

Variations in cardiovascular disease outcomes across Europe

Disparities in cardiovascular disease and treatment in the Nordic countries

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Summary

The Nordic countries, including Denmark, Finland, Iceland, Norway, and Sweden have seen a steep decline in cardiovascular mortality in recent decades. They are among the most egalitarian countries by several measures, and all have universal, publicly funded welfare systems providing healthcare for all citizens. However, despite these seemingly ideal conditions, disparities in access to cardiovascular care and outcomes persist. To address this challenge, The Lancet Region Health—Europe convened experts from a broad range of countries to summarize the current state of knowledge on cardiovascular disease disparities across Europe. This Series Paper presents the main challenges in Nordic countries based on evidence from high-quality nationwide registries. Focusing on major cardiovascular health determinants, areas in need of improvement were identified. There is a need for addressing structural causes underlying these disparities, such as poverty and discrimination, but also to improve access to healthcare in deprived neighborhoods and to address underlying social determinants of health that may mitigate disparities in cardiovascular outcomes. Overall, while the Nordic countries have made great strides in promoting egalitarianism and providing universal healthcare, there is still much work to be done to ensure equitable access to care and improved cardiovascular outcomes for all members of society.

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Introduction

In this Series paper, we provide an up-to-date, comprehensive review of selected cardiovascular disease (CVD) disparities in the Nordic countries. We provide a summary of the main areas of disparity identified and suggest possible solutions to lower inequalities in CVD. Throughout this paper, we aim to enhance the knowledge and understanding of inequalities in CVD morbidity and mortality in the Nordic countries and to provide evidence-based foundations for future policies and interventions aimed at limiting inequality.

The Nordic countries, comprising Denmark, Finland, Iceland, Norway, and Sweden are a geographically unique region with intertwined histories and large cultural and linguistic similarities. The Nordic countries have small populations, comprising a total population of 27 million.

By international standards, the Nordic countries are culturally homogeneous with open economies combined with strong state governance. The countries are parliamentary democracies shaped by strong labor and peasant movements and a political culture characterized by peaceful conflict resolution. With little exception, their recent development has been parallel with economic growth, leading to their current top rankings by GDP per capita in Europe. In the Nordic countries, women entered the workforce since the early 1960's, at which time there was a shortage of labor. Currently, employment rates are high, and the gender employment gap is low.¹ To make this possible, Nordic countries have made access to child-care a universal benefit, with the five Nordic countries all ranging top ten for childcare policies.²

A unique characteristic of the Nordic countries is the parallel development of highly developed welfare states after World War II. A key foundation of the welfare system is universalism, ensuring universal access to welfare services for all citizens regardless of income. The countries are characterized by a high level of trust and support of the publicly funded welfare system, a strong public sector, and acceptance of the accompanying relatively high taxation rates. The Nordic countries are ranked among the most egalitarian countries in several measures. Although increasing socioeconomic

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Key messages

- Since 1975 mortality from cardiovascular disease has dropped steeply and mortality from coronary heart disease in the Nordic countries is now among the lowest in Europe.
- High-quality national Nordic registries provide compelling evidence that inequalities in cardiovascular fields exist and can be identified.
- Despite universal, tax-funded, healthcare coverage, disparities in cardiovascular morbidity and mortality persist in the Nordic countries.
- The Nordic countries are relatively egalitarian yet have a socioeconomic gradient in the distribution of cardiovascular risk factors similar to other countries.
- In the Nordic countries, regional inequalities in cardiovascular outcomes between affluent vs. deprived areas are consistent whereas findings concerning rural vs. urban areas are more ambiguous.
- Patients with a low socioeconomic position, severe mental illness, or immigrant status receive inadequate cardiovascular care, including acute care, leading to an inferior cardiovascular prognosis.
- To achieve equity in cardiovascular care and disease, clinicians must expand their individual awareness of vulnerable patient groups, and targeted policies are needed.

gaps, the Gini coefficient, which measures the distribution of wealth, remains below 0.30 in the five Nordic countries. In comparison, the Gini coefficient of the US is 0.39 and that of the UK 0.35.³

Life expectancy in the Nordic countries has increased and continues to rise. At present, life expectancy exceeds the EU average of 80.6 years, ranging from 83.3 years in Norway to 81.6 years in Denmark (Fig. 1). CVD is a major cause of mortality, and the improvement in life expectancy is mainly attributed to a steep decline in mortality from cardiovascular (CV) causes, in particularly ischemic heart disease (IHD). While Nordic countries had the highest mortality rates from IHD in Europe in the 1970'ies and 1980'ies, an unprecedented decline followed, and mortality-rates from IHD are now lower than in most other European countries (Fig. 2). As in most Western countries, there is evidence also from the Nordic countries that the decline in cardiovascular mortality is attributable to both decline in the incidence of myocardial infarction (MI) and to improved survival.⁴ It has been estimated that half of the improvement is due to improvement in risk factors on the population level and half is due improved treatment and secondary prevention.^{5,6}

The Nordic countries have similar universal national public health services with limited private healthcare, exemplified by a low proportion of hospital beds in private hospitals ranging from 2 to 10%.⁷ However, universal access does not cover all aspects of healthcare, with 15–20% of costs covered by co-payment for typically visit fees, medication, physiotherapy, and dental care. Overall, the level of unmet needs for medical examination and treatment has been lowered across all income groups in Europe. From the European Health Interview Survey it can be drawn that the share of people reporting unmet

medical needs due to financial reasons varies across the Nordic countries, ranging from 1 to 3% in Norway, Denmark and Sweden, to 8 and 11% in Iceland and Finland, respectively.⁸ However, comparing self-reported unmet healthcare needs across regions and countries is challenging due to differences in survey standards. With these interregional differences in mind, The Global Burden of Diseases Study has identified the Nordic countries overall as having one of the highest scores and improvements in the quality of care index (QCI) from 1990 to 2017.⁹ The QCI is a complex index based on a principal component analysis which summarizes quality of care in IHD based on mortality rates, lost life years, and years lived with disability, with higher scores indicating better quality of care.

