Healthy migrant perspectives on disability and mobility in a Swedish nineteenth-century population*

[All figures and tables are found at the end of the paper]

1. INTRODUCTION

Both historically and today, migrations are integral part of young life as individuals look for an education or a job or a partner while establishing themselves as independent adults enjoying an income and a social and healthy life. Bringing people to new places and possibilities makes migration itself – the causes and outcomes – an exciting phenomenon to research, as it reflects the living conditions of individuals, groups or whole populations and the societies they live in. On the one hand, migration manifests an act of self-determination enabling the extension of opportunity structures by moving to more prosperous labour markets or housing conditions, for example, than in the current area of residence. On the other hand, migration is not possible for all and it could further be forced by war or environmental disasters. Since migration requires physical ability and often material resources to realize, most migrants are selected on the basis of health. Within the fields studying migration, population and health, these selective circumstances have been conceptualized within the 'healthy migrant hypothesis'. For example, it proposes that persons who are too old, weak or impoverished are less likely to migrate (Abraido-Lanza et. al. 1999; Evans 1987; Friesbie et. al. 2001; Wallace & Kulu 2914). That migrants are positively selected this way can be translated to include disabilities, as well, and constitutes one major rationale to our study.

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Whether and how disability interfere with migration in human life is an almost silent issue in research. One reason to this silence is because impairments are intuitively associated with low or no capacity to set oneself on the move; and since there are so few migrants who are disabled there is little point to explore them. This study goes 150–200 years back in time to to examine whether this association holds and to what extent it may be differentiated through a careful investigation of migration risks across the life course of men and women with or without disabilities. We also search for health effects coupled with disability evidenced by the distance migrants moved and shifts over time. This makes our study among the first to test how health in terms of disability shaped human migration from historical and empirical perspectives. As a result, one minority population long hidden in society and research come to the fore to contribute to the debate on 'healthy migrant effects'.

1.1 AIMS OF THE ANALYSIS

The overall aim is to obtain knowledge on how disabilities affect health and living conditions across human life historically by examining the event of migration and the distance migrants crossed. Comparisons are made between disabled and non-disabled layers in a 19th-century population consisting of more than 35,000 inhabitants residing in the Sundsvall region, Sweden. First, we use migration rates and proportional hazard regressions to estimate the migration propensity. Second, spatial analysis helps us clarify how disability determined the distance and type of destinations that migrants targeted. To differentiate all outcomes, we look for variations across time and by gender and disability and type of disability (sensory, physical and mental), also accounting for the geographical and socio-demographic features among the individuals.

2. LITERATURE OVERVIEW

While migration studies concerned with both past and present time have increasingly turned the focus on gender, class and ethnicity the recent decades, disability has largely escaped interest.

Beside the perception that disability implies immobility, the troubles with accessing sufficient data recognizing impairments and migrations among individuals help explain the lack of such studies, particularly for past times. While studies on populations, health and epidemiological research centre upon the wellbeing and quality of life among humans from multiple angels including migration and life course approaches, studies focusing on disabilities are few except from on elderly people among whom relatively few migrants are found. In these studies, disability is primarily treated as the outcome of old age or of chronic diseases or accidents, which basically makes disability become a biomedical condition. This may have a direct negative impact on humans' functionality and health status that limit their mobility. However, who is recognised as disabled is contingent and a socio-cultural construct according to disability scholars. They argue that disability makes people face obstacles indirectly due to discriminatory attitudes based on social classifications and prevailing norms in society that depict them as different from the mainstream (Jaeger & Bowman 2005; Kudlick 2003). Such environmental attitudes may limit one's life chances and participation in society beyond the functional impairment itself.

While a great many disability studies examine mobility issues, few of them regard long-term residential migrations. Instead, the focus is on moves and transports in everyday life from accessibility aspects, as disabilities often jeopardize mobility possibility for people to participate in society and work and thus to enjoy a social and healthy life on equal basis with others (Landby 2018). Although these studies do not primarily regard residential migrations, they show that spatial mobility it useful to study to identify issues concerning the policy, citizenship, identity and rights of individuals with disabilities, as stated in the UN Convention on the Rights of People with Disabilities (2006). Impairments risk to result in an even sharper inequality between people regarding the access to education or employment, or to health care or a social life. Such access can vary depending on residence within and across countries and work to make disabled individuals less or more visible as migrants.

Disability history constitutes a relatively small field rooted in social history. The scarcity of sources helps explain why there is little knowledge about the actual lives and moves of disabled individuals and often only in small numbers. Some information is found in hospitalization registers or in records from educational institutions or poor relief (Förhammar & Nelson 2004), but they tell little about human life as disabled beyond institutions. Combining such sources with population registers, Sofie De Veirman (2015) shows quantitative life-course results of people with auditory impairment and their hearing siblings in Flanders before and during industrialization. De Veirman concludes that this type of disability impeded the job and marriage chances of people and their migration, which primarily took place between institutions (asylums, hospitals, charity hospices, poorhouses). Those occupied in the service or handicraft sector often moved between towns, even if having hearing disabilities. Compared with their hearing siblings, they experienced a sedentary life in social segregation.

Our previous studies contribute life-course results on disabled individuals in 19th-century Sweden, based on the dataset we use for the present analysis. Acquiring disabilities in young adulthood (15-34 years) decreased both the marital and survival chances substantially, where the male gender and mental disabilities implied the worst outcomes (e.g. Haage, Häggström Lundevaller & Vikström 2016; Haage, Vikström & Häggström Lundevaller 2017). Our sequence analysis study on how disability at age 15 influenced the transition to work, marriage and parenthood observing a sample followed until age 33, indicates that disability did not stop young people's migration but made it occur to a lesser extent (Vikström, Haage & Häggström Lundevaller 2017). This result calls for a thorough investigation on how disability and different types of it affect the migratory behaviour of men and women in past society.

3. THEORETICAL FRAMEWORK

The life-course approach constitutes one key framing our analysis, both theoretically and methodologically (Elder 1985; Giele & Elder 1998; Elder, Kirkpatrick Johnson & Crosnoe

2006; Kok 2007). This approach focuses on how individuals move through life in terms of trajectories, as the dynamic outcome both of individuals' characteristics and their opportunity structures given the time-space context they face. However, circumstances such as disabilities may change people's chance to take the trajectory otherwise taken and could limit their possibility to migrate. Our analysis seeks to clarify this issue making use of impairment notes that ministers reported on young parishioners some 150–200 years ago (section 4.2).

