employment status) and migrant status are associated with two different aspects of health, namely:

1) the quality of inpatient MDD care provided at psychiatric hospitals
2) the clinical outcomes after first time admittance for MDD

The hypothesis was that patients with a low socioeconomic position or a migrant background had a lower chance of receiving high-quality inpatient hospital care compared to patients with a high socioeconomic position and patients who are native Danes.

Moreover, it was hypothesized that patients with a low socioeconomic position or a migrant background had a worse prognosis in terms of increased mortality, increased suicidal behaviour, and increased readmission rate after first time admittance for MDD compared to patients with a high socioeconomic position and patients who are native Danes. These assumptions were investigated through three papers with the following objectives:

2.2. PAPER I:

This paper aimed to identify the existing knowledge on potential inequalities in the quality of care provided in the mental health system in relation to demographic and socioeconomic characteristics.

The hypothesis was that most of the papers identify health inequalities when comparing the quality of care provided to different socioeconomic and demographic groups in the mental health care system.

2.3. PAPER II

i. To investigate how socioeconomic position in terms of education, income, and employment status were associated with the quality of inpatient care among first time admitted MDD patients as reflected by meeting the guideline-recommended process performance measures of care.

ii. To investigate how socioeconomic position in terms of education, income, and employment status were associated with clinical outcomes in terms of all-cause mortality, suicidal behaviour, and readmission at 1-year follow-up after their first-time MDD hospital admittance.

The hypothesis was that being a patient in the lowest socioeconomic position in the three dimensions investigated (education, income, and employment status) were associated with a lower chance of receiving high quality of care, as well as a worse prognosis in terms of the four clinical outcomes investigated, compared to patients in the highest socioeconomic positions.

2.4. PAPER III

i. To investigate how migrant status among first time admitted MDD patients was associated with the quality of inpatient care as reflected by meeting guideline-recommended process performance measures of care.

ii. To investigate how migrant status was associated with clinical outcomes in terms of all-cause mortality, suicidal behaviour, and readmission at 1-year follow-up after their first-time hospital MDD admittance.

The hypothesis was that being a migrant was associated with a lower chance of receiving high quality of care, as well as having a worse prognosis in terms of the four clinical outcomes investigated, compared to native Danish patients.

CHAPTER 3. BACKGROUND

3.1. MAJOR DEPRESSIVE DISORDER

Depression is a common mental illness characterized by sadness or irritability and accompanied by several psychophysiological changes, for example, decreased desire, interest and energy, disturbances in sleep, appetite and sexual desire, and suicidal thoughts (20). For the diagnosis of clinical depression (MDD), these changes must last a minimum of two weeks and in addition interfere considerably with family relations and work (20).

In Denmark, MDD is common with a lifetime risk of 17–18% (21) and a prevalence of approximately 3% (22,23). For patients with more severe symptoms and severe functional impairment, hospitalization is usually indicated (24). The annual number of cases of MDD admitted to a psychiatric hospital is approximately 11,000 (25).

MDD is a serious disease associated with an increased risk of early death and suicide, significant comorbidities, poor physical health and functioning, and occupational impairment (26–28). The treatment results are often unsatisfactory since many cases end up becoming chronic, and an increasing number of MDD patients end up receiving disability pensions (29). Depressive disorders are one of the most prevalent mental health problems and a leading cause of the burden of disease worldwide, with more than 264 million people affected (17). The WHO has projected that by 2030 depression is expected to be the largest contributor to the disease burden worldwide (30). In addition, the economic burden due to depression is substantial, mainly because of the high indirect costs caused by disability (31–34). In Denmark, the estimated cost related to the loss of production because of depression is approximately 0.5 billion US dollars per year (35).

3.2. THE DANISH HEALTHCARE SYSTEM

The Danish national healthcare system is public and provides healthcare to the entire population of approximately 5.9 million citizens (36). It is founded on the principle of equal and universal access to care for all, and this principle is underscored by universal coverage (36). Approximately 85% of all healthcare expenses are financed by taxes (36). This includes free access to general practice care, outpatient specialist care and hospital care, while co-payments are limited to pharmaceuticals and some specialist services, such as psychologist, dentistry, and physiotherapy (36).

The healthcare system is divided into three administrative levels (36). The state, through the Ministry of Health, is responsible for areas such as legislation, health financing, and national guidelines (36). The five Danish regions oversee the delivery of primary care in general practice and outpatient specialist care as well as in- and outpatient hospital care (36). Finally, 98 municipalities are accountable for public health, prevention, rehabilitation, home nursing, school health, and child dental care (36).

The healthcare system is organised into a primary and a secondary sector. The primary health care sector includes general practitioners, practising specialists, and municipalities, who provide primary care, including most cases with mild-to-moderate depression, and is usually the first point of contact if general medical treatment is needed (19,37). The secondary sector comprises both psychiatric and nonpsychiatric hospitals.

3.3. HEALTH INEQUALITY

Health of individuals and populations depends on a complex interplay of factors including genetics, upbringing, relationships, experiences, health behaviour, environment, and living conditions, as well as the help one can get in the healthcare system when the need arises. Differences in these elements can result in differences in health status (38). Social inequality in health is a scenario where health status is systematically unequally distributed amongst groups. That the differences are *systematic* entails that they remain largely unchanged, even though individuals go in and out of groups over time (38). Both internationally and in the Danish literature, a widely used conceptualization of health inequality is based on Finn Diderichsen´s model of "the mechanisms of health inequality" (2,12,39–41). Figure 1 illustrates how health inequalities can be conceptualized and analysed as different mechanisms, but also shows how these are interconnected and often are mediated through the social position of the individual.
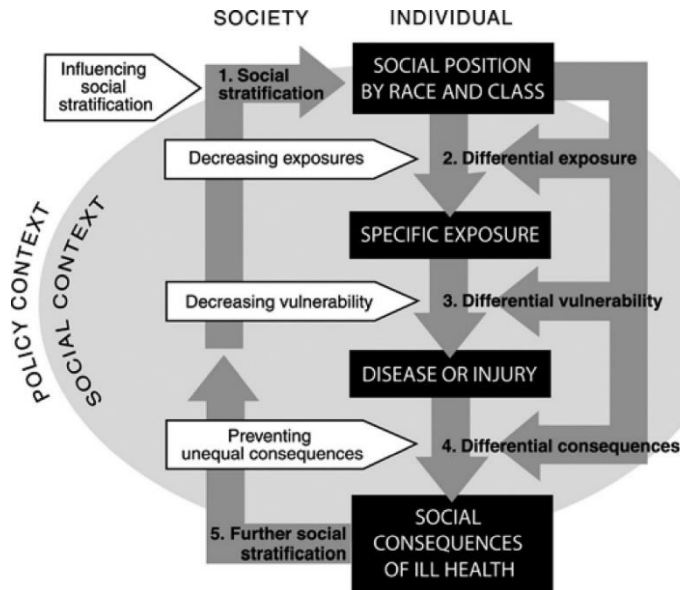
Figure 1: Modified version of Finn Diderichsen´s model of mechanisms of health inequality (39).

Social position at an individual level is influenced by early development in childhood and upbringing conditions, which again are influenced by the economic, social, and psychological conditions in the family (2,40). However, at an even more fundamental level, many of the differences are based on social stratification. The basic political and cultural structural conditions contribute to the emergence of social hierarchies in which individuals enter with different access to power, prestige, and resources (12). One type of social hierarchy may arise based on differences in *socioeconomic position*. Differences in educational level, income, wealth, and employment status can influence health, since privileges, opportunities, and access to resources are of great importance for the possibility to live a healthy life and get help when it is needed (42–44). Another type of social hierarchy can occur based on demographic characteristics, such as gender, age, ethnicity, sexuality, etc. Biases and stereotypes may result in some demographic groups not experiencing the same *social status* as the rest of society, resulting in discrimination and reduced opportunities (44). These differences in social hierarchies are important from a health perspective, because they have a major impact on the conditions in which people are born, grow up, live and age, and are often called the *social determinants of health* (10). A low position in the social hierarchy is often associated with a greater exposure to harmful determinants over a lifetime (2).

In this thesis, the position in social hierarchies, both in terms of socioeconomic position and social status, is collectively termed *social position*. Social position is investigated in terms of three characteristics related to socioeconomic position

(educational level, income level, and employment status) and one related to the social
status of a demographic characteristic (migrant status).

3.4. MIGRANT STATUS

In 2020, migrants constituted 10.6% of the approximately 5.9 million inhabitants in
Denmark, of which 56% originated from non-western countries (45). Migrants thus
constitute a significant and increasing proportion of the Danish population. Migrants
are a diverse group, consisting, among others, of refugees, family reunification
migrants, labour migrants, and students (46). Migrants represent a potentially
vulnerable group, since they could be exposed to risk factors before, during, and after
migration (46–48). Pre-migration factors include poverty, lack of access to health
care, and, for refugees, also violence and torture (46,49,50). The travel process itself
may also involve risk factors, including stress, fear, and trauma (46). Those who
migrate voluntary for higher education or as skilled labour may be spared for many of
these factors (51). However, common challenges for all migrants may be connected
to postmigration factors related to establishing life in a new country such as isolation,
social marginalisation, loss of identity, or with factors related to social status such as
discrimination, and racism (46,48,52). Regarding the health care system, all migrants
may face challenges associated with 'newness' such as language and communication
barriers as well as provider factors such as stigmatisation and lack of cultural
competencies (46,48,52,53).

3.5. ACCESS, QUALITY OF CARE AND CLINICAL OUTCOMES

A potential mediating factor between illness and its consequences is the help available
in the healthcare system when an illness strikes. While nonhealthcare determinants of
health are the primary drivers of population health in terms of morbidity and outcomes
(2,10,12,54), the literature indicate, however, that services of the healthcare system
contribute approximately 10-43% of the population health outcome (55–57).
Therefore, while the health care system does not have the power or capacity to
influence all multiple determinants of health, it nonetheless has the potential to
alleviate some of the social inequalities by addressing them directly at the point of
care (58). However, the opposite might as well be true. Just as social position is related
to the risk of getting ill, it may also be associated with differences in the help one can
get in the healthcare system. If this is the case, the healthcare system may not alleviate
health inequalities, but could instead create or enhance them. Healthcare services are
therefore also important to investigate to understand and counteract social inequalities
in health (2).

The two main factors described in relation to healthcare services are *access to care* and the *quality of care* received once contact is established (5). Access is central, since entrance to an appropriate provider is a prerequisite for receiving health services (59,60). Access is a complex problem, involving factors related to the *health seeking behaviour* of the patients, as well as the *contextual determinants*, such as the a priori *availability* of appropriate providers, the *accessibility* in terms of individual and structural barriers and *affordability* in terms of financing. Theoretical framework of access and potentially inequalities in access to health care has been developed (59–64), and numerous papers have investigated such inequalities in practice (65,66). By contrast, potential inequalities in the quality of care have not yet received similar research attention.