Addressing the social determinants of health and reducing health inequalities in its many dimensions has been a longstanding goal of the European Unions' healthcare policy.¹⁰ Ameliorating disparities in health requires an understanding of the social determinants of health, which refers to the conditions in which people are born, grow, work, live, and age, as well as the healthcare systems in place to address illness. In this paper, we identify major areas of disparities in CVD in the Nordic countries, highlighting common recommendations and unique points to address these disparities (Panel 1). This is a scoping review and many areas of CV disparity have not been addressed. The areas covered were chosen because they represent widespread or strong disparity, because they are topical issues in cardiovascular medicine, or because they have received limited attention hitherto. We have focused on atherosclerotic CVD with particular attention to cardiac disease but also present selected data on all-cause mortality when only this data was available. We found this justified by CVD remaining a leading cause of mortality in these countries. With health systems in the Nordic countries being mainly public and a personal identity number as unique identifier of all citizens, Nordic registries provide a unique possibility of studying inequalities in health. We have therefore included registry-based research on the new and emerging topics of disparities in CVD related to mental health, ethnicity, and access to acute care.

Determinants of cardiovascular risk

Socioeconomic position

Socioeconomic position refers to the social and economic factors that influence what positions individuals or groups hold within the structure of society. Socioeconomic position can be determined by various indicators, as educational level, income, and occupation, each with advantages and disadvantages, and as a result we did not restrict review of evidence to one indicator. Despite highly evolved healthcare systems, there is little indication that disparities in health are significantly lower in the Nordic countries than in comparable regions.¹¹ Relative

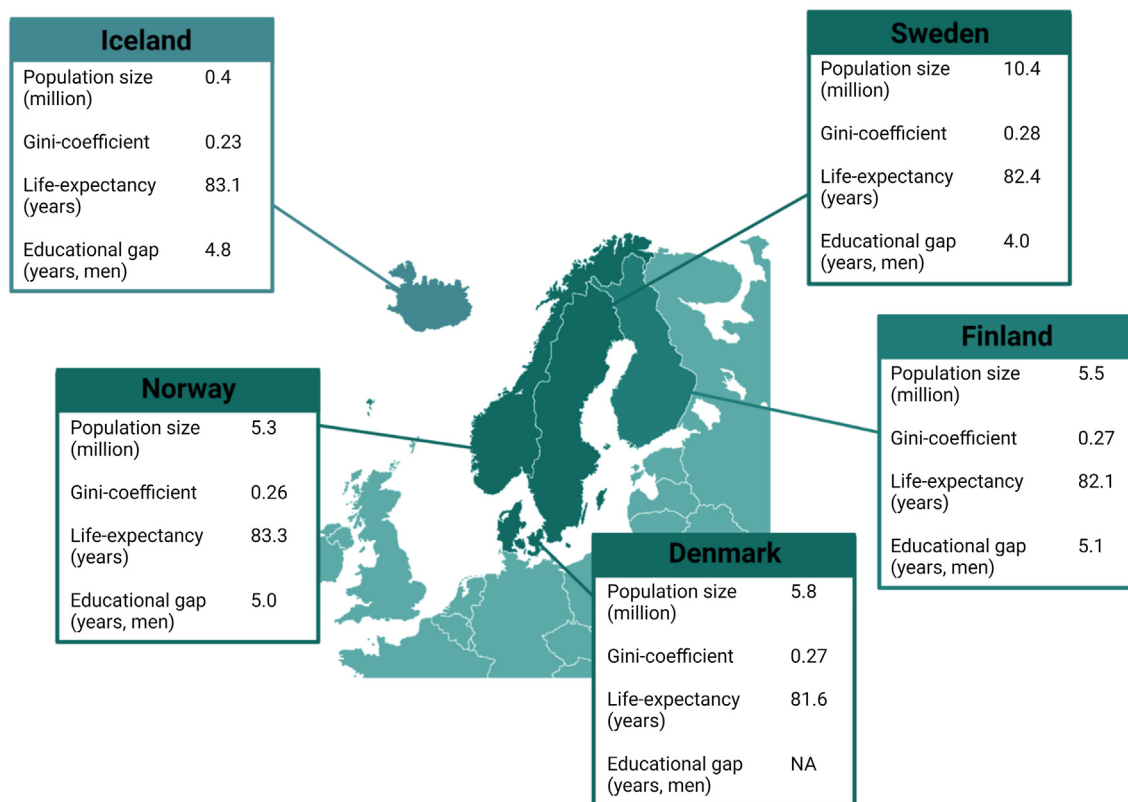


Fig. 1: Key-information. The Gini-coefficient is a measure of the distribution of wealth. Educational gap is life expectancy (years) between high and low education among men. Similar trends are observed among women. Data source: European Commission, Country Health Profiles, 2021 and Hodgson GM. What the world can learn about equality from the Nordic model, The Conversation, 2018.

inequalities as measured by the rate ratio of mortality, comparing the low with the high educated, ranges between approximately 1.6 and 2.1 within the Nordic countries. This persistence of socioeconomic inequality in health despite comprehensive welfare states has been

referred to as the Nordic health paradox.^{12,13} In Sweden, the gap in life expectancy between highly and lower educated men is 4.0 years, while in Iceland, Norway, and Finland, it is 4.8, 5.0, and 5.1 years, respectively, with slightly smaller gaps in women. These differences are

