A Database for the Future. Major Contributions from 47 Years of Database Development and Research at the Demographic Data Base

By Sören Edvinsson and Elisabeth Engberg

To cite this article: Edvinsson, S. & Engberg, E. (2020). A Database for the Future. Major Contributions from 47 Years of Database Development and Research at the Demographic Data Base. *Historical Life Course Studies, 9*, 173–196. https://doi.org/10.51964/hlcs9305

HISTORICAL LIFE COURSE STUDIES

Major Databases with Historical Longitudinal Population Data: Development, Impact and Results

VOLUME 9, SPECIAL ISSUE 4, 2020

GUEST EDITORS
Sören Edvinsson
Kees Mandemakers
Ken Smith

EHPS NETWORK

MISSION STATEMENT

HISTORICAL LIFE COURSE STUDIES

Historical Life Course Studies is the electronic journal of the *European Historical Population Samples Network* (EHPS-Net). The journal is the primary publishing outlet for research involved in the conversion of existing European and non-European large historical demographic databases into a common format, the Intermediate Data Structure, and for studies based on these databases. The journal publishes both methodological and substantive research articles.

Methodological Articles
This section includes methodological articles that describe all forms of data handling involving large historical databases, including extensive descriptions of new or existing databases, syntax, algorithms and extraction programs. Authors are encouraged to share their syntaxes, applications and other forms of software presented in their article, if pertinent, on the EHPS-Net website.

Research articles
This section includes substantive articles reporting the results of comparative longitudinal studies that are demographic and historical in nature, and that are based on micro-data from large historical databases.

Historical Life Course Studies is a no-fee double-blind, peer-reviewed open-access journal supported by the European Science Foundation (ESF, http://www.esf.org), the Scientific Research Network of Historical Demography (FWO Flanders, http://www.historicaldemography.be) and the International Institute of Social History Amsterdam (IISH, http://socialhistory.org/). Manuscripts are reviewed by the editors, members of the editorial and scientific boards, and by external reviewers. All journal content is freely available on the internet at http://www.ehps-net.eu/journal.

Co-Editors-In-Chief:
Paul Puschmann (Radboud University) & Luciana Quaranta (Lund University)
hislives@kuleuven.be

The European Science Foundation (ESF) provides a platform for its Member Organisations to advance science and explore new directions for research at the European level. Established in 1974 as an independent non-governmental organisation, the ESF currently serves 78 Member Organisations across 30 countries. EHPS-Net is an ESF Research Networking Programme.

The European Historical Population Samples Network (EHPS-net) brings together scholars to create a common format for databases containing non-aggregated information on persons, families and households. The aim is to form an integrated and joint interface between many European and non-European databases to stimulate comparative research on the micro-level.
Visit: http://www.ehps-net.eu.

HISTORICAL LIFE COURSE STUDIES
VOLUME 9 (2020), published 03-12-2020

A Database for the Future

Major Contributions from 47 Years of Database Development and Research at the Demographic Data Base

Sören Edvinsson
CEDAR, Centre for Demographic and Ageing Research, Umeå University, Sweden

Elisabeth Engberg
CEDAR, Centre for Demographic and Ageing Research, Umeå University, Sweden

ABSTRACT

The Demographic Data Base (DDB) at the Centre for Demographic and Ageing Research (CEDAR) at Umeå University has since the 1970s been building longitudinal population databases and disseminating data for research. The databases were built to serve as national research infrastructures, useful for addressing an indefinite number of research questions within a broad range of scientific fields, and open to all academic researchers who wanted to use the data. A countless number of customised datasets have been prepared and distributed to researchers in Sweden and abroad and to date, the research has resulted in more than a thousand published scientific reports, books, and articles within a broad range of academic fields. While there has long been a clear predominance of research within the humanities and social sciences, it has always been used for research in other fields as well, for example medicine. In this article, we first give a brief presentation of the DDB and its history, characteristics, and development from the 1970s to the present. It includes an overview of the research based on the DDB databases, with a focus on the databases POPUM and POPLINK with individual-level data. A number of major traits of the research from 1973 to now have been outlined, showing the breadth of the research and highlighting some major contributions, with a focus on work that would have been very difficult to perform without data from the DDB.

Keywords: Historical databases, Life courses, Population studies, Demography, Sociology, History, Life sciences

e-ISSN: 2352-6343
DOI article: https://doi.org/10.51964/hlcs9305
The article can be downloaded from here.