Another mechanism by which positions in social hierarchies can be associated with health inequality is by prognostic differences after becoming ill and hospitalised, such as mortality, suicidal behaviour, and readmissions. Since these all relate to the clinical consequences of the illness, these are collectively denoted *clinical outcomes* in this thesis.

As illustrated in Figure 2, the clinical outcomes after hospital admittance are not only affected by the quality of care provided in the health care sector, but also by the wider social determinants of health (non-healthcare determinants) as well as the access to care. Social position potentially affects all these determinants. The focus of this thesis is the association between social position and quality of care and clinical outcomes, respectively.
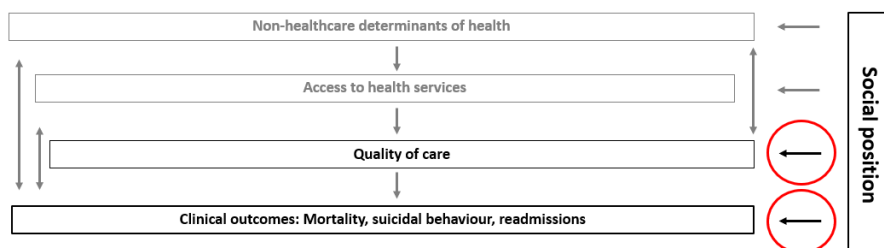
Figure 2: As marked with red circles, the focus of this thesis is the associations between social position, and the quality of hospital care as well as several clinical outcomes.

3.6. QUALITY OF CARE

Quality of healthcare services can be defined as: "*...the degree to which health services for individuals and populations increase the likelihood of desired health*

outcomes and are consistent with current professional knowledge" (5,67,68). This implies that the quality of healthcare is defined based on the extent to which the core health services increase the likelihood of achieving the desired treatment results for patients or patient groups in accordance with current evidence (69).

Quality of care can be specified in relation to the Donabedian model of *structure, process,* and *outcome* (70–72). To assess, evaluate, and improve the quality of care, specific quality measures are needed (73,74). Quality indicators are tools to monitor and evaluate how well the healthcare system serves the needs of patients and well as the extent to which patients' care is consistent with evidence-based standards of care (73,74).

Quality indicators describe and measure whether care is being provided under conditions that are conducive to the provision of good care (structure indicator), what the provider did for the patient, and how well it was done (process indicator) and the related health outcomes (outcome indicator) (73). The basic assumption is that a good structure increases the probability of good processes and thus good patient pathways, which together increase the probability that patients achieve the best outcome (70–72). The analyses in this thesis regarding the quality of care were based on process indicators, sometimes also called process performance measures.

3.6.1. QUALITY OF CARE IN THE DANISH HEALTHCARE SYSTEM

Denmark is considered a pioneer in healthcare quality mechanisms and initiatives among OECD countries (18). During the last decades, Denmark has developed and implemented a range of national quality and patient safety initiatives in the healthcare system (75,76). A centrepiece of this effort is the national clinical quality registries which monitor the quality of care for specific diseases (36). The first national clinical quality registry was established in 1976 and since then, more than 85 registries are now organized in the National Clinical Registries (RKKP) (36,76). RKKP was established in 2010 and provides a framework for the infrastructure around all clinical registries in the Danish health care system (36,76). The national clinical quality registries contain systematically collected data related to patient pathways in terms of care and outcomes expressed in clinical indicators. These clinical indicators typically reflect recommendations from national clinical guidelines and are developed by expert health professionals who have been appointed by professional organizations and scientific societies (36,73–76). All databases include patient-level data (76). The Danish national clinical quality registries have a universal framework emphasizing standardized reporting and public disclosure of data approved by the Danish national health authorities (36,73–75). At the national, regional, local, and hospital level, it is mandatory, according to Danish law, to report data to RKKP and the completeness of the individual registries is therefore high (36).

3.6.2. THE DANISH DEPRESSION DATABASE

The Danish Depression Database (DDD) is a nationwide clinical quality registry, established in 2011 (19). The objective is to monitor, document, and improve the quality of treatment and care among patients with depression (19). The steering group for the database is interdisciplinary with psychiatrists, psychologists, nurses, general practitioners, a physiotherapist, and a representative of the Depression Association, all appointed by the relevant organizations (77).

The database contains information on the quality of care, as well as admission and discharge dates for all patients admitted at Danish psychiatric hospitals with a primary diagnosis of unipolar depression when discharged (77). The database includes patients from the age of 18 with permanent residence in Denmark (19). It is mandatory by law for all Danish psychiatric hospital wards to report data to the registry and since no private psychiatric hospitals exist in Denmark, the registration of depression requiring admission is considered complete (19).

3.6.3. INEQUALITIES IN THE QUALITY OF HOSPITAL CARE

In 2001, the Institute of Medicine published its influential report, Crossing the Quality Chasm: A New Health System for the 21st Century (78). The report listed "Six Aims for improvement" which together would ensure that patients would experience high-quality care (5,78). In the two decades since the seminal report, healthcare has made progress on five of the six aims. Progress, however, on the sixth aim – equity – has lacked behind, resulting in global quality leaders calling equity the "forgotten aim" (58). A central reason for this lack of widespread progress in equity in health care quality is the lack of data infrastructure (58).

While this data infrastructure is exactly what characterises the Danish healthcare system, these data have primarily been used to shed light on the Danish regions' overall quality of care and on potential geographic variation in quality between regions and hospitals. In the 2013 report *Health Care Quality - Denmark*, the OECD recommended Denmark to use its rich data infrastructure to investigate the quality of hospital care across population groups and to monitor whether the Danish healthcare system's quality indicators were met for all patients regardless of background (18,79). However, despite this clear recommendation, a 2019 report from the Danish National Audit Office (´Rigsrevisionen´) concludes that very little progress has been made, neither from a political nor an administrative authority, in relation to making a systematic monitoring of inequalities in the quality of care in the Danish hospitals (79). Although there has been no systematic collection of data on potential inequalities

in the quality of care, several scientific studies have been conducted using data from national clinical registries to investigate potential inequalities between population groups. Studies based on this approach have found inequalities in the quality of care among patients with stroke (80), heart failure (81), and chronic obstructive pulmonary disease (82). The report from the National Audit Office also contained an analysis that showed that these inequalities contributed to a potentially avoidable excess in mortality of the most disadvantaged patients (79).

Despite these calls for action and the increasing knowledge of existing inequalities in the quality of care among somatic illnesses, it is uncertain how comprehensive our understanding of potential inequalities in mental health care is, or in other words, the social inequalities that are produced or reinforced in the clinical encounter between the mentally ill patient and the health care system.

3.7. CLINICAL OUTCOMES

3.7.1. THE DANISH HEALTH REGISTRIES

In addition to the Danish Quality Registries, Denmark has more than 100 well-developed national health registries, and a unique patient identifier termed the Central Person Register (CPR) number, which provides good opportunities to investigate potential inequalities in clinical outcomes for patients (36). In general, health databases contain high-quality data covering the whole population during long periods of time (83). The CPR number allows the individual registry to include patient-level data and enables unambiguous individual-level linkage between a vast number of national registries. It thus constitutes a valuable tool for ensuring information on important exposures, confounding factors, and health-related outcomes, helpful for national health planning and epidemiological research (36,83).

3.7.2. ALL-CAUSE MORTALITY AND SUICIDE

The associations between mental disorders and mortality have been investigated for more than 150 years (84). Large studies performed in the Nordic countries have found that life expectancy for patients with severe mental disorders, compared to the general population, generally was approximately 15 years shorter for women and 20 years shorter for men (85). Regarding depression specifically, systematic reviews have found a higher mortality related to depression both in general (26) as well as across different patient populations (86–89). In Denmark, a population-based cohort from 1995–2013 found excess mortality translated into a reduced life expectancy of approximately 14 years in men and 10 years in women among people with a diagnosis

of MDD (90). The paper found the highest mortality rate ratio for deaths due to suicide and accidents, however the highest absolute number of deaths were due to natural causes (90).

Suicide accounts for 1.4% of all deaths worldwide, which makes it the 17th leading cause of mortality (91). A previous meta-analysis reported that approximately 80% of individuals who had committed suicide had a mental disorder at the time of death (92). Approximately 40% all suicides were committed by people suffering from MDD (92) and approximately 15% patients with MDD ultimately died by suicide (93). Especially patients admitted to or recently discharged from psychiatric wards are in danger. A recent nationwide Danish register cohort study found that suicide rates among people admitted to or discharged from a psychiatric hospital were >100-fold higher than for those never hospitalized (94). The increased risk of admitted and discharged patients is found both for affective disorders in general (95,96) but also specifically for patients with MDD (94,97–99).

In this thesis, the association between social position and all-cause mortality as well as suicidal behaviour among in-patients with MDD are investigated. Theoretically, the effect of depression on mortality and suicidal behaviour may be modified by social factors in at least two ways (100). The mortality may be lower among those with a higher social position because economic and family resources, such social support and the ability to purchase care, may act as a buffer for the negative effects of depression (101). However, one can also imagine that mortality may be higher among those with a higher social position, since they may find it more challenging to fulfil expectations in relation to the family and labour market and be worse at coping with the vocational and other losses that could follow as a consequence of their illness compared to patients coming from backgrounds with lower social position who may never had such high expectations to begin with (102–104).

3.7.3. READMISSION

Hospital readmission is commonly defined as the event when a patient who has been discharged from a hospital stay (often called the index admission) is admitted again to that hospital or another hospital within a specified time frame. The most used time frames are 30-day, 90-day, and 1-year readmissions.

It has been reported that a substantial proportion of psychiatric inpatients are readmitted after discharge (105,106). A recent large Canadian study found the 30-day readmission rate for a cohort of 42,280 patients was 6.8% for mood disorders, and the 5-year readmission rate was 34.0% (107). The median time intervals between the discharge of the index admission and readmission were 227 days (107).