The life-course concept resembles the time-geographical approach that Torsten Hägerstrand introduced almost half a century ago (1970, 1985). It has been applied in different research, one of which studies everyday mobility between activities taking place between home and work or in leisure time as tourists. Different groups travel differently depending on age structure, gender, health status, socio-economic position and family situation (Berg et al., 2014, 2015; Gil Solá, 2013, 2016; Ellegård & Svedin, 2012). A few such works concern marginalized groups including people with disabilities and find that mobility constraints tend to increase existing barriers resulting in a further exclusion from society and social life compared to the mainstream population (Jo et al., 2004; Nyman et al., 2018; Pettersson, 2015; Åström, 2001). Like the life-course concept, the time-geographical approach stresses the need to examine both the individual and structural level of analysis. As physical and social environments matter for the (im)mobility of humans who also shape and interact with their surroundings, these two levels cannot be studied separately but relative to the *resources* and *constraints* their time-space setting provides.

Focusing on contextual circumstances, Brian R. Grossman (2018) recently conceptualized cross-state migrations in the USA addressing community-based social service and care provisions from a disability perspective. Grossman calls his model 'Moves in context' and introduces the concept of 'Intrastate confinement', which works to 'wall in' marginalized groups as people with disabilities. It refers to state dissimilarities in their right to and the distribution of service provisions. Consequently, they cannot cross state lines by the promise of

educational, economic or social advancement like other US citizens. It would risk reducing their entitlement to community-based support and citizenship. As does both the life-course and time-geographical approach, Grossman treats migration as a trajectory event that depends on the social position/personal *resources* of people and on *constraints* in their social structure/ideology. It requires certain incentives and abilities to conduct a cross-state migration. Social ties and information are further beneficial for making this move, Grossman argues, but disabilities tend to make the access to such properties short and work as a lock-in mechanism.

Historically, governments and authorities have made use of legislation and confinement to institutions as means to control citizens regarded as deviant or even dangerous to society (Eggeby 1993; Foucault 1961), which worked to constrain the life and mobility of people with disabilities. Schweik (2009) argues that the 'Ugly laws' through criminalization aimed at removing 'unsightly' poor people and beggars from city streets in late 19th-century USA, many of whom had disabilities. While in Sweden, the establishment of asylums for the disabled did not take place on a larger scale until the early 20th century, there is one legislation of theoretical interest that may have 'walled in' the disabled individuals we study. The Servant and Master Act *(tjänstehjonsstadgan)*, which was in effect 1664–1926, made authorities reject people to settle in a new parish if not able to provide for themselves through employment or if no relatives could support them there. Historians argue that the government's aim with this law was to cut and control the peaking poor relief costs and to supply employers' call for cheap workforce (Harnesk, 1990; Petersson, 1983).

3.1 HEALTHY MIGRANT HYPOTHESIS

While the 'healthy migrant hypothesis' has appeared in epidemiological and demographic research, it has been less used for historical populations and internal migrants and not with respect to disability (Wallace & Kulu 2014). Even if not being always verified (Andersson & Drefahl, 2017), one recurrent result behind this hypothesis is that migrants seem to gain a

positive health effect compared to sedentary populations (Abraido-Lanza et. al. 1999; Evans 1987; Friesbie et. al. 2001; Kolcić & Polašec 2009; Kristiansen et. al. 2007; Lu 2008). Historical results show evidence of these effects comparing mortality between incoming settlers and indigenous Sami peoples in Sweden during colonization (Karlsson, 2013; Vikström, Marklund & Sandström, 2016). Thus, there is reason to assume that healthy people are positively selected to become migrants while persons who are too old, weak or impoverished are less likely to be.

Our study tests the healthy migrant hypothesis translating it to disabilities. If it holds true, low migration levels would characterize disabled layers in populations. Further, as this hypothesis views migration as indicative for good health, it may provide one means to assess the disability, as some disabilities may more than others entail hardship resulting in immobility. Hence, the lower level of disability the longer distance while short ditto or immobility would indicate severe or disabling impairments. That the distance migrants travel reflects their position in society in terms of power and resources has been proposed in literature (Vikström, 2003; Lim 1993), for instance, to explain why female migrants do not challenge as long distances as their male peers historically or in recent societies showing gender inequality.

4. AREA, DATA AND METHODS

Sweden experienced the urban-industrial process at a slow pace although it increased in speed during the second half of the nineteenth century and came to affect more remote and sparsely populated areas. One such area was the Sundsvall region (Figure 1) situated some 600 km north of Stockholm, where the population depended on agricultural production until the 1860s. From then onward the demographic and socio-economic structure altered, especially in a few parishes along the coast (Alnö, Skön, Njurunda and Timrå). This was because the economic activity and the labour market became based on the forest and sawmill industry that also promoted the commerce and business life in the town of Sundsvall (Bergman 2010; Tedebrand 1997). Attracting thousands of migrants, the sawmills added to the regional population growth caused

by the 19th-century mortality decline (Edvinsson 1992; Vikström 2003). While there were 18,793 inhabitants in 1840, this number had increased to 46,418 in 1880 (Alm Stenflo 1994).

[**Figure 1**: Map of Sweden and the Sundsvall region…see ending pages]

4.1 DATASET AND DEFINITIONS

The data consist of parish registers of the nineteenth-century Sundsvall region, digitized by the Demographic Data Base (DDB), Umeå University, Sweden. It provides linked registers from records of birth and baptism, marriage, migration, death and burial, as well as catechetical examination records. As the DDB registers are linked on an individual level they provide demographic data summarized for each parishioner across life (Nilsdotter Jeub 2009; Vikström et al. 2006). In these registers, the ministers made marks about impairments *(lytesmarkeringar)*, using typical terms of their time that report about physical and mental dysfunctions among the parishioners (Haage 2017; Rogers & Nelson 2003; Drugge 1988). Although it is difficult to interpret how severe or painful these impairments were, they show evidence of 'disabilities' in relation to a physical or mental status that was perceived to be 'normal', 'healthy' or 'able' at the time (Eggeby 1993). This means that those who the ministers recognized as disabled in the 19th-century context are defined as such in our study. Governed by these considerations, we first categorized the disabilities into five groups (Table 1), then modified into three groups: sensory disabilities (visual or hearing defects, being blind or deafmute); physical disabilities (bodily defects, cripples); mental disabilities (due to 'idiocy', 'insanity').

[**Table 1.** Descriptive statistics of the study population (15–34 years old) in the Sundsvall region 1835–1892: absolute and relative number by disability and gender and other socio-demographic characteristics.]