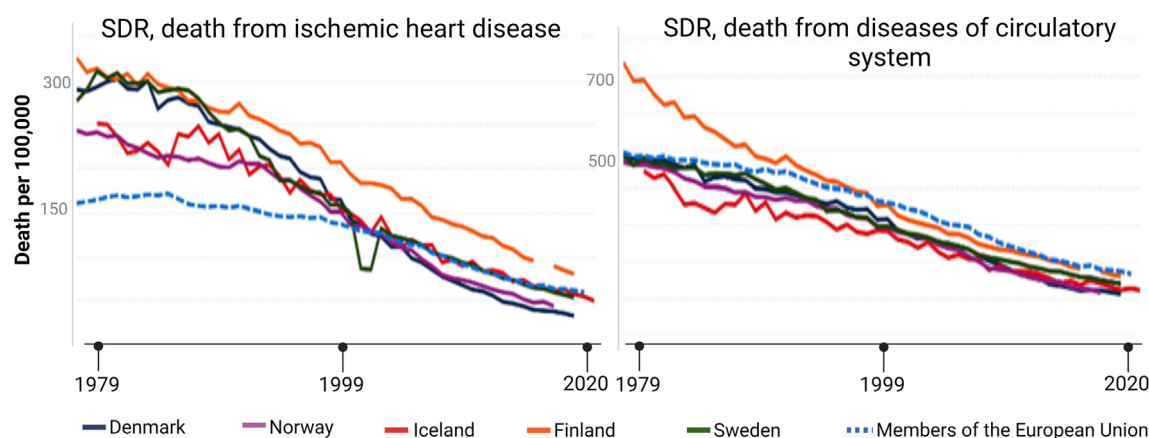


Fig. 2: Temporal trends in age-standardized death rate per 100,000 in the Nordic countries, year 1979–2020. SDR: Age-standardized death rate. Data source: European Health Information Gateway.

Panel 1: Recommendations for future policies and efforts to address disparities in the Nordic countries.**Socioeconomic position as a determine of cardiovascular risk**

Targeted prevention has the potential to reduce health inequalities, particularly among population-groups with the lowest socioeconomic position subjected to the most inferior cardiovascular prognosis. Such interventions may include systemic changes supported by sufficient funding strategies.

- Regulatory policies that address major behavioral risk factors such as smoking, unhealthy diets, physical inactivity and obesity, especially among adolescents.
- Such policies should include pricing and marketing policies for tobacco and unhealthy food items as these have been shown to have greater impact in lower socioeconomic strata.
- Application of tax-policies on unhealthy products to discourage consumption.
- Although smoking has been banned in public areas, the effective enforcement of these polices remains crucial to achieving sustained reductions in smoking prevalence.
- Recognizing the importance of psychosocial stress, particularly anxiety, exhaustion and depression, as a risk factor for cardiovascular disease, and develop interventions and structural changes to society that focus on limiting, managing and reducing stress.

Inequalities in access to healthcare

- Regional differences in access to healthcare in the Nordic countries should continuously be monitored through registries and emerging disparities should be addressed.
- The socioeconomic differences in treatment of cardiac arrest are concerning and warrants more attention in the process of improving access to treatment, including bystander CPR. This could include "safe heart zones" with easy access to automated external defibrillators in deprived neighborhoods, which has recently been introduced in Denmark.

Cardiovascular disease in patients with severe mental illness

The commonly used cardiovascular disease risk scores might underestimate the true risk of cardiovascular events in patients with severe mental illness.

- Develop evidence-based risk models to estimate 10-year risk of first cardiovascular event in patients with severe mental illness. The models may include use of anti-depressants, anti-psychotics, diagnosis of severe mental illness, or social deprivation. Models should be tested in Nordic populations to assess prediction value.

Provide better structural networks to enhance collaboration.

- A greater focus on integrating treatment of somatic and mental health problems by establishing specialized clinics, optimizing the inter-sectoral collaboration.

Support patient-level education.

- Enforce psychoeducation regarding early signs of somatic disorders, including risk factors and compliance to prophylactic medication.

Ethnic disparities

Diminish structural barriers.

- Provide skilled interpreters to patients with linguistic challenges at no supplementary financial cost.
- Provide informational resources and medical documents in various languages.
- Governments should promote collaborations with Non-Governmental Organization to assist refugees and stateless individuals in their access to healthcare.

Strengthen current registries.

- Governments and clinics should encourage registry research providing contemporary feedback on trends in quality of care among groups subjected to inequality.

well below the EU average education gap of 6.9 years for men, but similar to those in other Western and Southern European countries¹⁴ (Fig. 1). Also, a considerable socioeconomic gap in CVD outcomes, has repeatedly been demonstrated in the Nordic countries, with this gap differing little from that of other European countries. The proportional decline in mortality from CVD has been lower among the less educated between the 1990s and the 2010s, resulting in a greater relative inequality in both men and women¹⁵ and also a greater population attributable fraction. However, in absolute terms, the education gap for CVD mortality has shown a declining trend in the Nordic countries. The background for this is not clear. A Danish study indicated that changes in population-level risk factors have contributed to improvement across

socioeconomic groups,¹⁶ however, for several risk factors such as obesity, diabetes, and smoking, the socioeconomic gap has widened.