In this thesis, the association between social factors and readmission among patients with admittance requiring MDD are investigated. In psychiatry, readmission rates are widely used as a proxy for relapse or complications following an inpatient stay (108). However, the emphasis on the factors leading to readmission differ. Some argue that readmission rates can be considered an expression of "predischarge" factors such as the quality of inpatient care and the length of stay of the preceding hospital episode (108). This presupposes that the return to the hospital would not have occurred if appropriate care had been taken in stabilizing the patient's psychiatric status and planning for community treatment (109). If the social position influences the quality of care received at hospitalization, these differences could result in variations in readmissions. Another perspective puts emphasis on "post-discharge" events, such as continuity of care with a focus on lack of coordination or follow-up by outpatient facilities (108). Well-educated patients with a high income may have the resources to remain more compliant with treatment, rehabilitation recommendations and prescribed secondary prevention, whereas a low position could reflect a higher vulnerability. Thus, one would expect that there will be a larger proportion with low social position being readmitted. However, one can also imagine that those with a high social position have a stronger network that can help identify a potential relapse and that these patients will have the resources to gain easier access to primary care and the psychiatric system. If this is the case, one must expect an overrepresentation among those with high social position in readmission.

CHAPTER 4. LITTERATURE REVIEW AND EXISTING KNOWLEDGE

The literature search focused on identifying publications regarding the association between relevant social factors and quality of care and clinical outcomes, respectively. The association between socioeconomic position, migrant status, and several other demographic and socioeconomic characteristics and the quality of care for MDD and other psychiatric disorders are thoroughly investigated in paper I and will not be further described in this chapter. See appended paper I for further details.

The search regarding the association between social factors and clinical outcomes among MDD patients was focused on all-cause mortality, suicide/suicide attempts, and readmission. Scientific publications were searched for in PubMed with a combination of free-text and MESH terms. The search strategy included literature in English and Scandinavian languages with no restrictions on publication year. In total, 3,502 articles were screened. In addition, the reference lists of the identified papers were searched and articles matching the eligibility criteria were included.

The full search strategy can be found in Appendix A.

4.1. INEQUALITY IN MORTALITY AMONG MDD INPATIENTS

Only one paper was identified on the association between socioeconomic position and mortality (110). This paper registered patients consecutively admitted with affective disorders to a nonspecific psychiatric hospital between 1983 and 1988. Five years later, the patients were contacted again for a second interview and deaths were recorded. Overall, for affective disorders, the paper found significant differences in all-cause mortality according to educational level (p = 0.042), but not according to the unspecified variable "professional levels" (p > 0.10). No further data on direction or point values were presented in the article.

Regarding death from unnatural causes, mortality was particularly high in patients with recurrent major depressive episodes. For patients with single major depressive episodes, those with a middle educational level (SMR = 24.1 (95% CI: 5.0;70.7)) and with apprenticeship (SMR = 14.0 (95% CI: 5.0;70.7)) died significantly more often. However, mortality was not analysed for patients with the lowest educational level and unskilled workers due to the low number of observations. Regarding death from natural causes, no socioeconomic factors were associated with a higher dead rate than expected.

However, there are some serious limitations to this paper. First, the data are more than 40 years old and thus may not be relevant today. Secondly, due to their relatively small sample of 354 patients (and even fewer with MDD), it may have lacked statistical power to observe differences. Third, the cause of death was not all collected from official records, and finally the paper estimated the associations of depression and mortality through standardized mortality ratios compared with general population data external to the study sample.

While the literature search indicates that there could be an association with educational level but none with occupation, the evidence is very limited, and more research is needed. No paper on the association between migrant status and mortality among patients with MDD was identified.

4.2. INEQUALITIES IN SUICIDAL BEHAVIOUR AMONG MDD INPATIENTS

In total, ten relevant papers were identified (see Table 1) (103,111–119). Five papers assessed suicide attempts, all cross-sectional in design (111,113–115,119). Four of these investigated employment status (111,113,114,119). Among these, three found no difference between employment and unemployment among suicide attempters (111,113,119), while one found a higher percentage of unemployed (114). Three papers investigated education, and neither found a difference in relation to suicide attempts (113,114,119). Finally, one paper investigated insurance status, which can be considered a proxy for socioeconomic position, and found no difference in the association with suicide attempts (115). These studies ranged from 23 till 401 cases. One paper investigated all inpatients with mood disorders, and thus also patients with bipolar disorder (114).

One paper investigated a combination of suicide, suicide attempts, and suicide ideations termed ´suicidal activity´ (103). As an exposure, a composite measure of income and education termed ´social status´ was used. This paper used a follow-up design and found that high social status was statistically significant associated with higher suicidal activity in high-status white women compared to low-status white women, but no differences were found related to social status among black men, black women, or white males. However, the study population was very small, and the data is now more than 40 years old.

Four papers assessed suicides (112,116–118). Three of these were matched case-control studies, ranging from 85 to 135 cases (112,117,118). One of these investigated social class and found no association with low class and suicide (112). All three investigated employment status. Two found no significant association (117,118), while one found a significant positive association between paid employed and suicide

in both single variables as well as in multiple regression analysis (OR = 2.80 (95% CI: 1.48-5.32)) (112). In addition, one paper found that while employment status was not associated with suicide, losing one's job during the year prior to index admission was significantly associated in multivariate analysis (IRR = 2.9 (95% CI: 1.2-7.5) (118). The data in two of these papers were from the last century (112,118) and one was not restricted to MDD patients but included all affective disorders (118).

The last paper identified was a recently published nationwide register-based cohort study from Finland with 56,826 first-time hospitalized patients with MDD included, of which 2,587 committed suicide (116). It found that higher educational and income levels predicted future suicide.

The overall findings indicate that socioeconomic factors are not associated with suicide attempts, even though these findings build on rather weak evidence. In contrast, there is seemingly rather robust evidence that baseline higher socioeconomic status in terms of longer education and high income predicts a higher risk of suicide among MDD inpatients. No paper on the association between migrant status and suicide among patients with admittance requiring MDD was identified.

Table 1: Summary of identified studies on the association between social position and suicide attempts/suicides among admittance required MDD patients

Author, publishing year, country	Study design	Size, population, diagnosis, setting, and period	Exposure, outcome	Main results	Limitations
Suicide attempts					
Gastel et. al., 1997, Belgium	Cross-sectional	338 inpatients (63 suicide attempters (SA), 275 non-suicide attempters (NSA)) with MDD, consecutively admitted at the Department of Psychiatry of the University Hospital of Antwerp between 1986 and 1994	**Exposure** Employment **Outcomes** Suicide attempts during the index depressive episode, serious enough to warrant admission to hospital	**Employment** (Chi-square test) No significant difference was found between employed (23%) and unemployed patients (17%) $\chi^2=1.4$	Last century data Uncertain source of outcome Cross-sectional study, which cannot establish the causal relationship
Chan et al, 2011, Malaysia	Cross-sectional	75 (23 SA, 52 NSA) inpatients with a depressive disorder, 18 - 76 years, consecutively admitted to the National University of Malaysia Medical Centre between 2007 and 2008.	**Exposures** Employment Education **Outcomes** Suicide attempt one month prior to baseline assessment	**Education** (Chi-square test) No statistically significant difference was found between suicide attempters with high educational level (91.3%) and non-suicide attempters with high educational level (86.5%). χ^2 data not reported in article.	Small sample size Lack of validated self-report scales Possible selection bias Cross-sectional study, which cannot establish the causal relationship

				Unemployment (Chi-square test) No statistically significant difference was found between unemployed suicide attempters (43.5%) and unemployed non-suicide attempters (42.3%). χ^2 data not reported in article.	
Brown et al., 2016, USA	Cross-sectional	692 (401 SA, 291 NSA) adult inpatients with MDD consecutively admitted at Butler Hospital in Providence in 2013	**Exposure** Insurance status **Outcomes** Suicide attempt history before admission Multiple suicide attempts history before admission	**Insurance Status** (Chi-square test) No statistically significant difference was found between insurance status and suicide or multiple suicide attempt history. No χ^2 data provided in article, p = 0.069	Cross-sectional study, which cannot establish the causal relationship
Ma et al., 2019, China	Cross-sectional	288 (58 SA, 230 NSA) MDD inpatients, 18 - 78 years (only Han Chinese) consecutively admitted at Central South University Xiang-Ya Second Hospital between June 2016 to May 2017.	**Exposures** Unemployment Education (years) **Outcome** Suicide attempts in the last month before admission	**Unemployment** (Chi-square test) No statistically significant difference was found between unemployed non-attempters (32.61%) and unemployed attempters (44.83%) $\chi^2 = 3.04$, p = 0.08	Cross-sectional study, which cannot establish the causal relationship Comparatively small sample size in this study Limited to one area and cannot be generalized

			Education (Mann–Whitney nonparametric test) No statistically significant difference was found between educational length among non-attempters (avg. 12 years) and educational length among attempters (avg. 12 years) $z = -1.74$, $p = 0.08$	Possible information bias due to collection of information through a research interview
Brioschi et al, 2020, Italy	Cross-sectional	93 (48 SA, 45 NSA) Inpatients, >18 years, affected by a mood disorder with an education level beyond primary school, consecutively admitted at the Mood Disorder Unit of the San Raffaele Turro Hospital in Milan between May 2017 and May 2018	**Exposures** Unemployment Education (years) **Outcome** Previous suicide attempts	**Employed** (Chi-square test) A statistically significant difference was found between employed NSA (84.4%) and employed SA (60.4%) $\chi^2 = 6.6$, $p < 0.05$ **Education** (t-test) No statistically significant difference was found between years of education among SA and NSA $t(91) = 0.217$, $p > .10$ No further data are provided in the article.	Not restricted to MDD Retrospective recall of suicide attempt data Only volunteers (risk of selection bias) Small sample size

'Suicidal activity'				
Kaplan et al., 2019, USA	Follow-up	144 inpatients with MDD, 16-32 years old admitted in two Chicago-area hospitals in the "late 1970's and early 1980'"', followed up at six periodic intervals till 20 years after index hospitalization	**Exposure** Social status (Income and education) **Outcome** "Suicidal activity" at a given follow-up (completed suicide, attempted suicide, or showed serious suicidal ideation)	**Social class** (Chi-square test) White woman: High status (50%), low status (21%). $\chi^2 = 6.30$ (p<0.01) Black men: High status (0%), low status (0%). "No variance" (no data presented in article) White male: High status (28%), low status (42%). $\chi^2 = 0.62$ (non-significant) Black female: High status (40%), low status (60%). $\chi^2 = 0.56$ (non-significant)	Small sample Last century data Unmatched
Suicides				
Sinclair et al., 2005, UK	Retrospective matched case control	322 (127 cases, 195 controls) inpatients with MDD who committed suicide during admission or within 1 year post-discharge at the former Wessex Health Authority of England between 1988–1997.	**Exposures** Social class Employment **Outcome** Suicide	**Social class** (Single variable analysis conditional logistic regression) Social class IV or V: Cases (26%), controls (25%). OR = 0.57 (95% CI, 0.21- 1.54)	Last century data