As the DDB parish registers are recorded longitudinally at the micro-level, we can reconstruct the lives of individuals to conduct life-course analysis. The dataset includes those the ministers report had disabilities between 15 and 34 years (N=504). From then onward, we observe them for a maximum of 18 years, looking for the migration events we account for, defined as moves across administrative parish borders. The DDB digitization further allows the construct of a control group made up by individuals who did not have any impairments reported in the parish registers. This makes the entire dataset includes a case-control population of 35,109 individuals, all of whom were 15–34 years old at observation start. However, the majority were below 20 years old as the impairment marks were primarily reported in young adulthood.

4.2 METHODS

In our investigation of migration, we study variations in three outcomes: migration rates and risks; the destination selection; and the distance moved. Cox regression is a standard technique for modelling time to event data to study the time it takes before the event in question occurs, in this case migration. Allowing the examination of the combinational effects of several variables makes it an adequate choice for estimating the migration propensity. This enables us to identify (dis)similarities between disabled and non-disabled men and women. Because they enter the study at different ages (left truncation) and the observation period is quite extended, using time to event as the time scale is inappropriate (Korn et al. 1997; Thiébaut & Bénichou 2004). To control for the effect of age on migration and handle the effect of left truncation, age is used as the time scale in the Cox regression models. Hence, the age at observation start is the enter-value while the exit-value is set by age as observation stops due to migration or right censoring (death, end of observation or digitalisation of the parish records). To uncover the migration patterns and how it shifted across time, we examine the destinations and distances primarily making use of spatial analysis and descriptive statistics. All the analyses are run in the statistical computing environment of R (Broström 2012). Beside gender, the variable of

major concern to us is whether individuals were disabled or not and according to the three categories: sensory, physical and mental disabilities. The non-disabled cases constitute the control group. Another major concern is to identify temporal patterns and shifts in individuals' migrations before and after the onset of industrialization due to the increasing establishment of steam-driven sawmills in the study area from the 1860s onwards.

As for the Cox regressions, they also account for other covariates than disability and gender that can impact on the migration risks, one of which concern socio-economic status in terms of resources and in two ways. First, we account for father's occupation because many individuals did not hold any occupation due to young as we target them for observation. Their father's occupation is grouped into three categories: lower strata, upper/middle strata and unknown/undefined cases,[1] based on occupational codes that researchers at the DDB have developed from the parish registers.[2] Second, the occupation of individuals is treated as a time-dependent variable showing whether they had held any job at all before migration possibly occurred. Since the majority were of young age and primarily held low-status occupations there was no point in classifying them further. Periodic cohort distinguishes between when the individuals are under observation: during pre-industrial time (observation starts between 1835 and 1844), or during industrial time (observation starts between 1865 and 1874). Birthplace in relation to parish of residence is also accounted for, as this indicates the experience of migration prior to the migration events we focus on. Similar to having held occupation, marital status and disability are treated as time-dependent variables.

The study of variations in the selection of migration destinations is limited to the migrant population, consisting of 109 individuals with a disability and 13,580 without a disability. The parish ministers noted the destination parish for all migrants. These destination parishes are

[1] We selected father's occupation at the start of the observation of the individuals or immediately before the start. Socio-economic status is divided into three categories because of small numbers in some of the groups.

[2] The DDB classification does not completely correspond to the two commonly used classification schemes in historical studies, SOCPO and HISCLASS, but there are many similarities between them; for a comparison between the schemes, see the Appendix in Edvinsson and Broström (2012).

classified into four groups, three of which represent internal migration within the sampled region (i.e. coastal, inland and the town of Sundsvall), while all others are classified as external migration. Differences in the distribution of destination selection is then analysed using Chi-square tests. Through this procedure, we can test whether people with or without disabilities moved to different types of locations, and how this changed over time.

Differences in migration distance by disability is investigated using spatial visualisations and tested using linear regressions. As the exact location of residence and destination within the parishes is unknown, we use the parish administrative boundaries as a proxy for migration locations. The distance between the two parishes is measured as the minimum distance between the centroid of the sender parish and the boundaries of the receiver parish. In this way, the distance between a sender and a receiver parish is the average minimum distance travelled to move from the sender to the receiver parish. This assumes that the population is evenly distributed within the sender parish boundaries, which is not the case. However, this measurement works as an adequate approximation of the minimum average distance travelled compared to alternatives. For example, the minimum distance between the boundaries of two adjacent sender and receiver parishes is zero, and the distance calculated using only centroids would depend on the size and shape of the receiver parish.

Variations in migration distance are analysed using linear regressions. The distribution of migration destinations is heavily skewed towards short migrations with a long tail of more distant migrations. Hence, the outcome is modelled as the natural log of the log of distance, which fits better to the assumptions of normally distributed errors of the linear regression. We analyse the effect of disability and gender on the minimum distances between parishes. Using regression-based models we account for other covariates that could affect migration distance, namely father's occupation, own occupational status, marital status, age, period cohort and birthplace – similar to the Cox regressions.

5. RESULTS

5.1 MIGRATION RATES AND RISKS

Figure 2 shows the migration rates by type of disability, gender and periodic cohort. Clearly, disability decreased these rates, the lowest level being associated with mental disabilities followed by physical disabilities, while sensory disabilities implied the highest migration rate within the group of disabled people. No matter of periodic cohort, this group had lower rates than the group without disabilities. Moreover, while the migration rates for the latter increased between the pre-industrial and industrial period, they decreased for all disability groups. In this respect, the gap between the two groups widened over time. As for gendered differences, women's migration rates were similarly negatively affected by all types of disabilities, while mental disorders tend to particularly have limited men's migration.

[**Figure 2:** Migration rates by disability, gender and periodic cohort in the Sundsvall region 1835–1892.]

Figure 3 takes the above results further by plotting the predicted migration propensity according to periodic cohort, disability and gender. The change in the effect of disability over time is tested by introducing an interaction between periodic cohort and disability. This test lends credit to the notion that migration increased during the industrial period, but only if individuals did not have disabilities. Regardless of gender, disability lowered the migration risk over time, but it did slightly more among the men.

[**Figure 3:** Predicted migration propensity by disability, gender and periodic cohort, estimated using Cox proportional hazards regression].

Table 2 confirms that the migration risk differed by disability to a most significant degree. It shows three Cox regression models, also accounting for other characteristics that may

influence the risk to migrate such as having an occupation or not and marital status. Due to assumed differences between and within the genders, Models 2–3 show separate outcomes for men and women, while Model 1 includes all. Age is compensated for, as it is used as a time scale in the regressions.