1 INTRODUCTION

The Demographic Data Base (DDB) at the Centre for Demographic and Ageing Research (CEDAR) at Umeå University has been committed since the 1970s to building longitudinal population databases and disseminating data for research. In contrast to many other similar ventures, already from the start the databases at the DDB were built to serve as research infrastructures, useful for addressing an indefinite number of research questions within a broad range of scientific fields, and open to all academic researchers who wanted to use the data. The DDB's role as a national research infrastructure was defined a few years later in the government ordinance of 1978 (UHÄ-FS, 1978, 75; 1990, 8), and over the years this privileged position has been both a strength of and a special challenge to the DDB. Since its start in 1973, a countless number of customised datasets have been produced and distributed through specified contracts to researchers in Sweden and abroad. To date, the research has resulted in more than a thousand published scientific reports, books, and articles within a broad range of academic fields, and has been used for almost 70 dissertations (DDB, 2016). Data has been retrieved from the DDB databases by academic researchers in Sweden, Europe, North America, Asia and Australia and has been used for research in a large variety of academic fields. Sociology, statistics, demography, geography, history, economics, medicine and cultural studies, are just some examples. Today, the DDB owns and administers three main research databases: POPUM, with individual-level data from Swedish parishes covering the period 1680–1900; POPLINK, with similar data but over a longer time span, until around 1950; and TABVERK, with aggregate statistics from all Swedish parishes for the period 1749–1859.

In this article, we first give a brief presentation of the DDB and its history, characteristics, and development from the 1970s to the present. The second part includes an overview of the research based on the DDB databases, with a focus on the databases POPUM and POPLINK with individual-level data. Considering that we are talking about more than a thousand published studies, it would be too great an endeavour to give a full and fair presentation of all the research. Instead, we have outlined a number of major traits of the research from 1973 to now, thereby showing the breadth of the research and highlighting some major contributions, with a focus on work that would have been very difficult to perform without data from the DDB.

2 FROM PARISH RECORDS TO LIFE-COURSE DATA

2.1 A VISIONARY ENTERPRISE

While the DDB was first established in 1973, its inception can be traced back to the pioneering and innovative work of Professor Egil Johansson (1933–2012) in the mid-1960s, studying the history of literacy in Sweden with quantitative methods and information from the longitudinal Swedish parish registers (Johansson, 1969/70). Realising the potential of these sources, he also managed to convince others of the value of digitising them. Although this was an extensive, costly, and visionary enterprise, undertaken at a time long before personal computers and modern software had been invented, the proposal aroused great interest within the scientific community (Brändström, 2009). This can be attributed to the increasing focus on quantitative social and economic history research in Europe at the time. With Louis Henry, France had witnessed the birth of historical demography, and since the 1950s parish registers had been used in pioneering studies of population and fertility (Rosenthal, 2003). In the mid-1960s, around the same time as Egil Johansson embarked on his project, Peter Laslett published his seminal work *The World we Have Lost* (Laslett, 1965), which with similar sources and quantitative methods questioned and overturned popular conceptions about life in past Britain. Johansson's work on literacy showed that the Swedish sources, combined with modern information technology, had no less potential to make valuable contributions to social and demographic history, to the history of ordinary people, and to our knowledge of life and death among populations of the past.

The first steps of database-building were taken in 1973 through a government-funded employment project under the Swedish National Archives, creating jobs in parts of northern Sweden where opportunities for those providing labour, particularly female labour, were scarce. The new enterprise was a labour-intensive project, and this form of funding created a win-win situation for all parties involved. Between 1973 and 1982, data entry units were established in six different locations in northern Sweden, funded by provisional contributions from the National Labour Market Board. After five years, in 1978, the Swedish National Archives stepped down as the responsible authority and Umeå University assumed the future organisational and financial

responsibility for DDB. The future development required more sustainable and long-term funding than the short-term employment policy-related measures could provide, and formally becoming a part of the university organisation was considered a good solution. The transition from the Swedish National Archives to Umeå University in no way meant that the national interest in the project was diminished, however. The governmental hand was still there, in the form of earmarked funding in the annual university budget and in the remaining governmental ordinance defining the DDB's national role and mission, issued the same year (Brändström, 2009). Today, the DDB receives its core funding from Umeå University, supplemented by funding from external project grants.

As mentioned, data was not collected to serve any particular research project or group, or with certain research questions in mind. The intention was instead that the databases would be long-lasting resources for the future, usable for all sorts of research questions within all kinds of scientific fields, nationally as well as internationally. To be able to achieve this, it was very important to find ways to listen to the needs of the research community. Database-building is a long-term commitment and a costly enterprise that requires a combination of constantly having your ear to the ground and wise strategic planning. One important source of input from the research community has been active participation in scientific meetings and conferences. From the 1970s onward, a group of researchers was formed around the DDB, pursuing research on the data and developing research methodology. The idea was also that, through their networks, they would inspire and initiate national and international research on the DDB data. A further development came in 1990 when the Centre for Population Studies was established, with the aim to promote local, national, and international population research based on DDB data, and to develop international networks. Organising international conferences and workshops, around the data or related to different research topics in historical demography, has also been a vital part of the strategy to initiate and stimulate research. Several of the contributions have later been published, in proceedings and in academic journals (Brändström & Tedebrand, 1988; Sundin & Söderlund, 1977; Tedebrand, 2000).[1] Since 2015 the DDB is part of CEDAR, the Centre for Demographic and Ageing Research, at Umeå University.