			Employment (Single variable analysis conditional logistic regression) Paid employment: Cases (40%), Controls (26%). OR = 2.03 (1.20, 3.44) (Multivariable analysis conditional logistic regression) OR = 2.80 (95% CI, 1.48- 5.32)	
Lin et. al., 2008, Taiwan	Matched case control	510 (85 cases, 425 controls) inpatients with MDD, who committed suicide within a 90-day period post-discharge nationwide in Taiwan during 2002-2004.	**Exposure** Employment **Outcome** Suicide	**Employment status** (Chi-square test) Unemployed: Cases (28.2%). Controls (31.8%). Part-time employed: cases (22.4%). Controls (28.9%) Full-time employed: Cases (49,4%). Controls (39.3%) χ^2= 3.157, p = 0.206	Paper comparing separate labour market status groups not between groups of different social position

Study	Design	Population	Exposures / Outcome	Results	Notes
Høyer et al., 2009, Denmark	Matched case-control	270 (135 cases, 135 controls) inpatients with affective disorder, >17 years, who committed suicide during admission or within 1 year post discharge nationwide in Denmark in 1994 and 1995.	**Exposures** Employment Loss of job during the year prior to the index admission **Outcome** Suicide	**Employment** (Single variable analysis conditional logistic regression) Unemployed: Cases (19%), controls (12%). Employed: Cases (25%), controls (26%). Retired: Cases (56%), controls (62%) IRR not presented in article. All results non-significant. **Loss of job** (Single variable analysis conditional logistic regression) Yes: cases (19%), controls (10%). IRR: 2.9 (95% CI, 1.2-7.5) (Multivariable analysis conditional logistic regression) Yes: IRR: 2.94 (95% CI, 1.16-7.46)	All affective disorders Last century data Paper comparing separate labour market status groups not between groups of different social position Only few (38 pairs) with all matching criteria met
Aaltonen et al., 2019, Finland	Register-based cohort	56,826 (2,587 suicides) first-time admitted inpatients with MDD, ≥18 years, nationwide in Finland in the period 1991–2011. Follow-up until death or end of the year 2014 (maximum 24 years)	**Exposures** Education Income **Outcome** Suicide	**Education** (Cox proportional hazard Regression multivariable-adjusted models) Basic = 1 (ref) Upper secondary aHR = 1.147 (95% CI, 1.049-1.253) Tertiary or higher: aHR = 1.295 (95 CI, 1.160-1.445)	

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Income (Cox proportional hazard Regression multivariable-adjusted models)
Lowest third: aHR = 1 (ref). Middle third: aHR =1.065 (95% CI, 0.961-1.180) Highest: aHR = 1.065 (95% CI, 0.961-1.180)

4.3. INEQUALITIES IN READMISSIONS AMONG MDD INPATIENTS

In total, three relevant papers were identified investigating inequalities in readmission between MDD inpatients (24,120,121), and one additional paper investigating inpatients with mood disorders were also included, due to its strong study design (see Table 2) (107).

The three papers investigating MDD inpatients were all cohort studies. One paper included adolescents aged 13–19 and concluded that maternal/paternal education was a nonsignificant predictor of rehospitalization (120). However, this study design was limited by only assessing readmissions to the same service to which participants originally were admitted, and thus may underestimate the rate of total readmission. Among the papers on adult MDD inpatients, one found no association with income or employment (121) while the other found an increased risk among the unemployed in univariate analyses (HR = 1.5 (95% CI: 1.07-2.2)) (24). However, this association became nonsignificant in the multivariate regression analysis. These papers were rather limited, one by design with problems of loss to follow-up and non-standardised methods for diagnosis (24) and one by design where the exposure data were collected at survey interviews occurred six years on average prior to the index MDD admission as well as problems of substantial missing data on the predictors (121).

The last paper was a well-designed, large cohort study from Canada with 18,876 relevant inpatients, followed for five years (107). The paper found no significant association between education and readmission for 30-days or 5-year readmittance risk but found a significant higher odds ratio for both outcomes in patients who were unemployed. However, the paper included all mood disorders, and not just MDD.

The overall findings indicate that education is not associated with readmission risk among MDD patients, while employment status is more unclear. No paper on the association between migrant status and readmittance among patients with admittance requiring MDD was identified.

Table 2: Summary of identified studies on the association between social position and readmission among MDD patients

Author, publishing year, country	Study design	Size, population, diagnosis, setting, and period	Exposure, outcome	Main results	Limitations
Lin et al., 2007, Taiwan	Cohort study	300 inpatients with MDD, aged >17 admitted to the Kai-Suan Psychiatric Hospital between 2002 and 2003. Follow-up = 1 year.	**Exposure** Employment **Outcome** 1-year readmission	**Unemployed** (Cox regression) Univariate regression: HR = 1.529 (95% CI, 1.072–2.18), p = 0.019. Forward multivariate regression: Non-significant. No further data provided in the paper.	All subjects coming from the same hospital. High number lost to follow-up (72 patients) Diagnoses were based on clinical impressions and not using structured instruments for Axis I or II diagnosis
Innes et. al., 2015, UK	Cohort study	530 first-time admissions for MDD in Scotland between 1995 and 2011. Mean follow-up time = 4.4 years.	**Exposures** Income Employment **Outcome** Readmission	**Income quintile** (Cox regression) 1: Highest quintile (zero outcome events) 2: Reference 3: aHR = 1.60 (95% CI, 0.41–6.25) 4: aHR = 1.82 (95% CI, 0.51–6.48) 5: aHR = 0.99 (95% CI, 0.26–3.73) Missing: 0.91 (95% CI, 0.32–2.65) **Working in the last 4 weeks** (Cox regression) Yes: Reference No: aHR = 0.94 (95% CI, 0.39–2.26) Missing: aHR = 0.62 (95% CI, 0.28–1.36)	Exposure data from the survey interview that took place 6 years (on average) prior to index MDD admission. Substantial missing data for some predictors (more than 25% of participants were missing data on income quintile)

van Alphen et. al., 2017, not specified.	Cohort study	165 adolescents aged 13–19 years with current MDD at an acute residential treatment program (not specified) between 2013 and 2014. Follow-up = 6 months	**Exposure** Maternal/ paternal education **Outcome** Readmission to the same residential service	**Maternal/paternal education** (Cox regression) Nonsignificant. No further data provided in the paper.	Only assessed readmissions to the same short-term residential service to which participants were originally admitted.
Chen et. al, 2018, Canada	Cohort study	18,876 aged 16 years or older, first time admitted inpatients diagnosed with mood disorders in Ontario between 2005 and 2015. Follow-up = 5 years.	**Exposures** Education Employment **Outcomes** 30-day and 5-year readmission rates	**Education** (Multivariate logistic regression) Low level education (<high school): Reference Higher level education (>high school): 30 days: OR = 0.93 (0.81-1.07) 5 years: OR = 1.05 (0.98-1.13) **Employment** (Multivariate logistic regression) Employed: Reference Unemployed: 30 days: OR = 1.53 (1.35-1.73) (p< 0.001) 5 years: OR = 1.71 (1.60-1.82) (p< 0.001)	No separate data on MDD patients

SUMMARY OF FINDINGS

Overall, the literature review revealed that no papers on associations between being a migrant and the clinical outcomes related to admittance for MDD compared to a native born patient, were identified. Furthermore, the existing literature is rather limited on the association between socioeconomic position and all-cause mortality, with no papers investigating the association with MDD as a specific disorder. The association with readmission is also sparse, with most of the identified papers having serious design limitations or not containing specific data on MDD patients. While several papers investigated the association with suicide, most used a cross-sectional design, and many were based on data from the last century. The most robust finding was a Finish cohort study, which found a significant association between higher socioeconomic position in terms of longer education and high income with a higher risk of suicide among MDD inpatients.

Hence, there is a need for well-designed studies taking into consideration some of these weaknesses and provide new knowledge to fill out the wide gaps where knowledge is lacking.

CHAPTER 5. PAPER I

This chapter is based on the paper "*Are there inequities in the clinical quality of mental health care? A systematic review*" by Knudsen SV, Rasmussen LR, Valentin JB, Mainz J and Johnsen SP, currently under preparation. The full article is available as appended paper I.

5.1. AIM

This paper aimed to identify the existing knowledge on potential inequalities in the quality of care provided in the mental health system in relation to demographic and socioeconomic characteristics.

5.2. METHODS

A systematic review was conducted. The target was peer-reviewed papers presenting original quantitative data on potential inequalities in the quality of mental healthcare provided to patients with psychiatric disorders in the psychiatric treatment regimen (general practice, inpatient, and outpatient care) (122). The search was planned and performed in collaboration with subject specialists and librarians. For further details on the search strategy and screening process, see appended paper I. As a result of the many different potential populations and outcomes, no meaningful meta-analysis of the data could be conducted, and the results were presented as a narrative synthesis of the findings from the included papers (122).

5.3. RESULTS

A total of 5,549 publications were screened for eligibility (122). Among them, 77 were assessed as full-text papers. In total, three papers were included in the analysis (122–125). Among these papers, which included investigations of twenty-two combinations of indicators and patient characteristics, only one statistically significant difference in the clinical quality of care in the mental health care system was identified (122). Here, younger age (< 65 years) was associated with a lower quality of care in terms of higher odds of receiving potentially harmful concomitant antipsychotic therapy in outpatient visits. No papers have assessed inequalities based on sexual preferences, geographic location, marital status, comorbidity, migrant status, or other demographic or socioeconomic characteristics (122). For further details on the three identified papers, see appended paper I.

5.4. DISCUSSION

5.4.1. MAIN RESULTS

The main finding is that research about potential inequalities in the clinical quality of care of mental health care services is very restricted as only three papers were identified (122). The identified papers investigated twenty-two combinations of quality indicators and patient characteristics. Among these, only one statistically significant difference was found.

5.4.2. COMPARISON WITH THE EXISTING LITERATURE

Paper I was, to our knowledge, the first of its kind to investigate potential inequalities in the quality of care provided in the mental health care system in relation to demographic and socioeconomic characteristics.

5.4.3. METHODOLOGICAL CONSIDERATIONS

The search was ended in June 2018 where this study was conducted. Furthermore, the review was restricted to papers published in English and Scandinavian languages. Thirdly, the review did not cover all mental health problems, with illnesses such as dementia and substance abuse omitted.