[**Table 2:** Migration propensity by disability and gender in the Sundsvall region 1835–1892: three Cox regression models.]

According to Table 2 (Model 1) there are significant variations regarding disability type, one of which is that mental disabilities limited migration the most (with about 70% compared to non-disabled) while sensory or physical disabilities did to about 50%. While these hazards hold true for the disabled group as whole (Model 1) and the men (Model 2), the hazards for women (Model 3) suggest that the they were more negatively affected by sensory disabilities (blind and deafmute) than the men. The impacts of the other factors adjusted for go in the expected directions given previous migration findings (Dribe 2000; Vikström 2003), for example, that the migration ratios were higher in the industrial era than during pre-industrial times. That the hazards were higher among single than married people and lower among native-born parishioners than those born elsewhere comes as no surprise; nor that having an occupation was associated with a higher migration propensity than not having a job since migrations must be afforded and laws emphasized employability for moving to another parish. In all, the negative effect of disability on migration remains strong and statistically significant.

5.2 MIGRATION DESTINATION AND DISTANCE

This section examines how disability shaped the destination migrants targeted and the distance they moved. To identify possible disability patterns in the migration flow between sender and destination parishes, the parishes are categorized into three areas: 1) one coastal area primarily

representing industrialized parishes; 2) one inland region consisting of mainly rural parishes; 3) the Sundsvall town and only urban area under study. The left-hand side of each alluvial plot in Figure 4 represents a sender area, while the right-hand side is the destination. The size of the edges between sender and destination shows the relative number of migrants moving between these areas. Differences in intra-regional migration are one of the most striking contrasts in the patterns of disabled and non-disabled migrants. During the pre-industrial period, the intra-regional flow of disabled migrants is larger than for non-disabled movers, while it becomes similar and less dependent on disability during the industrial period. Figure 4 also shows that disabilities made people less inclined to move beyond the Sundsvall region, a feature most notable during pre-industrial time.[3]

[**Figure 4:** Alluvial plots of migration flows by sender-destination type, disability and periodic cohort in the Sundsvall region 1835–1892]

We further examine how disability influenced the destination by testing the differences found between the disabled and non-disabled group for each periodic cohort using a Chi-square test. Figure 5 shows the test results which confirm that disability implied a significant difference in migration destination during the pre-industrial period but not for the industrial period. The colors in Figure 5 represent the degree to which an observed number of migrants per destination category deviates from the expected number if the distribution of destinations would be equal between the groups of disabled and non-disabled persons. We find divergent patterns between the pre-industrial and industrial period. Prior to industrialization there was a significant disability difference in the migration destinations. Migrants having disabilities were much less likely to move outside the region than migrants without a disability, while the latter moved to

[3] Not visible by the migration flow plotted are differences in migration propensity as the size of the sender areas is determined by the number of migrants and, therefore, do not account for differences in the risk population - the spatial distribution of disabled and non-disabled.

the coast to a higher degree. In the industrial period, there was no statistical difference in the destination between the two groups. Disabled or not, all migrants moving during that period show the highest propensity to move outside the region followed by a coastal parish.

[**Figure 5:** Migration by destination type, disability and periodic cohort in the Sundsvall region 1835–1892.]

Mapping the geographical distribution of destinations, Figure 6 details the differences regarding the distance of the migrants in both groups. The map plots the centroid of the parish of destination where the size of the point represents the number of migrants bound for it. Having a female gender and disability seem to limit the distance for migrants the most. Men travelled profoundly longer distances to reach their destination compared to women, while all without disabilities travelled farther away than those having disabilities did. Again, the gap between migrants moving during the pre-industrial and industrial period become obvious in terms of the much shorter distances covered during the former period, when most destinations were located within the region. The maps of Figure 6 further highlight how infrequent the distant destinations were during the pre-industrial times among the few disabled migrants.

[**Figure 6:** Geographical distribution of migrations by parish destination and by disability, gender and periodic cohort in the Sundsvall region 1835–1892]

The temporal variations in distance among migrants in the disabled and non-disabled groups are further tested in a linear regression model. Figure 7 shows these estimates adjusted for differences in age, geographical origin and gender. As most migrations were relatively short and the distribution of destinations in km is skewed, the outcome is modelled on a log scale. To make the results from the regression model interpretable, we transform the estimated effects back to km as the predicted distance. The regression models show that the profound distance

gap between disabled and non-disabled migrants in the pre-industrial period is both strong and statistically significant. Having a disability back then made migrants move, on average, much shorter, while it during the industrial period did not make any discernible difference in terms of distance. Furthermore, even though the distance migrants crossed increased over time in general, migrants with disabilities manifest the most substantial increase.

[Figure 7: Estimated migration distances by disability and periodic cohort in the Sundsvall region 1835–1892.]

6. CONCLUDING DISCUSSION

The overarching aim of our study was to advance the knowledge on how disabilities affected individuals' living conditions and opportunities in society historically by studying migration. Making use of micro-level longitudinal parish registers digitized by the Demographic Data Base (DDB), Umeå University, we ran Cox regressions models and conducted spatial analysis on a 19th-century population comprising some 35,000 individuals in the Sundsvall region, Sweden. Whether the results show continuity or rather change during the century under study is of key interest from healthy migrant perspectives. Such temporal comparison would suggest possible shifts in the health status and capability of disabled people, or how their disabilities were perceived by the surroundings, here indicated by migration to another parish. We find three temporal trends regarding how disability affected migration in the 19th century: 1) disability impeded the migration risk throughout the century and even more during industrial time; 2) disability made the destinations of pre-industrial migrants differ markedly while during industrialization this difference almost disappeared; 3) similarly, the distances migrants travelled to these destinations became less determined by disability over time. Below, we differentiate these findings followed by a theoretical discussion on why we come across them.

First, our results demonstrate that all-type disabilities decreased the rates and risks to migrate to statistically significant and profound degrees among both men and women. Hence, disability

did not alter gendered migration patterns typical of the time, e.g. that male migrants moved longer distances that their female peers. Yet there were some variations by disability type and gender. The lowest risk to migrate was associated with mental disabilities, especially among the men followed by physical and then sensory disabilities, respectively. The latter type of disabilities was more limiting for women's migration than for men, while men suffered more from physical disabilities. These migration variations across disability type and gender suggest that people with disabilities comprised a diverse group who faced different obstacles and possibilities in life, probably coupled with gendered expectations. At the time, men were recognized as the breadwinning provider while women were devoted to the domestic sector and such expectations shape the migrations of men and women often looking for jobs to improve their current living conditions and future outcomes. However, disability jeopardized the migration of men and women to the similar extent and their contribution to the high levels of migrations in the industrial period. During this period, disability even came to impede migration more than before. Consequently, disability tends to have narrowed the selection of migrants over time, as further illustrated by the spatial results.