2.2 SOURCES WELL SUITED TO LONGITUDINAL STUDIES

It is no coincidence that Swedish researchers were among the first to set out to build large, longitudinal databases with individual-level data. What Egil Johansson discovered in the mid-1960s was that the Swedish parish records, with respect to their outline, detail, and coverage, were even better suited for longitudinal research than the sources used by Louis Henry, Peter Laslett, and others. Parish records, including births, marriages, and deaths, as well as family-based continuous registers covering the entire population, had been kept since the late 17th century, and their long time spans offered virtually unparalleled possibilities for longitudinal studies (Nilsdotter-Jeub, 1993). The parish records were not only kept for ecclesiastic purposes; until 1990, they also served as the system of official registration in Sweden. This was a consequence of the historically rooted religious conformity with a national state-church system that until the 1950s included practically all citizens. If someone left the Lutheran State Church they still remained in the church registers, in their capacity as the official system of national registration. This means that the Swedish church registers contain a nearly unsurpassed coverage of the entire population, irrespective of religious affiliation and/or denomination.

A distinctive feature of the Swedish system of national registration is the household-based longitudinal parish registers, or catechetical registers as they also are called, found only in Sweden and Finland. These were dynamic, in the sense that they were continuously updated when new demographic events occurred. The registers also include numerous other forms of personal information data, for example vaccination, reading ability, disabilities, and general conduct. Like in a census, families were kept together on the same page as long as they lived together. When a child was born, a parent died, or a widow remarried, the local minister meticulously recorded this in the register. There is also detailed information about the changing composition of the household group, even for servants changing their positions every now and then. Record

1 Some examples are the conferences/workshops *Time, Space and Man,* Umeå 1977; *Society, Health and Population during the Demographic Transition*, Umeå 1986; *Sex, State and Society*, Umeå 1998; *Genetics, Genealogies and Family Databases*, Umeå 2003; *The Practice of Birth Control and Historical Fertility Change*, Umeå 2008; and *Death Clustering: Towards New Explanations for Infant and Child Mortality in the European Past*, Umeå 2010. The contributions from the last two conferences have been published in *The History of the Family* (2010, 15(2)) and *Biodemography and Social Biology* (2012, 58(2)).

linkage is facilitated by clever links to the event registers, in terms of volume and page, where first-hand information about a particular birth, marriage, or death can be found. The event registers are linked in a similar way to the longitudinal registers, creating a comprehensive system of information whereby individuals can be followed over their entire life spans. With this kind of double bookkeeping, it is also possible to fairly accurately reconstruct missing or lost information. When a longitudinal register volume was completed after five to ten years a new one was established, into which the minister transferred current information from the old volume, of course with valuable links between the old and new registers. For obvious reasons, the longitudinal registers are extremely valuable for the creation of life-course data, making it possible to follow individuals and families over their entire life spans and over generations, without gaps and interruptions, as long as they remain within the parish borders.

The systematic bookkeeping at the local level has made it both practical and natural to carry out the digitisation in the same manner: book-by-book and record-by-record for one parish at a time. The DDB has long had the rare advantage of having a fully employed data entry staff, which has been a great asset in the continuous work, assuring quality and consistency of the data. Their long-term experience is particularly important when handling complicated sources, like very old or damaged books, requiring both skill and proper understanding of the content. At present, the POPUM database offers access to linked data from >100 Swedish parishes, information on approximately 650,000 individuals, and five million records, from the period 1700–1900. The POPLINK database, which is actually a subset of the data in POPUM extended until around 1950 (currently 15 parishes situated in the county of Västerbotten), has linked data on approximately 460,000 individuals and 3.3 million records. New data is continually added to both databases.

2.3 STRATEGIES AND DEVELOPMENT

In 1973, the new database project was presented in the leading Swedish historical journal *Historisk Tidskrift* (Johansson & Åkerman, 1973). Although the concept of 'research infrastructure' had hardly been invented, there is no doubt that the new venture had such ambitions. The objective was to, through a joint effort with the Swedish National Archives and the National Labour Market Board, 'produce a resource designated to serve and support research, in Sweden and internationally' (Johansson & Åkerman, 1973, p. 406). The project was to be research-driven, with a clear vision that the database should be built according to sustainable principles, providing a flexibility and versatility that would stand the test of time. Today, almost 50 years later, the majority of these basic principles formulated in 1973 are still relevant in the DDB's data production process. They are as follows:

1. The database shall be *true to the source*. It has to be possible to trace all records back to the original source for verification. The database shall be *complete*; that is, all relevant information in the original source shall be included in the data collection.
2. The data collection shall be *open*, which means that the database shall be built in a way that allows the inclusion of new data, in time as well as in space.
3. The database shall be *coherent* and *consistent*: data entry shall be performed according to similar rules and principles, for maximum comparability and coordination.
4. Data entry, processing, and storage shall be performed in an *efficient* way.
5. All processing of data shall be *research-oriented*, allowing for micro-historic research as well as large-scale cohort studies.