The aim of the paper was to investigate the extent of papers focusing on the inequalities in the quality of care with a clear accountability in the mental health care system. Therefore, a central criterion for this review was that only papers using process indicators measured in the clinical encounter between the patient and the health care system were included. Other types of indicators exist, and more papers could have been included if less rigorous criteria had been applied. For example, measures of utility, access, and continuity of care could have been included. However, while these measures are highly relevant to understand and reduce potential health inequalities, differences in these indicators cannot solely be attributed to the health care system (126,127). For example, patients with severe mental illness have a no-show rate for scheduled appointments as high as 50% (128), which are also influenced by factors outside of the direct influence of the health care system. For further details on methodological considerations, see appended paper I.

5.5. CONCLUSION

Even though the call for equality in health care has been a global imperative for decades, paper I revealed that only few, sporadic studies on clinical quality with a clear accountability in the mental health care system have been published. It is remarkable that, despite widespread international attention to these issues, so few papers were available. This makes it impossible to draw any general conclusions regarding social predictors of poor quality.

CHAPTER 6. PAPER II

This chapter is based on the article "*Socioeconomic inequality in quality of care and clinical outcomes among incident inpatients with Major depressive disorder*" by Knudsen SV, Valentin JB, Videbech P, Mainz J and Johnsen SP, currently conditionally accepted by Clinical Epidemiology. The full article is available as appended paper II.

In this chapter, a special focus is placed on comparison with the existing literature as well as methodological considerations, as these are unfolded substantially more in the thesis than in the appended paper.

6.1. AIMS

i. To investigate how socioeconomic positions in terms of education, income, and employment status were associated with the quality of inpatient care among first time admitted MDD patients as reflected by meeting the guideline-recommended process performance measures of care.

ii. To investigate how socioeconomic positions in terms of education, income, and employment status were associated with clinical outcomes in terms of all-cause mortality, suicidal behaviour, and readmission at 1-year follow-up after their first-time hospital MDD admittance.

6.2. METHODS

6.2.1. STUDY POPULATION AND DATA SOURCES

The study populations were identified from the Danish Depression Database. The population comprised all adult inpatients (≥18 years old), treated for MDD at a Danish hospital, recorded in the database between 2011 and 2017 (129). Only patients with a first time admission for MDD was included. For further details on the study population, see appended paper II.

The data sources were The Danish Civil Registration System, The Danish National Patient Register, The Register of Causes of Death and Statistics Denmark. For further details on the data sources, see appended paper II.

6.2.2. EXPOSURE VARIABLES

Paper II investigated social position in terms of educational level, income level, and employment status (129). Educational level was categorized as low, middle, or high. Family income was chosen as a measure of income level to best reflect the person's actual living conditions and consumption opportunities. Employment status was categorized as either employed, receiving public benefits (unemployed, sick leave, and early retirement), pensioners, and students. For further details, see appended paper II.

6.2.3. OUTCOME VARIABLES

Nine process performance measures were used as outcome variables for the quality of inpatient care. These measures reflect recommendations from national clinical guidelines by the Danish Health Authority (19,21,75). See Table 3 for more details on the measures.

Quality of MDD care was defined as the fulfilment of the individual process performance measures of care as well as a dichotomous indicator of receiving a general high quality of care defined as fulfilment of 70% or more of the eligible performance measures (129).

Four clinical outcomes were investigated. *All-cause mortality* was defined as all deaths occurring up to 365 days after hospital admission. *Suicidal behaviour* was defined as suicide or intentional self-harm up to 365 days after hospital admission. *Readmission for depression* was defined as readmission within 365 days after discharge with a primary diagnosis of MDD. *All-cause readmission* was defined as any readmission within 365 days after discharge (129).

Table 3: *Inpatient performance measures in the Danish Depression Database.*

	Indicator	Definition
1	Examination by psychiatrist	Indication of whether the patient's psychopathological assessment was performed by a specialist in psychiatry within seven days after admittance to the hospital ward.
2	Somatic examination	Neurological examination, relevant laboratory tests and other examinations within two days of admittance.
3	Assessment by social worker	Assessment of need for acute or longer-term support, such as help with changing housing, financial help to purchase medicine, educational guidance, rehabilitation, and application for disability benefits.
4	HAM-D17[a] assessment (In)	Initial assessment using HAM-D17 within seven days of admittance.
5	HAM-D17[a] assessment (Out)	Assessment using HAM-D17 at discharge from hospital.
6	Suicide risk assessment (In)	Using structured interview at admittance for suicide risk assessment.
7	Suicide risk assessment (Out)	Clinician's assessment of the patient's risk of suicide when discharge from hospital is planned.
8	Contact with relatives	Staff have established or tried to establish contact with the patient's relatives during hospitalization.
9	Psychiatric aftercare	Planned follow-up in out-patient clinic or at the general practitioner after discharge for inpatients.

[a]HAM-D17: Hamilton depression scale (17-item version).

6.2.4. POTENTIAL CONFOUNDERS

Relevant covariates were identified a priori using directed acyclic graphs and included age, sex, substance/alcohol abuse, and migrant status (129). A supplementary analysis that adjusts for regional residence was performed. See appended paper II for further details.

6.2.5. STATISTICAL ANALYSIS

The fulfilment of the individual performance measures as well as the dichotomous composite score for high-quality care were examined using Poisson regression models with robust error variances, reporting relative risk (RR) with corresponding 95% confidence intervals (CI) (129). This analysis was repeated to assess the robustness of the findings by using alternative cut points of 60% and 80%.

The associations between the three indicators of socioeconomic position and clinical outcomes were assessed with adjusted Aalen-Johansen cumulative incidences using inverse probability of treatment weights and bootstrapped to derive 95% CIs of the RR at 365 days follow-up (129).

All calculations were done in three models. Model 1 was crude. Model 2 was partly adjusted by including sex and age. Model 3 were fully adjusted by additionally including migrant status and substance/alcohol abuse. For further details on statistical analysis, see appended paper II (129).

6.3. RESULTS

Generally, the chance of receiving a high quality of care was low for all, regardless of social position, ranging from 26.7% to 38.6% as illustrated in Figure 3 (129). However, compared with the groups with high socioeconomic position, having a low position was associated with a significantly lower change of receiving high quality of care in all three dimensions of socioeconomic position. Similar results were in general found in the crude and partly adjusted models as well as in the sensitivity analyses with alternative cut-offs of 60% and 80% (129). In the analyses of the individual process performance measures, a similar overall pattern was observed, with low social position generally associated with a lower chance of fulfilment of the individual performance measures (129). For further details on these results, see appended paper II.

Compared with patients with high socioeconomic position, having a low position was associated with a higher risk of 1-year all-cause mortality in all three dimensions of socioeconomic position as illustrated in Figure 3 (129). Low position was also associated with a higher risk of suicidal behaviour among patients with low-level education, while no statistical or clinically significant difference for patients with low income was found, and a reduced risk for patients with public benefits was found (129). Having a low socioeconomic position was associated with a significantly lower risk of 1-year readmittance for MDD in all three dimensions of socioeconomic position, while not associated with an increased risk for 1-year all-cause readmittance (129). In the sensitivity analyses, additionally adjusting for regional residence did not change the overall results. Using income as a continuous variable when used as exposure, did not change the overall associations neither (129). For further details, see appended paper II.

	Prop. (%)	RR (95% CI)
High quality of care		
Low-level education	31.07	0.91 (0.85-0.99)
Middle-level education	33.33	0.99 (0.92-1.06)
(ref. high-level education)	32.96	
Low-income tertile	31.07	0.89 (0.83-0.96)
Middle-income tertile	32.58	1.00 (0.93-1.06)
(ref. high-level income)	33.18	
Public benefit	26.66	0.91 (0.84-0.97)
Pension	38.58	1.01 (0.90-1.13)
Student	30.27	1.00 (0.87-1.15)
(ref. employed)	32.79	
All-cause mortality		
Low-level education	4.85	1.22 (0.91-1.62)
Middle-level education	3.55	1.04 (0.82-1.32)
(ref. high-level education)	3.67	
Low-income tertile	6.21	1.65 (1.09-2.50)
Middle-income tertile	3.92	1.14 (0.76-1.71)
(ref. high-income tertile)	2.23	
Public benefit	2.53	1.26 (0.84-1.88)
Pension	10.22	1.35 (0.62-2.93)
Student	0.57	0.29 (0.11-0.78)
(ref. employed)	2.00	
Suicidal behaviour		
Low-level education	5.79	1.28 (0.97-1.68)
Middle-level education	4.55	1.05 (0.78-1.41)
(ref. high-level education)	4.19	
Low-income tertile	4.60	1.05 (0.75-1.45)
Middle-income tertile	5.44	1.20 (0.96-1.49)
(ref. high-income tertile)	4.64	
Public benefit	5.82	0.92 (0.71-1.19)
Pension	2.78	1.07 (0.39-2.93)
Student	7.31	0.90 (0.46-1.80)
(ref. employed)	5.19	
Readmission - MDD		
Low-level education	42.14	0.91 (0.86-0.97)
Middle-level education	46.10	0.97 (0.91-1.03)
(ref. high-level education)	48.25	
Low-income tertile	41.74	0.90 (0.84-0.97)
Middle-income tertile	44.94	0.94 (0.89-0.99)
(ref. high-income tertile)	48.79	
Public benefit	41.23	0.89 (0.83-0.95)
Pension	43.71	0.82 (0.72-0.94)
Student	45.74	0.89 (0.73-1.09)
(ref. employed)	48.30	
Readmission - All		
Low-level education	83.94	1.02 (0.99-1.04)
Middle-level education	83.92	1.02 (1.00-1.05)
(ref. high-level education)	81.94	
Low-income tertile	83.81	0.99 (0.97-1.02)
Middle-income tertile	83.46	0.99 (0.97-1.01)
(ref. high-income tertile)	83.39	
Public benefit	84.64	1.02 (0.99-1.05)
Pension	84.83	1.01 (0.96-1.07)
Student	83.57	1.02 (0.94-1.10)
(ref. employed)	82.20	

-1.5 -1 -0.5 0 0.5 1 1.5 2 2.5 3 3.5

Figure 3: Proportions and fully adjusted relative risk for high quality of care and four clinical outcomes according to educational level, income level, and employment status. All models are adjusted for sex, age, migration status, and substance/alcohol abuse. Analyses with employment status as exposure are in addition also adjusted for educational level, while analyses with income as exposure are also adjusted for employment status.

6.4. DISCUSSION

6.4.1. MAIN RESULTS

Lower quality of in-hospital care was provided for patients in the lowest of all three dimensions of socioeconomic position examined (129). Furthermore, the same patient characteristics were associated with a worse prognosis in terms of higher risk of all-cause mortality within a year after discharge, while being associated with a lower risk of readmission due to MDD (129).