Behavioral cardiovascular risk factors

The Nordic countries continue to encounter significant challenges related to major behavioral risk factors such as smoking, unhealthy diets, alcohol consumption, physical inactivity, and obesity, which remain highly prevalent. Together these risk factors account for 70% of CV mortality¹⁷ and over one-third of overall mortality in the Nordic countries.¹⁴ Especially obesity is a major concern. The prevalence of obesity has increased during the last two decades among all Nordic countries; now placing Norway with an obesity prevalence of 23.1%,

higher than the average EU rate of 22.3%. Obesity prevalence in Denmark, Sweden, Finland, and Iceland remain at or just below the EU average (19.7%, 20.6%, 22.2% and 21.9%, respectively).¹⁸ The prevalence of people engaging in at least moderate physical activity each day is equivalent to the EU average for all Nordic countries, however, this is not the case regarding adolescents. In Denmark, only 7% and 13% of the 15-year-old girls and boys, respectively, reported doing at least moderate physical activity once a week (EU average of 14%). This was similar for Sweden and Norway.¹⁴ Conversely, a sharp decline in smoking rates has been observed, now placing the Nordic countries with the lowest prevalence ranging from 8.2 to 16.9% compared to the EU average of 22.1% (Fig. 3).¹⁸ This reduction has been achieved in part through increases in tobacco prices and by imposing a ban on smoking in public spaces.

Cardiovascular care and socioeconomic position

Not surprisingly, the burden of behavioral risk factors is unevenly distributed across socioeconomic positions, and with smoking, obesity and low income being

identified as the risk factors contributing the most to the socioeconomic gap in life expectancy in the Nordic countries.^{18,19} Observational studies have identified a higher prevalence of behavioral risk factors among individuals with a lower socioeconomic position in high-, middle- and low-income countries, and subsequently adverse risk of CVD and CV mortality.^{17,20} These inequities are consistent in Nordic studies whether socioeconomic position is defined by occupation, income- or education level.²¹ While only none to modest socioeconomic differences are seen for acute care as percutaneous coronary intervention (PCI),^{22,23} a social gradient in both primary^{24,25} and secondary prevention has been reported, as well as a social gradient in adherence behaviors.^{26–28} In accordance, a Norwegian registry of 50,000 cardiac patients with long-term follow-up reported that the excess in CV mortality among patients with lower socioeconomic position was mediated through CV risk factors both for men and women.²⁹ A Swedish registry reported that lower socioeconomic position was associated with a worse achievement of most CV risk factors targets, lifestyle change programs

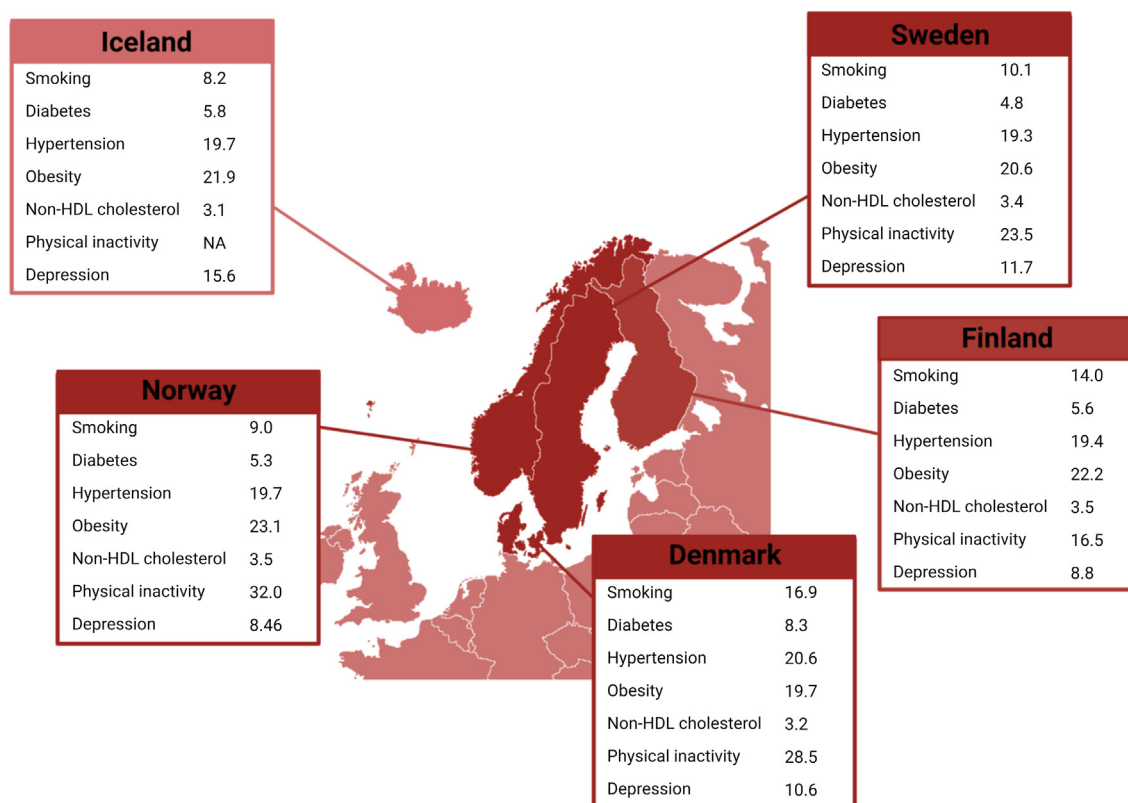


Fig. 3: Prevalence of cardiovascular risk factors. All numbers are prevalences (%), despite non-HDL cholesterol (mean). The following definitions are used: Smoking, daily. The prevalence of diabetes is age standardized and includes both type 1 and 2. Hypertension, systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg. Obesity, body mass index >30 kg/m². Non-HDL cholesterol, mmol/L. Physical inactivity, >150 min of moderate-intensity activity per week, or equivalent. Depression is given as a lifetime prevalence. Data source: Timmis et al., European Society of Cardiology: cardiovascular disease statistics 2021, EHJ, 2023 and Physical Activity Profile 2022, WHO.