Second, our spatial analysis provides insights onto how disability affected the migration flow by gender and across time in terms of destination and distance. Having a disability clearly cut the distance migrants moved throughout the 19th century, but it primarily did during the pre-industrial period and among women. In the industrial era, when disability continued to impede the migration risk and even more than before, the spatial differences between disabled and non-disabled migrants became more similar. Hence, if the former did migrate, they resembled the spatial attributes (distance and destinations) of their non-disabled migrant peers. This result also points towards a sharpened health selection of migrants as the 19th century went by, among whom individuals with disabilities were less likely found.

In all, the healthy migrant hypothesis seems to hold for the disabled people we study, in that migrants are positively selected while economic hardship or ill health make humans less likely

to move. This conclusion is empirically supported by the strong association between disability and low mobility we find, and the fact that migrants travelled shorter distances if having disability. However, these results are likely influenced by contextual circumstances that the population we study experienced. That disability made individuals less eligible to 'qualify' into the group of migrants during industrial time than pre-industrial time, suggests that context matters. According to some scholars disabled people became increasingly excluded from labour as handicraft and agricultural work were replaced by factory jobs, which they were less able to cope with (Barnes & Mercer 2005; Oliver 1990). Probably, the expansion of the sawmill industry in the Sundsvall region promoted a similar shift of the labour market, which added difficulties for disabled people to find subsistence through work and to afford migration. Another obstacle to move is found in the contemporary legislation. As this law rejected them to settle in another parish if not able to provide for themselves, they became increasingly subject to lock-in mechanisms if not finding employment. These are just a few of examples of societal constraints that jeopardized the migration for people with disabilities and likely contributed to the healthy migrant effects we see evidence of. Whether this was the case we cannot confirm from our analysis, and this constitutes one limit with it.

Even though we do not account for contextual factors in our statistical analysis, except for periodical effects, they require some further consideration. This can help explain why disability impeded migration and stresses the need to look beyond the functional limitation to understand the consequences of disability. It must not directly, or by itself, have limited individuals' health status or migration chance. This chance is also shaped by the time-space context and contingent on perceptions about disability relative to capability. Our results on the migration chance, or risk, may in fact indicate that having disabilities became more disabling in the industrial era, as does the narrowing selection of migrants over time. If disabled individuals were increasingly faced with disabling attitudes from surrounding peers and potential employers, they would have accumulated disadvantages across their lifetime as a result of negative views and subsequent

marginalization from the labour market and society. Rough housing conditions and poor access to income or social support may further have promoted ill health and deprived them from socio-economic resources to enable migration. We know from our previous studies that disability decreased the survival chances of both women and men substantially (Haage, Vikström & Häggström Lundevaller 2016). The sedentary lifestyle that disability consequently implied in having limited migration as explained in the present study probably played part to the low survival, which is also recognized as one healthy migrant effect.

Our study has a few more limits to make up for in future research, one of which is to examine if disability made migrants particularly dependent on social networks. An investigation of the destinations and the timing of their moves would reveal patterns of chain migration and if this was more typical among disabled migrants. Whether they migrated in company with relatives or possible friends would give further clues to their participation in past society. Yet our study holds many strengths methodologically and empirically speaking. It is exceptional in providing substantial historical and statistical evidence on one almost incompatible relationship, i.e. between disability and mobility, that has put one minority population to the fore.

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TABLES AND FIGURES

Table 1. Descriptive statistics of the study population (15–35 years old) in the Sundsvall region 1835–1892: absolute and relative number by disability and gender and other socio-demographic characteristics.

Covariates		Men N= 17,431 N (% of men)	Women N=17,678 N (% of women)	Total N=35,109 N (% of total)
Disability	Sensory disabled *(visual, hearing)*	91 (0.5)	60 (0.3)	151 (0.4)
	Physically disabled	106 (0.6)	54 (0.3)	160 (0.5)
	Mentally disabled	111 (0.6)	82 (0.5)	193 (0.5)
	Non-disabled	17,123 (98.2)	17,482 (98.9)	34,605 (98.6)
Periodic cohort	Pre-industrial	6,187 (35.5)	6,463 (36.6)	12,650 (36.0)
	Industrial	11,244 (64.5)	11,215 (63.4)	22,459 (64.0)
SES	Lower strata	3,811 (21.9)	3,723 (21.1)	7,534 (21.5)
	Upper/middle strata	5,669 (32.5)	5,682 (32.1)	11,351 (32.3)
	Unknown/undefined	7,951 (45.6)	8,273 (46.8)	16,224 (46.2)
Residence	Rural parish	8,504 (48.8)	8,699 (49.2)	17,203 (49.0)
	Urban parish	3,806 (21.8)	3,880 (21.9)	7,686 (21.9)
	Industrial parish	5,121 (29.4)	5,099 (28.8)	10,220 (29.1)

Source: Digitized parish registers, the Sundsvall region, Demographic Data Base (DDB), Umeå University, Sweden

Notes: The socio-economic status (SES) is based on the occupational status of fathers. In the pre-industrial cohort, the longitudinal observation of individuals started 1835–1844, while it for the industrial cohort is 1865–1874.

Explanations of disability type (with some examples/specifications from the parish register notes):
Sensory disabilities:
Visual dysfunctions (blind, weak sighted
Hearing dysfunctions (deaf, deafmute, deafness, bad hearing, stammering, mute)
Physical disabilities:
Bodily dysfunctions (crippled, lame, limping, using crutches, missing body parts, being small, hare-lipped)
Mental disabilities:
Mental dysfunctions (foolish, silly, insane, feeble-minded, crazy, idiot, less cognizant)

Explanations of socio-economic categories:

Upper strata	1. Large-scale business entrepreneurs 2. Higher civil officials
Middle strata	3. Small-scale entrepreneurs in trade and industry, master artisans and craftsmen; farmers, tenant farmers 4. Lower civil officials
Lower strata	5. Skilled labourers, craftsmen and artisans below the rank of master 6. Unskilled labourers in trade and industry; farmhands, crofters, maidservants

Table 2: Cox regression of the migration propensity (departure from parish of residence) among disabled and non-disabled individuals in the region of Sundsvall 1835–1892: three Cox regression models.