6.4.2. COMPARISON WITH THE EXISTING LITERATURE

Socioeconomic position and all-cause mortality

We only managed to find one paper investigating the association between socioeconomic position and all-cause mortality (110). This paper found a higher standardized mortality ratio among patients with middle-level education. This finding is inconsistent with the results in paper II. However, the former paper was characterised with some serious methodological limitations, as described in the Background section.

Socioeconomic position and suicidal behaviour

Compared with patients with high socioeconomic position, having a low position was associated with a higher risk of suicidal behaviour among patients with low-level education. This finding is neither in alignment with previous papers investigating suicide attempts, which found no association with education (113,114,119), neither with the previous paper investigating suicide, which found an association between high-level education and suicide (116).

Regarding low income, no difference in suicidal behaviour was found in paper II. This is in alignment with a previous paper on suicide attempts (115) but not with a previous paper on suicide, which found a higher risk among high-income patients (116).

Finally, a reduced risk of suicidal behaviour was found for patients on public benefit. The findings are inconsistent with previous papers which found either no association (111,113,117–119) or a higher percentage of unemployed (114) and one found a significant positive association between paid employed and suicide (112).

The most robust of the previous papers identified, a large Finish cohort study, found a significant association between long education and high income with a higher risk

of suicide among MDD inpatient. These findings are not consistent with the results in this thesis, even though the two countries in many ways are similar. A possible explanation for this discrepancy could be that suicidal behaviour in Paper II included both actual suicides as well as suicide attempts. However, this discrepancy calls for further studies.

Socioeconomic position and all-cause readmittance

Compared with patients with high socioeconomic position, having a low social position was not associated with any difference in risk for 1-year all-cause readmittance in any of the three dimensions of socioeconomic position. No previous paper investigating all-cause readmission was identified.

Socioeconomic position and readmittance for depression

Compared with patients with high socioeconomic position, having a low social position was associated with a statistical significantly lower risk of readmission due to depression in all three exposures. This is inconsistent with previous papers among adult MDD inpatients, which found no association with income or employment (24,121). However, differences in financing, organization, and access to care may all influence readmission and may complicate the comparability of these findings across health care systems.

6.4.3. METHODOLOGICAL CONSIDERATIONS

Since paper II was designed as a nationwide population-based cohort study, the observational design may have affected the accuracy and validity of the results due to potential systematic or random errors. Methodological considerations are therefore needed.

Selection bias

Potential selection bias, a systematic error that can occur from the procedures used to select subjects and factors influencing study participation, should be considered (130). The study population were identified from a national clinical registry with data from all public hospitals in Denmark. As no private psychiatric hospitals exist in Denmark, patients requiring inpatient MDD care are exclusively admitted to public psychiatric hospitals (46,129). Since treatment in public hospitals is free of charge for Danish

residents (18), in theory, there should be no difference in access to psychiatric care, regardless of social position and personal resources (129,131). Thus, in principle, everyone with the need for hospitalization for MDD is also admitted. Since it is mandatory for all public hospitals to report to these registries, the coverage of hospital contacts for severe mental disorders is considered complete (19,46). The probabilities of systematic exclusion of specific groups of patients with MDD are therefore considered very limited.

Information bias

Information bias, a systematic error that could occur if information collected about or from study subjects is incorrect, should also be considered (130). Overall, the paper was based on information registered prospectively in Danish registries and independently of the study hypotheses, which reduce differential misclassification. However, the potential information bias in different data sources is discussed below.

Using the unique personal identifier to enable linkage between public registries with very high data completeness (132) and where the coverage and validity of data in general are deemed to be high (133–135) should principally ensure high data coverage on sociodemographic variables. In general, the missing values on demographic and socioeconomic variables were very low (129).

Most sociodemographic variables were categorized according to predefined cut points. In most of these variables, formal standards were used. However, the income variable was categorized in tertiles to make easily understandable comparisons with the other exposure variables. This may have introduced a potential bias properly towards the null in the Danish context, where only 6% of the population live in relative income poverty (136). To account for this potential bias, a sensitivity analysis was performed investigating the associations between income as a continuous variable, coded as splines with four knots, and high quality of care as well as the associations with the four clinical outcomes. This analysis confirmed the pattern found in the primary analyses, although some statistical imprecisions among the households with the lowest incomes were observed.

The data on fulfilment of the process measures was collected at multiple sites during routine clinical practice. Many health professionals are involved in this data reporting to the Danish Depression Database, and intra- and inter-observer variations as well as errors and differences in registration or coding practice may occur. Extensive efforts are made to ensure data uniformity: Detailed guidelines with explicit data definitions included in standardized registration forms are used, key health care professionals in each hospital department are designated to be responsible for data collection and accuracy, and regular multidisciplinary structured clinical audits are carried out on a local, regional, and national basis to ensure data validity and uniformity with

continuous feedback provided to the hospital departments (75,76). Nonetheless, problems regarding the completeness of some of the data reported by the clinicians have been described (19). As all data are reported entirely through diagnosis codes and codes for clinical procedures in the Danish Depression Database, the process performance measures are only registered as being performed or not (129). Since "missing" data are registered as "not performed", it is not possible to determine whether a particular clinical procedure was not being performed or simply not being reported and thus misclassification bias could be introduced. This unknown proportion of patients with missing data could have two implications. The first is that since patients with missing information are considered to have received care not meeting the performance measures, the data are likely to give a conservative estimate of the true association (129). Secondly, if the proportion of patients with missing data on quality of care differs according to socioeconomic background, the findings on inequality could also be biased (129). However, information on these factors is typically not easily available for the staff involved in the registration process. Thus, it seems most likely that the missing registrations are randomly distributed according to socioeconomic background (129). In addition, the same pattern of social position being associated with a lower quality of care was observed throughout the nine separate quality measures, which supports the assumption that the incompleteness of process data is randomly distributed relative to socioeconomic position (129).

Consequently, despite the exact extent of misclassification is unknown, it is unlikely that there should be a systematic bias and that any potential lack of data registration or misclassification would most likely be unrelated to the social position. Potential bias will therefore most likely to be nondifferential misclassification, which properly thus results in an underestimation of the true association between socioeconomic position and the quality of care received. Using the Danish National Patient Registry which offers complete nationwide coverage (132) and the Danish Register of Causes of Dead which have a very high data completeness (137), complete data on time and date of admission and remission, on diagnosis and on data related to follow-up on clinical outcomes was ensured. The risks of information bias on these variables are thus considered very limited.

Confounding

Confounding, or a common cause of exposure and outcome, is a relevant concern in this paper, due to its observational design (130).

Potential confounding factors were addressed by restricting the population by designing the paper to ensure that the population is characterized by having been treated for admittance-required MDD in the Danish psychiatric hospital system. The advantage is that they had a partially comparable depression severity as well as the need for treatment. In addition, by excluding all patients with any hospital contact

with MMD as primary or secondary diagnoses ten years before index admission in DDD, it is highly likely that only patients with new onset depression are included. This solves some basic problems with confounding, which would arise if those who were treated in general practice or with private psychiatrists also were included and reduce the risk of case mix in the form of patients who potentially respond well to treatment with treatment-refractory patients whose lives are complicated by socioeconomic and comorbidity consequences due to previous depressions (129). In addition, clustering of patients within the hospital departments was considered using robust estimates of variance. This was done to include unmeasured characteristics of the hospital departments potentially associated with the quality of care. Finally, potential confounding factors were handled in the statistical analysis by multiple adjustments.

A consideration of potential confounding was whether the variations attributed to socioeconomic position may instead reflect variations in hospitals serving different catchment areas with different patient composition, and thus a problem of case mix (129). However, in the directed acyclic graph used to a priori identify potential confounders, place of residence was considered as a potential mediating variable and not a confounder and including it could thus risk masking some of the true association (129). Nonetheless, to investigate this potential bias, a sensitivity analysis was performed, which included data on the geographic residence of the patients. Adjusting for this factor did not change the overall results (129). This finding is in alignment with the fact that there is a substantial homogeneity between all five administrative regions, which are responsible for psychiatric hospitals, regarding sociodemographic and health-related characteristics (138). It is therefore unlikely that potential confounding should emerge because of variations in registration practise in hospitals serving different catchment areas.

Nonetheless, additional underlying and complex mechanisms may still have influenced and confounded the observed associations and potentially residual confounding because of uncontrolled for factors cannot be disregarded.

Precision

The statistical precision of the paper is strengthened by the large sample sizes obtained from nationwide population-based registries. In the analyses on quality of care, which was assessed for all patients, as well as the clinical outcomes with large numbers of events (MDD and all-cause readmission), the CIs are relatively narrow. Nonetheless, the analysis with few events (mortality and suicidal behaviour) demonstrated a relatively wide CI. The point estimates should therefore be interpreted with some caution. In addition, the absolute differences between groups for the quality of care and to some extent also the clinical outcomes were generally moderate to small, which implies that the observed differences could be random.

However, the main objective of these papers was to investigate potential inequalities in multiple dimensions of socioeconomic position, and the fact that the same general pattern was seen across all outcomes, supports that while the point estimates may not be exact, the directions of the associations are probably reliable and overall that the findings in the thesis are not likely to be explained by random errors.

Generalization

Population characteristics and management of MDD may differ across countries and given that the studies were carried out in a universal healthcare system, it may limit the generalizability of the results to insurance-based healthcare systems in countries such as the United States (129). These findings from a relative egalitarian society, could imply that the risks for patients with a vulnerable social position may be even more pronounced in more unequal societies.

Paper II focused on patients hospitalised with MDD. Since most cases of mild MDD are diagnosed and treated in the primary sector and many cases of moderate MDD are treated as outpatients at the hospitals, the results on the clinical outcomes can not necessarily be extrapolated to the entire MDD population. In addition, the paper only included first time admissions, and the results may not be generalized to patients with multiple admissions. These factors should be considered when comparing the findings with results from other health care settings.

6.5. CONCLUSION

The main findings in this paper suggest that health inequalities exist based on the socioeconomic position among inpatients with a first-time MDD diagnosis (129). The results implies a need for delivering better quality of care and ensuring better outcomes for MDD patients with low socioeconomic position (129). The clinical outcomes are not only affected by the quality of care, but also a range of factors originating from differences in the social determinants of health. Reducing these inequalities thus requires actions on these health determinants. However, the fact that patients with a low socioeconomic position both receive worse quality of care and have worse outcomes indicates that raising clinical awareness and providing basic clinical interventions to these patients could help reduce some of the inequality.

CHAPTER 7. PAPER III

This chapter is based on the article "*Differences in quality of care, readmission, suicidal behaviour, and mortality among migrants and Danish-born inpatients with Major depressive disorder*" by Knudsen SV, Valentin JB, Norredam M, Videbech P, Mainz J and Johnsen SP, currently under review. The full article is available as appended paper III.