With some modifications, these fundamental guidelines from the early years have also been recognised by others. They are also largely consistent with the core principles proposed by Mandemakers and Dillon (2004) as best practice in the field of building longitudinal historical databases for research.

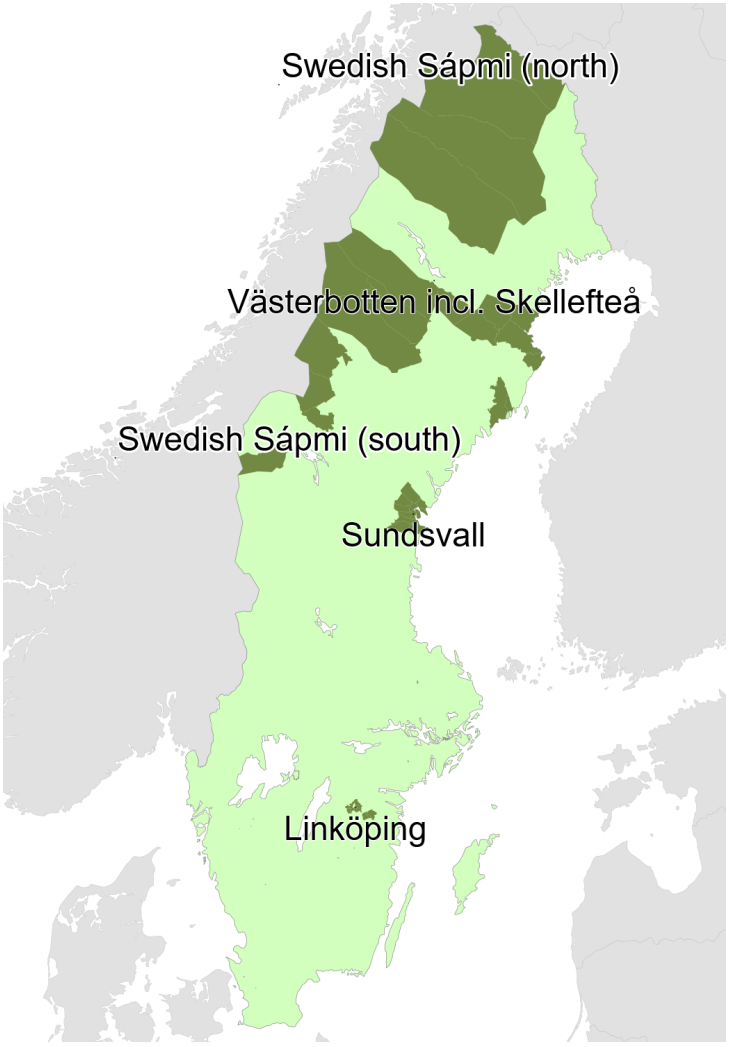
As a pioneer, the DDB has not always had the possibility to lean on golden rules and standards. Its development work was long characterised by learning by doing, and over the years the principles and methods for database-building have frequently had to be reviewed, developed, and sometimes reconsidered. A changing scientific field, new information and communication technologies, and new and advanced methods for analysis have also been important drivers in improving the processes as well as the data. In 1973, the database construction began with the digitisation of parish records from Tuna, a small parish in the industrialised Sundsvall area, which at that time was already an object of interest among historians and social scientists (Brändström, 2009). The work continued with parish records from six other parishes in different Swedish regions, selected on scientific merits. Together, these seven parishes formed the beginning of the POPUM database. Data entry was essentially a manual process, with transcription performed on cards. The

manually transcribed information was later entered into a data terminal. Quite soon, it became clear that working with geographically isolated parishes, however scientifically motivated, was not the best method for database-building. Several of the selected parishes were quite small, and due to in- and out-migration it was difficult to follow individuals over time and over the life course. To improve the coverage and the prospects for life-course studies, since then a conscious and successful strategy has been to collect data from contiguous groups of parishes, or regions, instead of focusing on single, geographically isolated parishes. Covering a cluster of neighbouring parishes usually captures a large number of short-distance migrations and administrative changes over time, increasing the number of complete life courses in the data.

There have, of course, been important methodological developments since 1973, although the basic principles have largely remained unchanged. Manual excerpts, punch cards, and magnet tapes are long gone, and today the data production process is entirely computerised, with some steps being completely automated. Data entry, still a manual process, is performed using custom-made software and, along with the advances of computer technology, manual linkage procedures have been replaced by advanced semi-automatic and automatic record linkage (Larsson & Engberg, 2015, 2016).