and guideline-recommended medical therapy after MI, suggesting that disparities in secondary prevention contributes to a higher long-term risk of recurrent disease among patients with low socioeconomic position.³⁰

Family patterns

Family patterns in the Nordic countries are characterized by the highest proportion of people living alone in Europe, reaching 40% in Denmark and 50% in Sweden, compared to <30% in Southern Europe.³¹ Being unmarried or living alone has consistently been associated with higher CVD morbidity and mortality rates in men and less so in women.^{19,32} In Finland, single living and/or being unmarried was associated with higher risk of a MI in all age groups in a registry study covering 1993–2002.³³ Age-standardized case fatality rates after MI were also significantly higher in the unmarried, regardless of sex, with lower rates in previously married and lowest in currently married. The majority of the excess mortality appeared already in the prehospital setting, bearing in mind that this was in the pre-PCI era and middle aged unmarried men less often received thrombolysis.³³ However, in a Danish study an independent factor for not being referred for cardiac rehabilitation was being unmarried.³⁴ In conclusion, living alone is disadvantageous for cardiovascular prognosis, most evident among elderly men. With current changes in demographics and Nordic family patterns, marital status could possibly account for a significant population attributable fraction of CVD outcomes.

Psychosocial stress as a risk factor of cardiovascular disease

Psychosocial stress, most importantly anxiety, exhaustion, and depression, is now recognized as an important factor in causing CVD, with the association between psychosocial stress and CVD being bidirectional. Psychosocial stress is associated with socioeconomic position.^{35–37} The estimated hazard ratio for CVD associated with psychosocial stress ranges between 1.2 and 2.0³⁷ and when considering a lifetime accumulated risk of depression of 20–30%, with the highest risk found in women, this may have a significant impact on the societal burden of CVD. In the global INTERHEART study, the attributable risk of psychosocial stress for MI was 32%.³⁵ Depression is likely to be more prevalent in the Nordic countries because of the established associations between seasonal affective disorders and the lack of sunlight in the winter. Based on health surveys, the Eurostat database reports prevalence of depression that are higher than the EU average of 7.6% but with Iceland standing out with a prevalence of 15.6% of all adults above age 15.³⁸ Although validated and comparable data are scarce, this is corroborated by a considerably higher prescription rate of antidepressants in Iceland.³⁹

Potential mechanisms causing socioeconomic disparities

The persistence of socioeconomic disparities in health and the underlying mechanisms are intricate and multifactorial. Extensive socio-epidemiological literature has put forth theories proposing potential causes and mechanisms of these disparities. These theories explore the complex interplay between biological and social determinants that accumulate over time. Additionally, it has been hypothesized that the persistence of health inequalities can be attributed to inequitable access to both material and non-material resources. Factors such as parental socioeconomic situation, social capital (including social support) and non-material resources like health awareness and literacy play significant roles in shaping these disparities. Other contributing factors are the greater homogeneity in risk factors among lower socioeconomic groups and in consumption behaviors.^{12,40} A 2021 report from Nordic Medico-Statistical Committee examined the mechanisms behind the persistent and sometimes larger socioeconomic disparities in the Nordic countries compared to societies with seemingly less equal populations. Despite the Nordic countries' endeavors to establish societies with universal healthcare and consideration for the well-being of the entire population, it is crucial to distinguish between equality and equity. When resources are limited, an approach that treats all citizens equally may not effectively address inequalities. Prioritizing equity by focusing on the needs of the most vulnerable segments of society could prove more effective in mitigating disparities.⁴¹

In conclusion, socioeconomic inequality continues to persist in the Nordic countries despite universal welfare systems. This inequity significantly impacts the distribution of CV risk factors, CV mortality rates, and overall life expectancy, disproportionately affecting individuals with lower socioeconomic positions.

Inequalities in access to healthcare

Regional inequalities

Although the Nordic countries are relatively small in terms of population, Norway, Sweden, and Finland are geographically large, with Norway extending 1770 km from north to south. The population density in Sweden, Finland, Norway, and Iceland is less than 30 inhabitants per square kilometer, which is significantly lower than the EU average of 112 (and 140 in Denmark).²⁵ This, combined with increased urbanization, presents a challenge for ensuring equal access to healthcare in rural areas, especially in regions with a high proportion of elderly and co-morbid patients.²⁶

Regional differences in life expectancy within the Nordic countries have been reported.^{42,43} Evidence suggests an increase in geographical segregation with rural areas falling behind in terms of health outcomes over the past few decades. A Finnish observational study of

almost 3000 participants found that individuals living in urban areas in childhood and adulthood had a more favorable CV risk factor profile, including subclinical markers of CVD, compared to rural residents.⁴⁴ However, studies from Denmark and Sweden indicate better CV health in rural areas, exemplified by people living in rural areas having slightly lower incidence rates of MI compared to persons living in urban areas.^{45,46}

A more complex disease pattern emerges from Danish registries, showing that IHD remains unequally distributed across the country, even when accounting for sociodemographic differences at neighborhood- and individual-level.⁴⁵ While these regional differences in CV health persist in the Nordic countries, these countries did in fact have some of the smallest regional inequalities in self-reported health conditions in the European Social Survey from 2014.⁴⁷

Inequalities in emergency care and out-of-hospital cardiac arrest

In many cases of CVD with acute onset, a short time from symptom debut to recognition and treatment is critical for survival, long term outcome, and to limit lasting disability. While healthcare systems with universal access aim to limit socioeconomic barriers in access to care, Nordic studies have identified regional disparities in access to emergency care.