7.1. AIMS

i. To investigate how migrant status among first time admitted MDD patients was associated with the quality of inpatient care as reflected by meeting guideline-recommended process performance measures of care.

ii. To investigate how migrant status was associated with clinical outcomes in terms of all-cause mortality, suicidal behaviour, and readmission at 1-year follow-up after first-time hospital MDD admittance.

7.2. METHODS

7.2.1. STUDY POPULATION AND DATA SOURCES

The study population was the same as in paper II. However, this paper investigated social position in terms of migrant status and to ensure as many relevant subjects as possible with this feature, subjects in this paper was only excluded if they had migrated to Denmark within one year before the index date (139). In addition, descendants of migrants were excluded since they represent a subgroup with characteristics of both migrants and native Danes. The paper used the same data sources as paper II. For further details see appended paper III.

7.2.2. EXPOSURE VARIABLES

Migrants were categorized according to the definition from Statistics Denmark, as individuals born abroad to parents born abroad, who are not Danish citizens (140). Migrants were then further subclassified into 'Western' or 'non-Western' according to their country of birth, also using the definition by Statistics Denmark (139,140).

7.2.3. OUTCOME VARIABLES

Outcome variables in terms of quality of care and clinical outcomes, were defined similarly to paper II. For further details see appended paper III. In addition to outcomes on the fulfilment of the individual performance measure and the dichotomous indicator of receiving a general high quality of care, a continuous variable of the total percentage of fulfilled eligible measures per individual was used (139).

7.2.4. STATISTICAL ANALYSIS

Analysis was performed on all migrants as well as the two migrant subgroups (non-Western and Western) compared with the Danish-born population. The individual performance measures and the dichotomous composite score were examined using Poisson regression models with robust error variances, reporting relative risk (RR) with the corresponding 95% CI (139). The continuous outcome variable was examined using multivariable linear regression models, reporting a percentage point difference (PDD) with the corresponding 95% CI. Cox proportional hazards regression analysis was used to analyse the associations between migrant status and clinical outcomes, reporting hazard rate ratios (HR) for all-cause mortality and cause-specific HR (csHR) for suicidal behaviour and readmissions (139). The associations were calculated in two models. Model 1 constituted the primary analyses and was adjusted for sex and age. Model 2 constituted the supplementary analyses and included sex, age, educational level, income level, employment status, and regional residence. For further details see appended paper III.

7.3. RESULTS

Generally, the chance of receiving a high quality of care, defined as at least 70% fulfilment of relevant process indicators, was low for all, regardless of migrant status (139). Among the migrants, 29.2% received high-quality care, compared to 33.3% for native Danes as illustrated in Figure 4. However, compared with the native Danes, being a migrant or belonging to any of the two migrant subgroups, was associated with a lower chance of receiving high quality of care in both the dichotomous and the continuous composite measure in the primary model (model 1) (139). For further details on the continuous measures, see appended paper III (139).

In the analyses of the individual performance measures, a similar overall pattern was observed, with migrant status being associated with a lower chance of fulfilment of performance measures (139). See Figure 4 for further details. Similar results were in

general found in the supplementary analyses, with additional adjustments for socioeconomic factors and regional residence (model 2), as well as in the sensitivity analyses with alternative cut-offs of 60% and 80% (139).

Compared to the native Danish patients, being a migrant or belonging to any of the two migrant subgroups, was associated with a higher risk of 1-year all-cause mortality, while no differences were found in the risk of 1-year suicidal behaviour (139). See Figure 5 for further details. Compared to the native Danish patients, being a migrant or belonging to any of the two migrant subgroups, was associated with a reduced risk of readmittance with a MDD diagnosis and all-cause readmittance (139). In the supplementary analyses, additional adjustments for socioeconomic factors and regional residence (model 2) had only a marginal impact on the results. For further details on the results, see appended paper III (139).

Quality measure	Prop.	Risk dif.	RR (95% CI) (model 1)	RR (95% CI) (model 2)
High Quality (70%)				
Immigrant (all)	29.2%	4.1%	0.91 (0.82:1.01)	0.92 (0.83:1.03)
Non-Western	28.8%	4.5%	0.91 (0.79:1.04)	0.93 (0.82:1.07)
Western	29.8%	3.5%	0.91 (0.77:1.07)	0.91 (0.77:1.07)
Danish (ref.)	33.3%			
Psychiatrist				
Immigrant (all)	36.7%	4.8%	0.92 (0.84:1.01)	0.93 (0.85:1.02)
Non-Western	36.3%	5.2%	0.93 (0.83:1.04)	0.95 (0.84:1.06)
Western	37.4%	4.0%	0.92 (0.80:1.05)	0.92 (0.80:1.06)
Danish (ref.)	41.5%			
Somatically				
Immigrant (all)	45.0%	3.9%	0.94 (0.88:1.02)	0.96 (0.89:1.03)
Non-Western	45.9%	3.0%	0.97 (0.89:1.07)	0.99 (0.90:1.09)
Western	43.5%	5.3%	0.90 (0.80:1.01)	0.91 (0.81:1.03)
Danish (ref.)	48.8%			
Social worker				
Immigrant (all)	33.7%	2.1%	0.96 (0.87:1.06)	0.96 (0.87:1.06)
Non-Western	32.2%	3.6%	0.92 (0.82:1.05)	0.93 (0.82:1.05)
Western	36.1%	-0.3%	1.01 (0.88:1.17)	1.01 (0.88:1.17)
Danish (ref.)	35.7%			
HAM-D17 (in)				
Immigrant (all)	26.4%	4.8%	0.85 (0.76:0.95)	0.87 (0.78:0.98)
Non-Western	26.1%	5.2%	0.84 (0.73:0.98)	0.88 (0.76:1.02)
Western	27.0%	4.3%	0.86 (0.72:1.03)	0.86 (0.72:1.03)
Danish (ref.)	31.2%			
HAM-D17 (out)				
Immigrant (all)	36.8%	3.3%	0.89 (0.80:0.98)	0.90 (0.81:0.99)
Non-Western	35.7%	6.1%	0.86 (0.75:0.98)	0.88 (0.77:1.01)
Western	38.6%	3.3%	0.92 (0.79:1.08)	0.92 (0.79:1.07)
Danish (ref.)	41.8%			
Suicide (in)				
Immigrant (all)	53.8%	4.0%	0.95 (0.89:1.01)	0.96 (0.90:1.02)
Non-Western	55.4%	2.4%	0.99 (0.91:1.06)	0.99 (0.92:1.07)
Western	51.3%	6.5%	0.89 (0.81:0.99)	0.90 (0.81:1.00)
Danish (ref.)	57.8%			
Suicide (out)				
Immigrant (all)	51.4%	2.7%	0.96 (0.89:1.02)	0.96 (0.90:1.03)
Non-Western	52.6%	1.5%	0.98 (0.90:1.06)	0.99 (0.91:1.07)
Western	49.4%	4.7%	0.92 (0.83:1.02)	0.92 (0.83:1.02)
Danish (ref.)	54.1%			
Relatives				
Immigrant (all)	39.3%	7.1%	0.90 (0.82:0.98)	0.92 (0.84:1.01)
Non-Western	39.2%	7.2%	0.91 (0.82:1.02)	0.95 (0.85:1.06)
Western	39.5%	6.9%	0.87 (0.76:0.99)	0.88 (0.77:1.01)
Danish (ref.)	46.4%			
Aftercare				
Immigrant (all)	39.1%	4.7%	0.92 (0.84:1.00)	0.93 (0.85:1.01)
Non-Western	40.3%	3.4%	0.96 (0.86:1.07)	0.98 (0.88:1.09)
Western	37.1%	6.7%	0.85 (0.74:0.98)	0.86 (0.74:0.99)
Danish (ref.)	43.8%			

Figure 4: The association between migrant status and quality of care was measured as Relative Risk (RR, 95% CI) of fulfilling the composite performance measure (>70% fulfilment of eligible individual performance measures) and nine individual performance measures. Proportions of the migrant population who receive high quality and the individual performance measures are provided (prop.) as well as the risk difference (risk dif.) from the reference group (Danish-born). Model 1 is adjusted for sex and age. Model 2 were adjusted for sex, age, educational level, income, employment status, and regional residency.

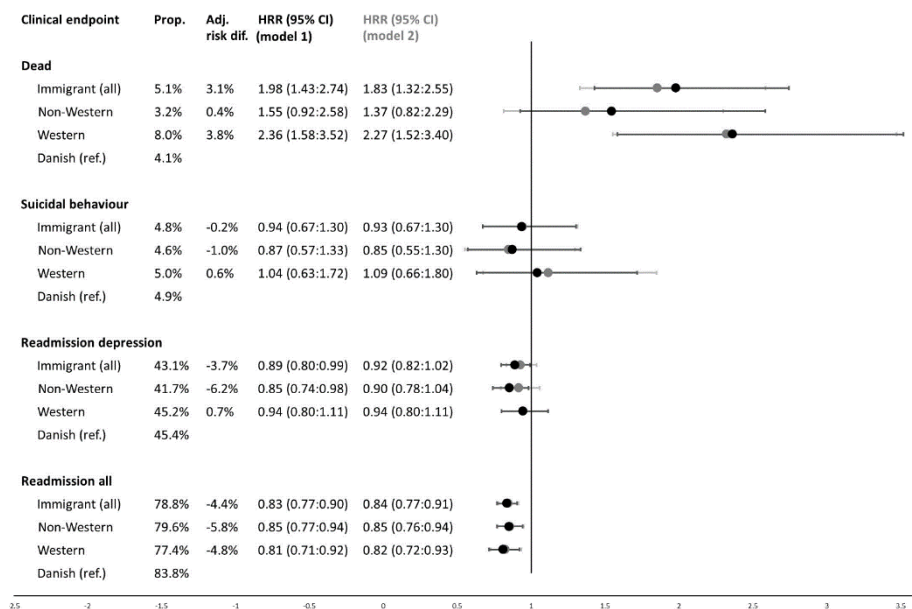| Clinical endpoint	Prop.	Adj. risk dif.	HRR (95% CI) (model 1)	HRR (95% CI) (model 2)
Dead				
Immigrant (all)	5.1%	3.1%	1.98 (1.43:2.74)	1.83 (1.32:2.55)
Non-Western	3.2%	0.4%	1.55 (0.92:2.58)	1.37 (0.82:2.29)
Western	8.0%	3.8%	2.36 (1.58:3.52)	2.27 (1.52:3.40)
Danish (ref.)	4.1%			
Suicidal behaviour				
Immigrant (all)	4.8%	-0.2%	0.94 (0.67:1.30)	0.93 (0.67:1.30)
Non-Western	4.6%	-1.0%	0.87 (0.57:1.33)	0.85 (0.55:1.30)
Western	5.0%	0.6%	1.04 (0.63:1.72)	1.09 (0.66:1.80)
Danish (ref.)	4.9%			
Readmission depression				
Immigrant (all)	43.1%	-3.7%	0.89 (0.80:0.99)	0.92 (0.82:1.02)
Non-Western	41.7%	-6.2%	0.85 (0.74:0.98)	0.90 (0.78:1.04)
Western	45.2%	0.7%	0.94 (0.80:1.11)	0.94 (0.80:1.11)
Danish (ref.)	45.4%			
Readmission all				
Immigrant (all)	78.8%	-4.4%	0.83 (0.77:0.90)	0.84 (0.77:0.91)
Non-Western	79.6%	-5.8%	0.85 (0.77:0.94)	0.85 (0.76:0.94)
Western	77.4%	-4.8%	0.81 (0.71:0.92)	0.82 (0.72:0.93)
Danish (ref.)	83.8%			

Figure 5: (Cause specific) Hazard Rate Ratio (HRR, 95% CI) of the clinical endpoints; dead, suicidal behaviour, depression-related readmission, and readmission, all at 1-year follow-up. Proportions (prop.) are provided as well as the adjusted risk difference (adj. risk dif.) from the reference group (Danish-born). Model 1 is adjusted for sex and age. Model 2 were adjusted for sex, age, educational level, income, employment status, and regional residency.