Covariates showing disability and demographic features of the individuals	*Cox Regression (Model 1)* **Both genders (N=54,847)**		*Cox Regression (Model 2)* **Men (N=28,152)**		*Cox Regression (Model 3)* **Women (N=26,695)**	
	Hazard ratio	*P-value*	*Hazard ratio*	*P-value*	*Hazard ratio*	*P-value*
Disability						
– Non-disabled (ref.)	1	-	1	-	1	-
– Sensory disabled (blind, deafmute)	0.494	0.000	0.583	0.008	0.361	0.001
– Physically disabled	0.507	0.000	0.579	0.021	0.437	0.006
– Mentally disabled	0.300	0.000	0.215	0.000	0.381	0.000
Gender						
– Women (ref.)	1	-	-	-	-	-
– Men	0.785	0.000	-	-	-	-
Marital status						
– Unmarried (ref.)	1		1		1	
– Married	0.724	0.000	0.647	0.000	0.763	0.000
SES (by father's occupation)						
– Lower strata (ref.)	1	-	1	-	1	-
– Upper/middle strata	0.800	0.000	0.776	0.000	0.812	0.000
– Unknown/undefined	1.577	0.000	1.715	0.000	1.436	0.000
Employment status						
– No occupation/unknown/undefined	1		1		1	
– Having occupation	1.488	0.000	1.655	0.000	1.426	0.000
Periodic cohort						
– Pre-industrial (ref.)	1	-	1	-	1	-
– Industrial	1.402	0.000	1.327	0.000	1.457	0.000
Birth area						
– In the regional parish of residence (ref.)	1	-	1	-	1	-
– In a neighboring regional parish	1.504	0.000	1.506	0.000	1.518	0.000
– In a Swedish parish beyond the region	1.943	0.000	2.078	0.000	1.816	0.000
– Born abroad	1.641	0.000	1.774	0.000	1.573	0.000
– Birth area unknown/undefined	3.566	0.000	3.634	0.000	3.515	0.000

Source: Digitized parish registers, the Sundsvall region, Demographic Data Base (DDB), Umeå University, Sweden
Comments and explanations: See Table 1.

Notes: Treating the covariates showing disability, marital status and employment status as time-dependent variables makes the number of cases under observation per model increase substantially. The distinct number of individuals are shown in Table 1.

Figure 1. Map of Sweden and the Sundsvall region showing the parishes under study.

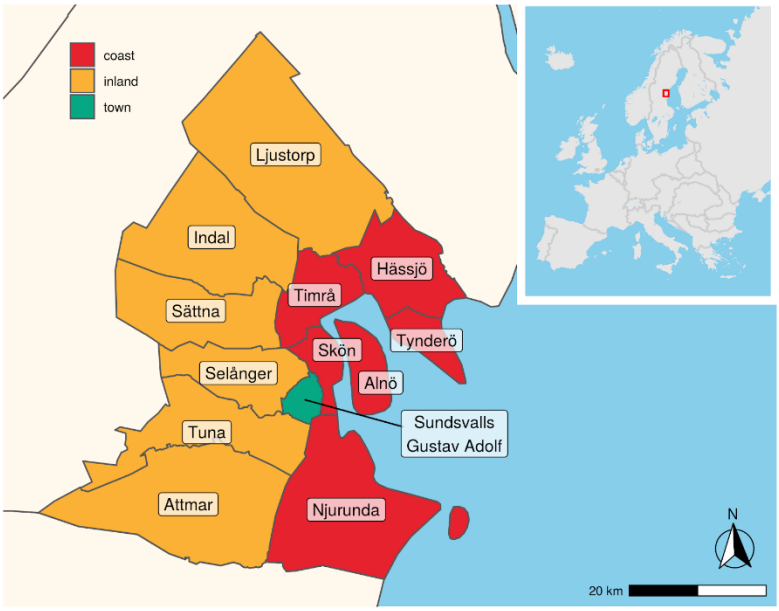
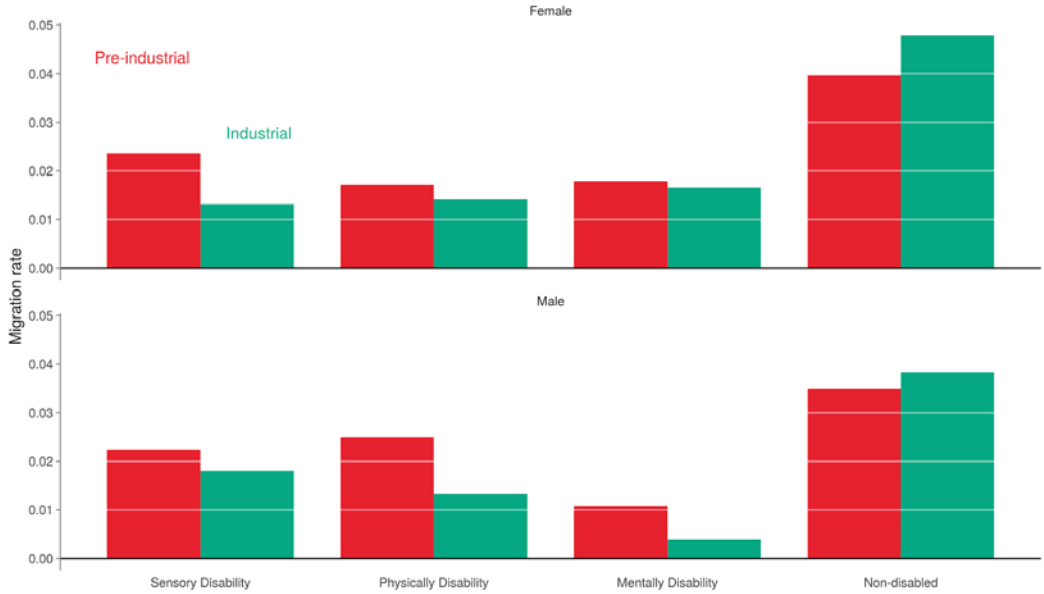
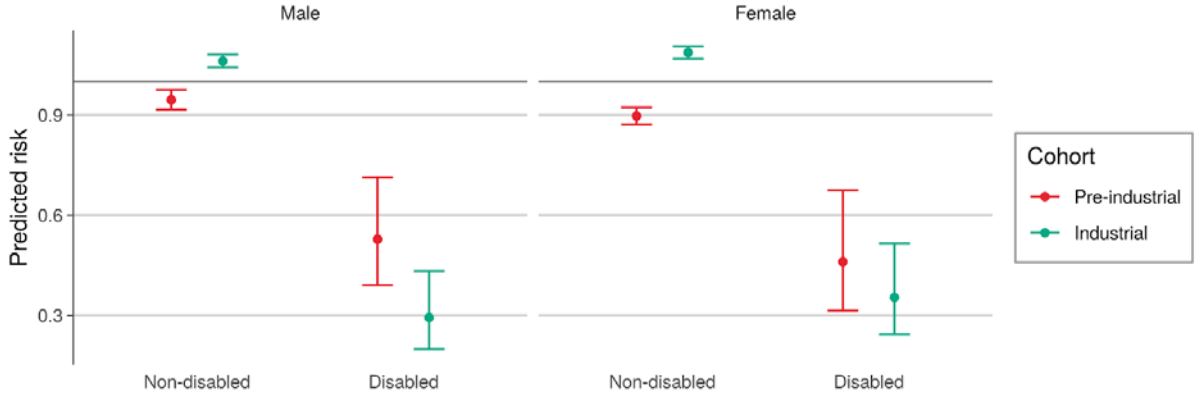