The first large region included in POPUM was the industrialised Sundsvall area, a previously agricultural district that in the 19th century became the heart of the sawmill industry in Europe and a centre for the Swedish labour movement. Several important studies have been conducted on the Sundsvall data, illuminating the Swedish industrialisation process and its consequences for individuals, families, and households. In the early 1980s, the Skellefteå area in the north was selected for a large project in genetic epidemiology, which was the start of the digitisation of the parishes in Västerbotten, which now constitute the core population in the POPLINK database. The third region selected for digitisation was Linköping, a socially diverse area in southern Sweden. The fourth large region in POPUM consists of parishes in Swedish Sápmi, with a Sámi and a settler population. Several of these parishes have also been included in POPLINK.

Map 1 *Swedish regions included in databases POPUM and POPLINK*

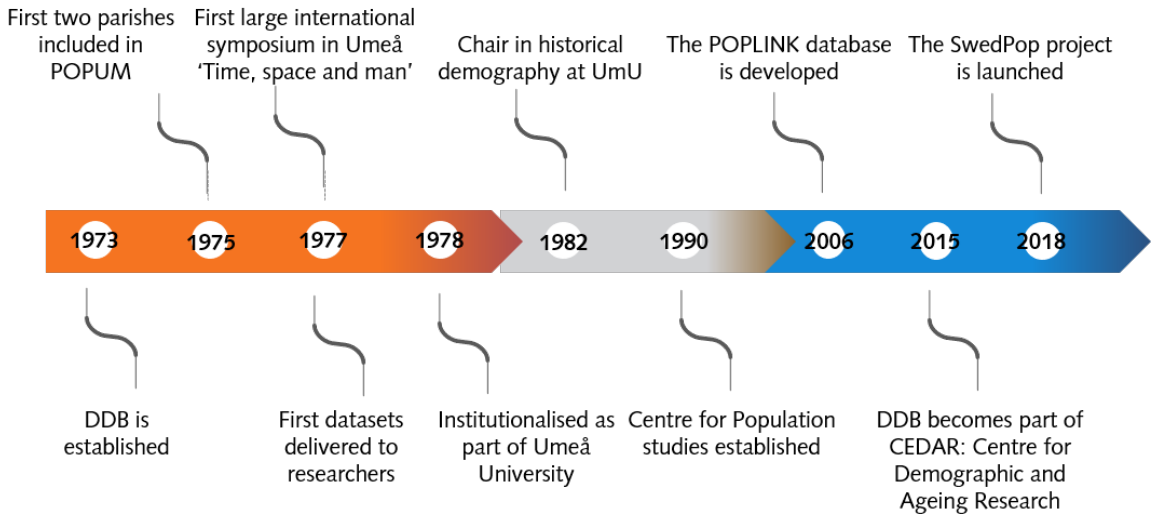


As important as the database-building and management is the dissemination of data. As mentioned above, data can be accessed by all academic researchers, both nationally and internationally, regardless of affiliation. The data in POPUM is open, while the data in POPLINK covering a much later period (until 1950) is surrounded by certain restrictions protecting privacy and confidentiality. Alongside the development of the databases, an organisation for efficient and comprehensive user support and service has been built to help researchers get access to data for their projects. From the very first contact, the individual user receives guidance and assistance from experienced staff, with the aim of delivering a sample that gives the researcher the best possible basis for performing analyses. As the variety of variables and information frequently makes the retrievals complex, for the time being all datasets are prepared at the DDB and delivered to researchers, accompanied by detailed documentation. Although the dissemination of data lies at the core of the DDB's commitment, at times it can also be a challenge for the organisation, particularly when requested data retrievals can be complicated and time-consuming to prepare, and costs are not always fully covered by user fees. Hence, we are continuously working to streamline the processes, without compromising the quality or accessibility. For more information on how to access data from POPUM and POPLINK, see https://www.umu.se/en/centre-for-demographic-and-ageing-research/order-data/.

2.4 LOOKING TOWARDS THE PRESENT

The most recent development of the DDB databases has been an expansion forward in time, taking full advantage of the long time spans of the rich Swedish sources. The POPLINK database provides access to population data from 15 parishes in the county of Västerbotten from around 1700–1950, with genealogical links covering up to 15 generations. Via a linkage to official registers such as those at Statistics Sweden and the National Board of Health and Welfare, data can be extended into the present time, facilitating large-scale multigenerational studies of present-day cohorts and populations. POPLINK was created from a subset of parishes in the POPUM database, supplemented with new data from the period 1900–1950. In response to the legal framework protecting privacy and confidentiality, we have chosen a safe and flexible model by which additional data, biobank data, research registers, and other contemporary data are not permanently linked to the POPLINK database; these registers remain with each data owner, and are linked to the population data for each project. This is possible thanks to the presence of persistent identifiers (civil registration numbers) in almost all Swedish registers since 1950. Linkage methods have been developed in collaboration with Statistics Sweden, where the linkage is also done. Data retrievals are pseudonymised, and a vetting procedure at the DDB (and sometimes also by an ethical review board) is required. POPLINK and its features, along with methods for linkage, are described in more detail in Westberg, Engberg, and Edvinsson (2016). The project has brought about valuable new collaborations with researchers within both the life sciences and the social sciences, studying intergenerational transfers and risk factors for disease over generations.