7.4. DISCUSSION

7.4.1. MAIN RESULTS

Lower quality of in-hospital care was provided for migrant patients (139). Furthermore, being a migrant was associated with a worse prognosis in terms of higher risk of all-cause mortality, while being associated with a lower risk of readmission with a MDD diagnosis and all-cause readmittance (139). No statistically significant differences were observed in suicidal behaviour.

7.4.2. COMPARISON WITH THE EXISTING LITERATURE

No previous papers were identified, which investigated the association between migrant status and clinical outcomes among hospitalised MDD patients.

7.4.3. METHODOLOGICAL CONSIDERATIONS

The same metodological considerations listed under paper II are just as relevant for paper III.

However, a few exceptions are worth mentioning. Regarding information bias, the frequency of missing values on education amongst migrants were quite high (10.7%). Statistics Denmark classifies migrants' education according to Danish standards, but it is subject to uncertainty and missing information and could be a source of bias (48,139).

In addition, a further limitation is that the complete hospitalisation history was not available for migrants who had only been in Denmark for a few years. Unfortunately, no data on previous admissions in the migrants' countries of origin were available, which could introduce a bias (139).

A priori considerations were made as to whether socioeconomic factors should be considered as confounders or intermediate factors. For example, mental disorders differ regarding socioeconomic position, and immigrants in general have a lower socioeconomic position than non-migrants (46). However, being a migrant may itself lower one's socioeconomic position (141). This could happen if discrimination or linguistic and cultural barriers lowers the chances of getting education or a job (141). In these cases, socioeconomic position should be considered an intermediate factor and statistically removing its influence will then render the effect of migration on health invisible (141). Using the directed acyclic graph tool, socioeconomic factors as well as regional residence were considered as potential mediating variables and thus a supplemental analysis including these measures was performed (139). Adjusting for these factors only marginally changed the point estimates and the same consistent pattern remained.

A final limitation is that even though migrants were further operationalised into two broad subgroups, the restricted number made further subclassification difficult. This meant that ethnically and socioeconomic heterogeneous groups are analysed together (139). Unfortunately, the population size did not allow for further stratification.

7.5. CONCLUSION

The paper suggest that health inequalities exist based on the migrant status of inpatients with a first-time MDD diagnosis (139). The results indicate the need for awareness in providing better quality of care and ensuring better outcomes for migrant patients (139). Clinical outcomes are affected by factors outside of the direct influence of the health care system, and thus need a wider societal effort to address the structural and social determinants of health. However, the fact that migrant MDD patients both have a worse prognosis and receive worse quality of care indicates that raising clinical awareness and providing basic clinical interventions to all patients, regardless of their country of origin, could help reduce some of the inequality.

CHAPTER 8. OVERALL DISCUSSION

8.1. MAIN RESULTS

While previous papers on inequalities in quality of care among mental health patients are very limited and do not identify inequalities, the results from this thesis showed that patients with low social position had a lower chance of receiving high quality of care as well as most individual process performance measures compared to patients with high social position. However, in general, the absolute differences in care were small to moderate. Patients with low social position had a substantially increased risk of mortality following first-time hospital contact with MDD, and low-level educational were associated with a higher risk of suicidal behaviour. Furthermore, low social position was associated with a lower risk of readmittance

8.2. COMPARISON WITH EXISTING LITERATURE

No previous papers were identified, which investigated the association between migrant status and clinical outcomes among hospitalised MDD patients. Regarding socioeconomic differences in clinical outcomes, the findings in the sparse existing literature are internally inconsistent and thus also with the findings in this thesis. However, it should be noted that most of the previous papers are characterised by design flaws, few participants, last-century data, or not containing specific data on MDD patients. In addition, different health care settings may complicate a direct comparison across health care systems. The divergence could perhaps also be a result of the more restricted inclusion criteria in this thesis, where only first-time admitted patients were included. However, these discrepancies call for further investigation.

8.3. METHODOLOGICAL CONSIDERATIONS

Generally, the strength of the papers includes the nationwide population-based design, large sample size, the comprehensive prospective data collection of quality of care based on national standards with explicit data definitions relevant for all patients, the restricted population of first time admitted MDD patients, and the high data completeness in the national registries used for sociodemographic and clinical outcome measures. These possibilities are due to the well-developed Danish databases and provide some rather unique opportunities to shed light on these issues. The main limitation is the potential misclassification bias of the performance measures. This potential limitation was investigated using several supplementary and sensitivity analyses, which did not change the overall results. Due to the accounted for important characteristics and the supplementary investigations, we assess the overall results to be reasonably valid.

CHAPTER 9. OVERALL CONCLUSIONS

The overall hypothesis was that a patient with a low social position would have a lower chance of receiving high-quality inpatient hospital care compared to patients with a high social position. This hypothesis was confirmed through two epidemiological studies investigating socioeconomic position and migrant status.

Moreover, it was hypothesized that patients with a low socioeconomic position or a migrant background have a worse prognosis in terms of increased mortality, increased suicidal behaviour, and increased readmission rate after first time admittance for MDD compared to patients with a high socioeconomic position and patients who are native Danes.

Regarding mortality, this pattern was consistently found regardless of the measure of social position. Low-level education was associated with a higher risk of suicidal behaviour; however, no differences were found based on income level, employment- or migrant status.

Finally, low social position was associated with a lower risk of readmission because of MDD, and low socioeconomic position additionally associated with a lower risk of all-cause readmission. While fewer readmissions sometimes are used as an indicator of good quality of care, the findings in this paper, where low social position was associated with a lower risk of readmission in combination with higher mortality in a tax-financed universal health coverage system, could indicate that a lower readmission rate for vulnerable groups may reflect problems with continuity, compliance, and other barriers to access in case of relapse of depression or worsening of comorbidities.

CHAPTER 10. PERSPECTIVES

The findings of this thesis suggest inequalities in the fulfilment of fundamental care processes and treatment recommendations for MDD based on social position. This calls for a raised awareness amongst clinicians to provide the equal treatment prescribed in the code of ethics as well as in the Danish law. As paper I shows, there is a widespread lack of studies on inequalities in the quality of care in the mental health sector. To create awareness and to inspire action, further studies are needed in specific mental health illnesses and providers.

The thesis also reveals that the general level of quality is low and that raising the general quality of care should be a central concern. However, changes in the general quality level does not necessarily reduce the inequality and it might even increase it (79). To achieve the same quality of care for all groups, an improved understanding of what constitutes optimal care for these more vulnerable groups are needed. An insight into the social circumstances, cultural perspectives, and health literacy of the patients could help professionals deliver better care. Likewise, investigating health care professionals' perspectives could provide useful to identify potential barriers such as lack of time, resources, and training in handling the specific needs of vulnerable groups.

It is probably also true that the measures of quality that are used today are not an adequate reflection of the overall effort in the health care system. It may be important to monitor the entire patient pathway, including sector transition and the importance of civil society, which today is a black box. This requires intersectoral planning for health and health equality, including the formulation and implementation of new trans-sectoral quality indicators.

The fact that the differences in quality were small to moderate in size while increased mortality rates among patients with low social position was found, indicates that other determinants than the care provided in the health sector influence the clinical outcomes. This underpins that targeted interventions related to the social determinants of health are needed to improve the survival of patients with MDD in a low social position.

Finally, the project has emphasized that it is a major problem that the registration process in the Danish Depression Database does not distinguish between care not provided and not registered. If quality data are to be systematically used for research, this source of potential bias also needs to be addressed. Clinics need to be better engaged, which requires that the system should be intuitive and that clinicians can see the value in getting real-time feedback on their work.

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APPENDICES

Literature search

Table A1 *The performed search strategies in PubMed included English and Scandinavian language literature with no restriction on publication year*

Database	Search strategy
PubMed	EXPOSURES: #1: SES[Text Word] #2: Socioeconomic[Text Word] #3: Demographic[Text Word] #4: SEP[Text Word] #5: Income[Text Word] #6: Wealth*[Text Word] #7: Poverty[Text Word] #8: Education*[Text Word] #9: Unemploy*[Text Word] #10: Employ*[Text Word] #11: Class[Text Word] #12: Affluen*[Text Word] #13: "Emigrants and Immigrants"[MeSH] #14: Migran*[Text Word] #15: Immigra*[Text Word] #16: Refugee[Text Word]) **#17: #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16#** PATIENTS: #18: "Depressive disorder"[MeSH Terms] #19: Depressi*[Text Word] #20: MDD[Text Word] #21: Affective[Text Word] #22: Mood[Text Word] **#23: #18 OR #19 OR #20 OR #21 OR #22**

SETTINGS:

#24: Inpatient[Text Word]

#25: Hospital[Text Word]

#26: Admit*[Text Word]

#27: Outpatient[Text Word]

#28: #24 OR #25 OR #26 OR #27

OUTCOMES:

#29: Death[Text Word]

#30: Mortality[Text Word]

#31: Survival[Text Word]

#32: Suicid*[Text Word]

#33: Readmis*[Text Word]

#34: #29 OR #30 OR #31 OR #32 OR #33

#35: #17 AND #23 AND #28 AND #34

Total literature from search: 3,502