For instance, a case study from southern Sweden found that rural areas, particularly those with a high proportion of elderly patients, had lower levels of emergency healthcare accessibility, with the largest disparity observed in transportation for medical intervention and, to a lesser extent, response time. This suggests that socioeconomic position and regional disparities in emergency healthcare access are intertwined.⁴⁸

Similarly, in Denmark, there were differences in the incidence and survival of out-of-hospital cardiac arrest across five administrative regions between 2009 and 2014, despite no substantial overall difference in age, sex, and comorbidities in patient characteristics. The variation in survival rates could be related to differences in time to emergency medical services (EMS) treatment, as a markedly increase in worst-cases (defined as unwitnessed arrest with non-shockable rhythm and an EMS response time >10 min) occurred after a system change in the regional EMS.⁴⁹ In a study comprising >20,000 out-of-hospital cardiac arrests in Denmark in 2001–14, the lowest quartile defined by income had lower likelihood of receiving bystander cardiopulmonary resuscitation (CPR) and lower 30-day survival. A concerning finding was that the highest income disparity in 30-day survival was found for publicly located witnessed arrests, resulting in an income disparity of 26.0% (95% CI 22.4%–29.7%) between the highest and lowest income quartiles. Less than 1% of the disparity in survival was, however, explained by less bystander CPR.⁵⁰ Similar data exist from Sweden, where a low socioeconomic

position was associated with a lower 30-days survival after cardiac arrest,⁵¹ and among 25,000 patients experiencing in-hospital cardiac arrests between 2005 and 2018, patients with higher socioeconomic position were less likely to experience delayed CPR, more often had prophylactic heart rhythm monitoring and were more likely to survive, even when controlling for major sociodemographic, clinical, and contextual factors.⁵²

In summary, management of cardiac arrest in Nordic countries shows socioeconomic disparities while distance to hospital appears to be of lesser importance except in northern parts of Finland, Norway, and Sweden.

Severe mental illness and the risk of cardiovascular disease and mortality

Psychiatric comorbidity and cardiovascular care

Psychiatric treatment is part of the universal healthcare provided in Nordic countries, typically through the secondary hospital sector including outpatient clinics.⁷ Despite this, individuals with severe mental illness constitute a vulnerable population with increased mortality, markedly lower life expectancy, and multimorbidity related to a higher burden of CVD risk factors (Fig. 4).

In Nordic countries, mortality rates amongst patients with severe mental illness, defined as schizophrenia and bipolar disorder, surpass those of the background population and the gap may even be increasing.^{53,54} Several Nordic studies have reported two-to threefold higher mortality rates in patients with severe mental illness compared to the general population, with an associated reduction in life expectancy of 15 and 20 years for women and men, respectively.⁵⁵ Of particular concern is the increased CV mortality,⁵⁶ which is a leading cause of death among patients with severe mental illness. CV mortality accounts for approximately 25% of all death in patients with schizophrenia⁵⁷ and approximately 33% in patients with bipolar disorder, twice as high as in the general population.⁵⁸

The high CVD burden linked to severe mental illness relates to distribution of risk factors and to disparities in access to care. Behavioral risk factors, such as obesity, dyslipidemia, diabetes, and smoking are all more prevalent among patients with severe mental illness.^{59,60} This may be partly attributed to adverse effects of psychiatric pharmacological treatment, or because of failure to achieve health promotion actions within this vulnerable population. A lack of prescription of guideline-recommended medications has been reported, both in the assessment of CV risk factors,^{61,62} but, most pronounced in secondary prevention.⁶² This may all contribute to the excess in CV mortality. However, negative social consequences of having a mental disorder and systemic barriers in the accesses to healthcare may also play a pivotal role.⁶³