Figure 1 *Our history*



A new and important direction in the strategic development of the DDB databases is the increased and intensified collaboration with other Swedish databases. With funding from the Swedish Research Council for the period 2018–2022, the population databases in Umeå, Lund, Stockholm, and Gothenburg, along with the Swedish Censuses at the Swedish National Archives, will be coordinated, harmonised, and made openly available for research in a new research infrastructure, SwedPop. Until now, data from the DDB-databases have only been available as customised datasets extracted by developers in Umeå. With SwedPop this will change. A web platform will be created, where researchers can download harmonised data from all databases, including DDB data, in IDS format as well as rectangular formats. SwedPop will significantly improve access to Swedish population data, and in the long run will also create new prospects for cutting-edge research within the social sciences and historical demography.

2.5 METHODOLOGICAL DEVELOPMENTS

In terms of methodology, there have been significant advancements in statistical methods used for analysis. In the first reports and articles from the late 1970s and early 1980s, there was a predominance of descriptive statistics and crude demographic measurements. Since then, along with advances within the computing sciences and the development of new software, the scientific potential of the data has increased through the implementation of new statistical methods. In this context, it can be mentioned that some of the first dissertations in history in Sweden using Event History Analysis were based on data from the DDB (Brändström, 1984; Edvinsson, 1992). Today, this is a standard method for analysing this kind of data. Also worth mentioning is statistician Göran Broström's pioneering methodological work to develop social science applications of Event History Analysis with the software R, using DDB data as real-life examples (Broström, 2012). A recent addition to the methodology is the adoption of sequence analysis, focusing on events and actions in their temporal context, and making it possible to study multiple events and their sequential continuity or change in the same analysis. Complete life courses and individual trajectories are analysed as separate threads, providing information about life patterns, based on similarities in chosen dimensions between sequences, when it comes to the timing and order of states. Sequence analysis has proven highly valuable for studies using life-course data, providing a deeper and more holistic view of changes and transitions throughout the life course (Abbot 1995; Aisenbray & Fasang, 2010; Svensson, Lundholm, de Luna, & Malmberg, 2015; Vikström, Haage, & Häggström Lundevaller, 2017).

The DDB databases POPUM and POPLINK are not only used in quantitative analysis. They can also be analysed using qualitative methods, and several researchers have combined information from the digitised parish registers with complementary data and thus contributed to method development. One example of how to do research on combined data as well as methods through triangularisation has been discussed by Lotta Vikström (2010), exemplified using POPUM data.

Finally, DDB data has proven valuable as a testbed for methodological developments. One example is the development of HISCO (Historical International Standard Classifications of Occupations), where data from the DDB was used in the process of developing an international standard for the classification of occupations within social science research (van Leeuwen, Maas, & Miles, 2002; van Leeuwen, Maas, & Miles, 2004). Data has also been used in the validation of methods for linking Swedish census data and longitudinal population data. By comparing the results of different methods for record linkage of the 1890 and 1900 censuses with the linked digitised parish registers from the Skellefteå regions, the authors were able to show discrepancies between different methods and what might have caused the linkage failures. Without considering the problem of missing surnames of children and family members, the success rate was rather low; but through the inclusion of information on the fathers surname and a created patronym, the success rate improved considerably (Larsson, Berggren & Engberg, 2019; Wisselgren, Edvinsson, Berggren, & Larsson, 2014). For the time being, the DDB is involved in developing a historical classification of causes of death in an international collaborative project (Hiltunen Maltesdotter & Edvinsson, 2020).

3 RESULTS AND CONTRIBUTIONS

3.1 DATA FOR A BROAD RANGE OF ACADEMIC FIELDS

Looking back at almost 50 years of database-building, we notice considerable development in terms of the size of the database, methodology, and scientific progress. The DDB has become a valuable source for research, for both local scholars at Umeå University as well as external researchers, from other universities in Sweden and abroad. One of the first data retrievals from POPUM in the 1970s was prepared for Roger Schofield, then director of the Cambridge Group for the History of Population and Social Structure. An important step for promoting research on the historical population data was taken in 1982, with the establishment of a Chair in historical demography at Umeå University, with Lars-Göran Tedebrand as the first professor to hold this position. This became very important for developing and strengthening research on the DDB data, as well as for raising a new generation of scholars within the field of historical demography (Tedebrand, 2012). As a consequence of the infrastructural character of the resource, the DDB data has been used in many fields and for many different kinds of research. While there has long been a clear predominance of research within the humanities and social sciences, it has always been used for research in other fields as well, for example medicine.