Figure 2: Migration rates by disability, gender and periodic cohort in the Sundsvall region 1835–1892.



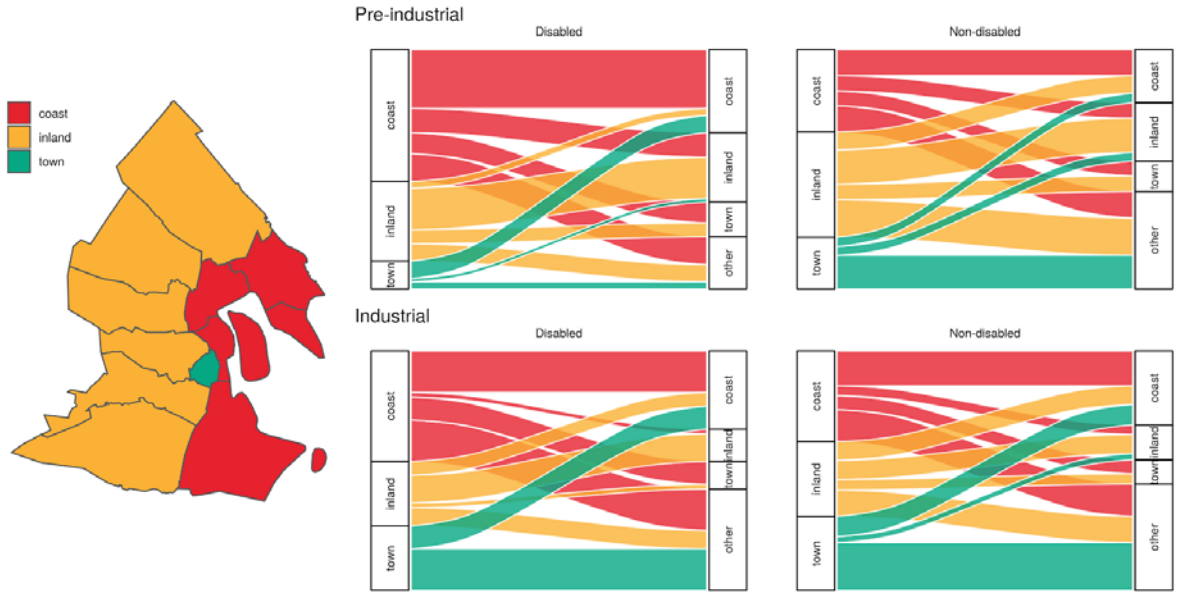
Source: Digitized parish registers, the Sundsvall region, Demographic Data Base (DDB), Umeå University, Sweden

Figure 3: Predicted migration propensity by disability, gender and periodic cohort in the Sundsvall region 1835–1892, estimated using Cox proportional hazards regression.



Source: Digitized parish registers, the Sundsvall region, Demographic Data Base (DDB), Umeå University, Sweden

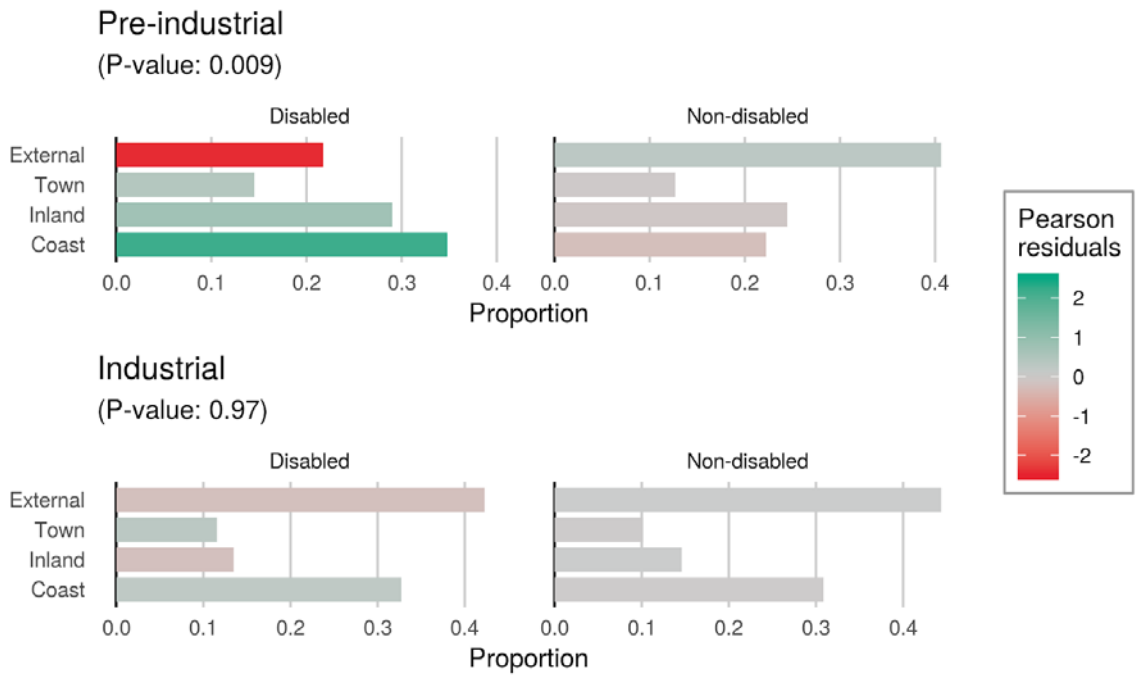
Figure 4: Alluvial plots of migration flows by sender-destination type, disability and periodic cohort in the Sundsvall region 1835–1892.