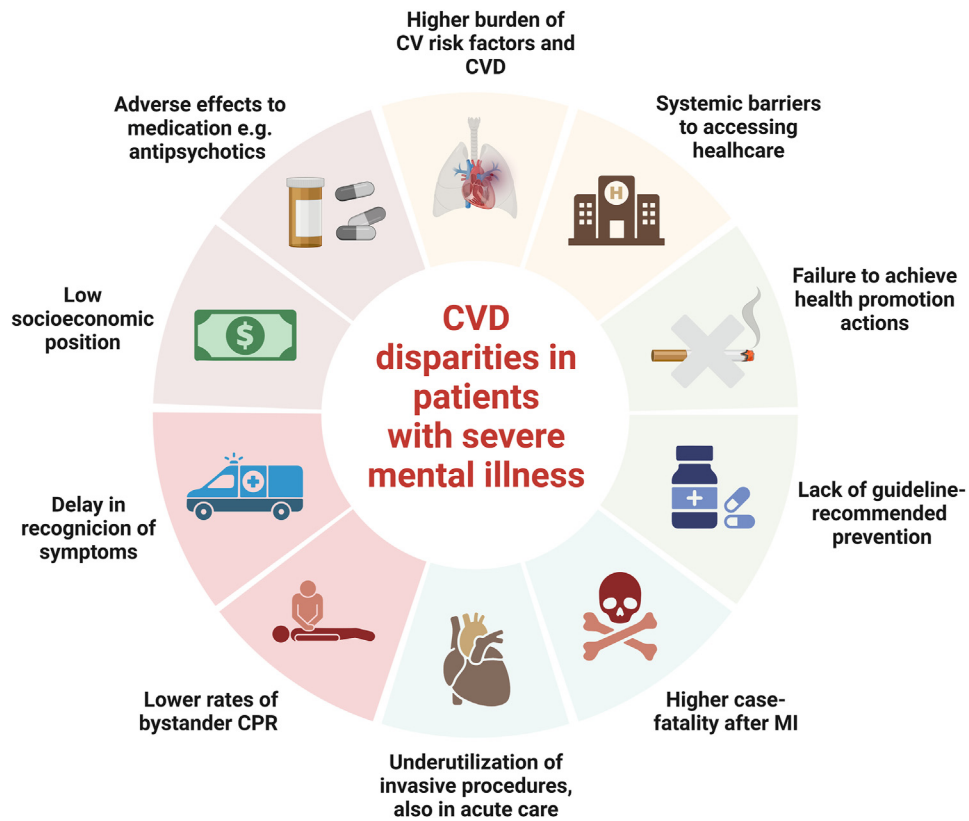


Fig. 4: Current cardiovascular challenges in patients with severe mental illness. CV: cardiovascular, CVD: cardiovascular disease, CPR: cardiopulmonary resuscitation, MI: myocardial infarction.

With the strength of Nordic comprehensive registries, studies have been able to evaluate inequalities in trends in hospital admission and invasive procedures among patients with severe mental illness. Among residents in Denmark in 1994–2006, hospital admission for CVD were 25–30% higher in patients with a psychiatric diagnosis, with an increasing trend over time in patients with schizophrenia.⁶⁴ Specialized CV examinations⁶⁵ and invasive procedures^{64,65} are significantly underutilized and there is an increased case-fatality after MI.⁶⁶ All associations were strongest among patients with schizophrenia.^{64–66}

Mental health and emergency care

When assessing out-of-hospital cardiac arrest patients among patients with and without a psychiatric diagnosis, patients with any psychiatric diagnosis had significantly lower short and long-term survival, most profoundly among patients with severe mental illness. This was possibly explained by lower rates of witnessed arrest and bystander CPR despite a similar time to recognition and arrival of the EMS.⁶⁷ Further, patients with a psychiatric diagnosis were less likely to receive an acute and subacute coronary angiography, even in the subset of patients presenting with ST-elevation MI.

However, in the subset of patients undergoing coronary angiography, no significant difference was found in standardized incidence rate ratios for revascularization in patients with and without a psychiatric diagnosis.⁶⁷

In summary, Nordic registries document that patients with severe mental illness constitute a vulnerable group of patients, where inequities in CV care are reported. This inequity is likely to contribute to the large disparities in CVD outcomes, although the differences in prevalence of CV risk factors, compliance and comorbidity are also major contributors.

Ethnicity

Over the last few decades, the previously very homogeneous populations of Nordic countries have experienced a significant influx of immigrants from non-Western regions, with the largest non-Western groups originating from Syria, Iraq, Somalia, and Bosnia and Herzegovina.⁶⁸ Ethnic diversity is therefore increasing, and immigrants and their descendants now constitute around 8% of the population in Finland, 15% in Denmark, 16% in Iceland, 17% in Norway and as high as 22% in Sweden. Immigration and integration have become highly prominent issues, both in the public discourse and politically. Despite several

similarities within the Nordic countries, their approaches to immigrant integration have varied. Sweden and Denmark have historically held opposite ends in all indexes of civic integration policy, with Sweden placed amongst the most liberal and Denmark among the most restrictive countries in Europe.⁶⁹ Regardless, the health of ethnic minorities has become an increasing concern. Managing the health needs of immigrants is challenging, both in terms of potential biological differences, immigrants may have suffered hazards related to the migration process, or they may encounter structural discrimination when accessing healthcare services.⁷⁰

Ethnic inequalities in cardiovascular disease and mortality

Large, observational studies have sought to investigate potential ethnic disparities in the incidence rates of CVD. However, these Nordic epidemiological studies are challenged by smaller immigration populations and a relatively short history of immigration, resulting in a young population of immigrants and their descendants, and a lack of clarity to which extent socioeconomic position influences the CV health of immigrants. Results have varied across ethnic groups defined by country of birth and within the Nordic countries. However, acknowledging these limitations, several studies report a higher incidence of CVD amongst immigrants when compared to Nordic-born people, without socioeconomic differences fully explaining the underlying mechanisms.^{71–73} Especially higher incidence rates of MI are reported among immigrant men, which persist several years after immigration.^{72,73} Additionally, a large Danish study reported that family-reunified migrants had a lower risk of MI, whereas refugees were at higher risk.⁷⁴ These findings are consistent with the effect modification of immigrant status on CVD described elsewhere.⁷⁵ Regarding CV mortality, results are less clear-cut. Higher CV mortality has been reported among immigrants in Denmark⁷⁶ and Sweden,^{76,77} although not consistently across all immigrant populations. Conversely, one Danish study that included all newly-arrived immigrants to Denmark between 1993 and 2010 (n = 114,331) reported a more favorable survival prognosis after overall CVD, MI and stroke in all immigrant groups.⁷⁴

Cardiovascular risk factors and ethnicity

The prevalence of behavioral risk factors varies among immigrants groups, which challenges conventional risk models^{78,79} and may account for the observed differences in CVD outcomes. Immigrants have a less favorable risk profile compared to Nordic-born individuals, which persists even after adjustment for socioeconomic position. These ethnical differences are particularly notable for obesity, diabetes, sedentarism and dyslipidemia.^{80–82}

One registry covering the entire Danish population found a 2.5-fold higher incidence of diabetes among non-Western immigrants compared to native-born Danes.⁸³ Moreover, inequities in pharmacological management of diabetes have been described among immigrants.⁸⁴ Smoking prevalence remains higher in men from the Middle East and lower in women than in Nordic-born individuals.^{78,80,82} In conclusion, behavioral risk factors represent a significant potential for risk reduction and addressing these could subsequently diminish inequality in CVD outcomes.