Over the period from the 1970s to the present, the databases have expanded, in terms of number of records and individuals as well as geographical regions covered. The data has also become more complete, in terms of life courses and genealogies. The addition of new geographical areas opens up for comparative research on different regions, and the inclusion of 20th-century data in POPLINK enables studies of long-term demographic and social development, also covering a central period in Swedish history, the early 20th century, and the establishment of the Swedish welfare state. In all, the expansion in the number of regions, individuals, and complete life biographies has improved its scientific value, and today size and completeness are important prerequisites for the use of the data in research. Size matters!

Before presenting some results based on the DDB data, we would like to direct attention to a number of research perspectives for which historical population databases with microdata such as those at the DDB have resulted in new knowledge made possible by their existence:

- The contextual perspective: The databases allow researchers to study people situated in different historical and spatial contexts. We can reach a deeper understanding of the interplay between individuals and their closest environment.
- The historical perspective: The long time spans allow us to analyse fundamental changes in the lives and living conditions of people from the 17th century onward.
- The family perspective: The family can be used as the unit of analysis and individuals can be studied in their family context.
- The life-course perspective: Individuals and families can be studied from a life-course perspective. The possibility to analyse complete or partial life courses is one of the major advantages of longitudinal historical population databases. Outcomes or choices are understood from previous experiences and conditions.
- The intergenerational perspective: The long time perspective makes it possible to follow families across generations, partly in order to study the historical development of families but also to analyse the influence of conditions and circumstances in previous generations.
- The 'ordinary people' perspective: The advantage of many historical population databases is that they include all social strata in society, i.e. even less affluent groups whose lives we usually lack sources about and who have often been neglected. Differences according to age and gender are typically an integral part of the studies.
- The rare event perspective: An important aspect of the increasing amount of data is the possibility to study infrequent events and conditions, for example rare diseases and disabilities.

In the following, we discuss some central results from studies using data from the DDB, illustrating the perspectives presented above. Egil Johansson's early work demonstrated that the rich — and in many ways unique — Swedish sources, covering the entire population, made it possible to do research on topics that would otherwise not be possible to examine. Access to vital information about fertility, mortality, migration, and marriage in its social context, as well as kinship and family composition over generations for entire populations, became valuable assets for studies in historical demography and

family history. The variety of research is suggested here using a number of examples. While we provide a broad description of the research, presenting many references, this is still merely a selection.

3.2 RELIGION, EDUCATION AND CULTURAL CHANGE

The initial studies based on the digitised parish registers in the DDB were within the fields of the history of education and religion. The initiator of the DDB, Egil Johansson, later Professor in Pedagogy, used computerised parish records data from the databases to make groundbreaking contributions to social and cultural history as well as social studies of religion (Graff, Mackinnon, Sandin, & Winchester, 2009). His internationally influential scholarly work has increased our understanding of the social process of alphabetisation, and of the interaction between institutions, families, and the state in the past. The most well-known of his studies are those on the long history of literacy in Sweden since the 17th century (Graff, 2009; Graff et al., 2009; Johansson, 1977). Using information from catechetical registers, where the parish minister noted the ability to read and understand religious texts among parishioners, he documented the programme for making Swedes literate. This began as early as the 17th century, and the marks showed that the majority of the population had become literate already by the late 18th/early 19th century, long before compulsory schooling was introduced in 1842. This had a strong impact on many aspects of Swedish society when it came to participation, adopting innovations, and national identity. However, the ability to write came later. This research field has been continued by several other scholars, most prominently Daniel Lindmark (1995), who has studied how schooling was performed before 1842. This early teaching was based primarily on home schooling, but also on locally organised education (see also Selander, 1986). Despite its origin as church records, the religious homogeneity in Sweden with a national state church makes the data less suited for comparative studies of religion than data on populations in a more diverse religious landscape, such as Canada or the Netherlands. But the information in the parish registers does tell the story of religious change. Bäckström (1999) has studied the change in attendance at catechetical examinations and communion in the late 19th century, a period when the hegemony of the state Lutheran church was challenged. This was expressed in much lower participation in communion and the fact that the yearly catechetical examinations increasingly ceased to be practiced. The grip of the Church lessened, and society became more secularised. He has also studied which groups led the way in this change. Egil Johansson has also studied local society and social differentiation in the early 19th century, based on bench lists and parish registers. These sources tell a great deal about the historical social arrangements and structures. Each family had its designated place, which was based on the formal social division (Johansson, 1983).

An innovative way to study cultural change from the information in parish records is Philologist Linnea Gustafsson's study of naming traditions. She has used data in POPUM to study the introduction of new names in the late 19th century, showing where and in what social groups we find the pioneers of name innovations (Gustafsson, 2002).