Source: Digitized parish registers, the Sundsvall region, Demographic Data Base (DDB), Umeå University, Sweden

Notes: Sender-destination categorization:
External/other area – migration to areas situated beyond the Sundsvall region
Coastal area – migration to industrialized parishes within the Sundsvall region
Inland area – migration to rural parishes within the Sundsvall region
Town area – migration the town of Sundsvall within the region

Figure 5: Migration by destination type, disability and periodic cohort in the Sundsvall region 1835–1892.

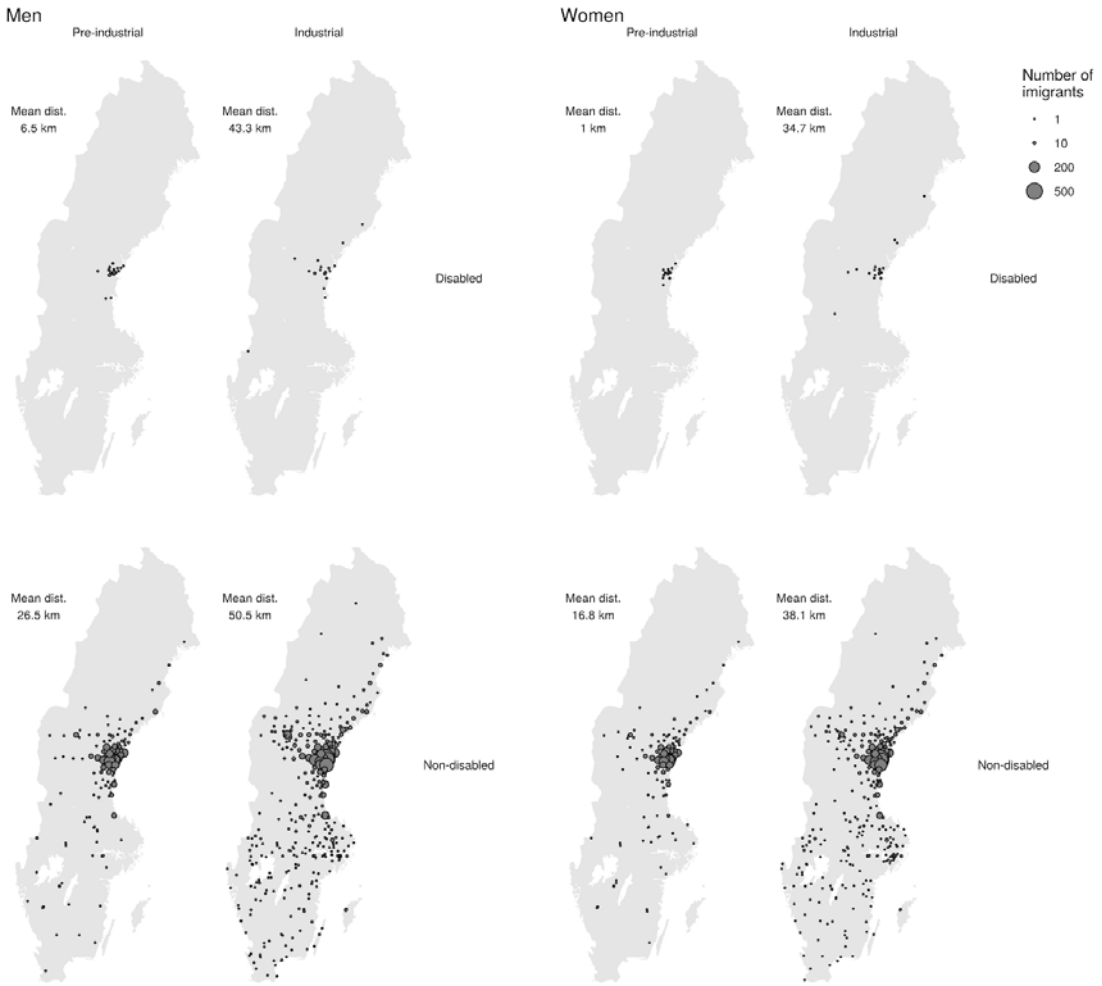


Source: Digitized parish registers, the Sundsvall region, Demographic Data Base (DDB), Umeå University, Sweden

Notes: Destination categorization:

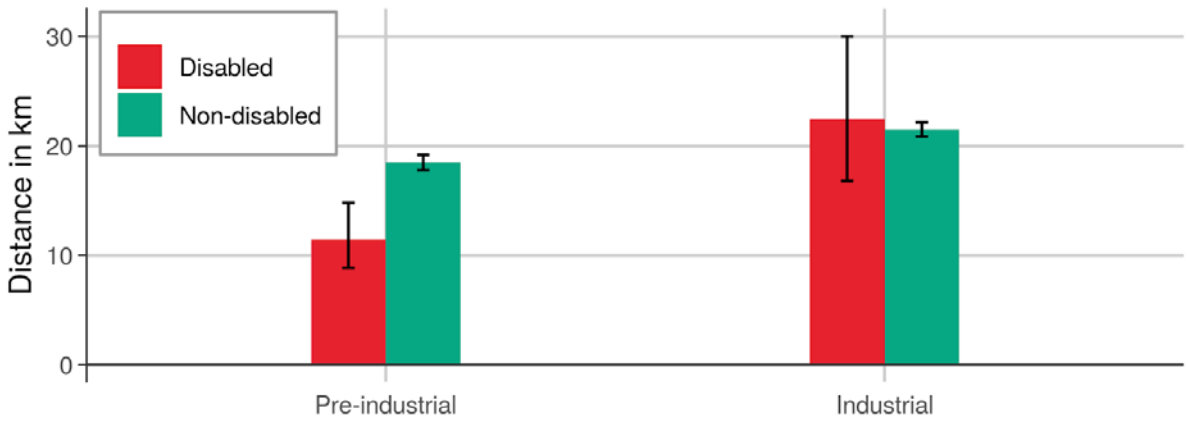
External/other area – migration to areas situated beyond the Sundsvall region
Coastal area – migration to industrialized parishes within the Sundsvall region
Inland area – migration to rural parishes within the Sundsvall region
Town area – migration the town of Sundsvall within the region

Figure 6: Geographical distribution of migrations by parish destination and by disability, gender and periodic cohort in the Sundsvall region 1835–1892.



Source: Digitized parish registers, the Sundsvall region, Demographic Data Base (DDB), Umeå University, Sweden

Figure 7: Estimated migration distances by disability and periodic cohort in the Sundsvall region 1835–1892.



Source: Digitized parish registers, the Sundsvall region, Demographic Data Base (DDB), Umeå University, Sweden