Cardiovascular care

To ensure equitable CV care, healthcare systems must adapt to demographic changes in ethnicity. While access to acute treatment may not present significant challenges, primary and secondary prevention pose greater difficulties. Revascularization and case fatality rates after MI is similar in non-Western and Nordic-born patients,^{85,86} likely reflecting adherence to guidelines in the acute setting. However, disparities in secondary prevention, both pharmacological and non-pharmacological, appear to be more widespread. A study of 33,199 patients with acute coronary syndromes reported lower initiation of ADP- and ACE inhibitors, higher risk of discontinuation of all guideline-recommended medication therapy, and lower use of non-pharmacological interventions, e.g., patient education, among non-Western compared to Danish-born patients.⁸⁷ Lower use of beta-blockers in secondary prevention among non-Western patients has also been reported, although not consistently across different ethnic groups.⁸⁸ Conflicting results are reported in two Swedish studies,^{89,90} although a trend towards lower use of guideline-recommended drugs among patients originating from outside EU-25 persists.⁹⁰ However, these results were partly mediated by socioeconomic position.

Deprived neighborhoods

Immigrants are inclined to reside in socioeconomic disadvantaged neighborhoods, commonly referred to as deprived neighborhoods. Individuals living in deprived neighborhoods generally experience worse health outcomes, regardless of individual socioeconomic position, compared to those living in more affluent neighborhoods.⁹¹ This disparity is partly attributed to behavioral risk factors,⁹² leading also to a higher incidence of CVD.^{92,93} A Swedish study of 61,386 adult immigrants who obtained Swedish residence permit during a 4-year time span reported that moving to a community with a high degree of deprivation was associated with an increased risk of diabetes.⁹⁴ Similarly, in a Swedish study of >300,000 patients with diabetes, a higher risk of developing CVD was reported when living in a deprived compared to a more affluent neighborhood.⁹⁵ Data from Danish registries also found higher incidence of MI among persons living in more deprived areas, defined by

Search strategy and selection criteria

We identified original articles and reviews for this paper through searches of PubMed conducting four search threads focusing on disparities in CV risk factors, CV care, atherosclerotic CVD, and CV mortality in the Nordic countries within the following aspects: 1) socioeconomic differences, 2) access to healthcare and emergency care, 3) mental health, and 4) immigrant status, respectively. Various combinations of terms for “disparities” and “inequity” adjacent to “cardiovascular outcome”, “cardiovascular disease” or “cardiovascular mortality” adjacent to “Denmark”, “Finland”, “Sweden”, “Norway” or “Iceland” was adjacent to specific terms for each of the four aspects listed above. MeSH-terms were included. The period of time was limited to studies conducted within January 1st, 2003 to January 1st, 2023. We searched the reference lists of articles identified by this search strategy and selected those we judged to be relevant. Additionally, we chose to include epidemiological reports from public and private organizations in the Nordic countries that we judged to be important to the topic.

median disposable income and for areas with a high proportion of immigrants and descendants from non-Western countries.⁴⁵ In Sweden the steep decline in CVD in recent decades was higher in affluent compared to deprived neighborhoods. Mortality following MI in Sweden 1995–2013 was higher if the residential address was in an area with a low socioeconomic position, irrespective of individual CV risk. Together, data indicate that improvements in CVD prevention and treatment in the Nordic countries have not benefitted individuals in deprived neighborhoods to the same extent.⁹⁶

There are multiple factors contributing to the higher CVD morbidity in deprived areas. Local CVD prevention centers may be able to address some of this disparity. Indeed, in a Danish registry, patients from deprived areas (defined by a socioeconomic vulnerability score) were more likely to be referred and just as likely to complete a program in a prevention center as patients from less deprived areas.⁹⁷ Physical environments, including access to healthy food and recreational areas may be of importance in addition to local social norms. Data from a large Swedish questionnaire survey on access to recreational values showed an association between walking distance (<300 m) to recreational values with higher level of physical activity. However, close access was rare and more than half of the study population of 25,000 from southern Sweden did not have close access to a recreational area (eq. serene, wild, lush, spacious, culture, the common, the pleasure garden and festive/center).⁹⁸ Results from Denmark also show that close access to green and recreational areas is associated with less time spent sedentary, a marker of risk of CVD and diabetes.⁹⁹

In conclusion, non-Western immigrants in Nordic countries face a higher CVD risk. This seems partly explained by differences in behavioral risk factors and lack of initiation or compliance to secondary prevention. However, results should be interpreted with caution as

immigrant groups are culturally heterogeneous and dynamically changing over time. Notwithstanding, immigration status remains a major cause of CVD disparities in the Nordic countries.

Conclusions

Our scoping review of Nordic literature provides up-to-date evidence of disparities in CV morbidity and mortality, despite the presence of universal, comprehensive welfare systems. We conclude that patients with a low socioeconomic position, severe mental illness, or immigrant status receive inadequate CV care, including acute care, leading to an impaired CV prognosis. Existing policies in the Nordic countries are inadequate in managing these current challenges. The policy recommendations highlighted in this Series paper for the Nordic countries’ future efforts align with Nordic trends and European international guidelines. Targeted interventions and policies are needed, especially to address management of CV risk factors, to achieve equality in the Nordic countries.

Contributors

EP, SH, and JH conceived this Series Paper. SH and JH did the literature search. All authors contributed to the writing of the manuscript and critically reviewed the full draft and subsequent revisions of the manuscript. EP was the lead of the Nordic group.

Editor note

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Declaration of interests

We declare no competing interests.

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