3.3 DEVELOPING HISTORICAL DEMOGRAPHY

3.3.1 MORTALITY STUDIES

In the Umeå group of researchers, mortality research has long had a particular stronghold. As late as the 1980s, there were few mortality studies using individual-level data. Anders Brändström's studies on infant mortality in the northern parish of Nedertorneå were pioneering in several respects, in terms of both methods and perspective. These were the first studies of mortality using computerised DDB data, but also among the first large-scale micro-demographic studies of mortality in Sweden (Brändström, 1984). Brändström's studies made significant contributions to our understanding of the decline in infant mortality in Sweden, and had a large impact on Swedish historical demography. New insights were developed in numerous other studies on infant mortality and the 19th-century mortality decline, which in many cases fundamentally deepened and changed much of the understanding of the Swedish mortality transition (Bengtsson, 1996; Brändström, 1993, 2004; Brändström, Edvinsson, & Rogers, 2000, 2002; Garðarsdóttir, 2002). Brändström's influential work was a study on 19th-century Nedertorneå, a parish close to the Finnish border, where infant mortality was very high. In contrast with what was usually the case, there was no urban penalty. Mortality was higher in the countryside, while children in the small urban part of the parish had better survival. Brändström proved that an almost complete lack of breastfeeding in the traditional rural population explained its high mortality. The tradition of not breastfeeding newborns changed during the 19th century, however, due

to campaigns at different levels in society, from the national medical authorities but also locally through physicians and, not least, midwives. If much of the focus in earlier mortality studies was on economic conditions, Brändström brought in behavioural perspectives. Agency was important, and old traditions could change. Similar aspects have been further discussed by Jan Sundin using DDB data from the Linköping region (Sundin, 1995). The important role of child-care practices in the family and local environments is illustrated by Edvinsson (2004b), who found that in the late 19th-century Sundsvall region, children of mothers migrating from regions with high infant mortality had a significantly less chance of surviving their first year compared to those originating from low mortality regions. Edvinsson interprets this as different traditions of child-care behaviour influencing the newborns' survival chances.

Another major strand of mortality research with DDB data concerns family clustering of deaths and intergenerational aspects of inequality in health and mortality (Edvinsson & Janssens, 2012). The longitudinal registers and high-quality record linkage that allows us to study individuals in their family context over generations makes the Swedish data highly suitable for large-scale studies of different aspects of intergenerational transfers, social and cultural as well as genetic and inherited. Family clustering of deaths was observed already in Brändström's early work. In high-mortality and high-fertility Nedertorneå, some families lost all or almost all their children while in other families all or almost all the children survived (Brändström, 1984). These observations were further developed by Lynch and Greenhouse (1994) and Lynch, Greenhouse, and Brändström (1998); they found a strong intrafamilial correlation of infant mortality in a selection of Swedish parishes, and by analysing mortality according to birth order they reached results suggesting that children of high birth order were not necessarily disadvantaged. A decade later, this theme was again taken up and further developed: Edvinsson et al. (2005) showed that infant mortality in Sweden in the 19th century was highly clustered, with a relatively small number of families accounting for a large proportion of all infant deaths. Two important factors were associated with high-risk families: a biological component, evidenced by an overrepresentation of women who had experienced stillbirths; and a social component, indicated by an increased risk among women who had remarried. The statistical methods of studying clustering have been investigated by Holmberg (2012) and Holmberg and Broström (2012). Another aspect of family difference has been explored by Häggström Lundevaller and Edvinsson (2012), who found that Rh disease contributed to clustering of perinatal mortality in the Skellefteå region.

A related theme is the possibility that mortality patterns are transferred across generations. In a special issue presenting international collaborative studies on the intergenerational transfers of infant mortality, Broström, Edvinsson, and Engberg (2018) found a clear association in infant deaths across generations in the Swedish parishes, a pattern that resembled the results of the other studies (Holmberg, 2012; Vandezande & Edvinsson, 2012). Other examples of intergenerational perspectives in research are presented below, in connection to biological and genetic studies as well as those on social mobility.

Socioeconomic aspects of demography have been a rich field for studies based on DDB data, particularly concerning health and survival. One of the main determinants of survival chances in today's world is social position. Having more economic and social resources and having high social status are strongly associated with better health and lower death risk. While a common assumption is that this has been the case throughout history, studies based on microdata present a more complex picture, showing that the connection between social class and survival is not as straightforward as expected. Already in his early work, Brändström (1984) found that there was no strict social gradient in infant mortality in Nedertorneå. Differences caused by breastfeeding practices were strongly socially determined, but not necessarily in the sense that infant care was better in higher social classes. Edvinsson (1992, 1993) found a much more complex relationship between social class and mortality in 19th-century Sundsvall than what is commonly assumed. The pattern differed between age groups: While only weak associations were found for infant mortality, child mortality (1–14 years) showed a strong disadvantage for working-class children during the industrialisation process. In the adult population, however, the social gradient was not evident; it could even be a disadvantage to belong to a higher social class. The results regarding infant and child mortality have later been further confirmed using a larger dataset for the Sundsvall and Skellefteå regions (Edvinsson, 2004a).

The recent addition of 20th-century data in POPLINK has made it possible to study the long-term development of social inequalities in mortality. In the last decade a couple of studies have been published, focusing on long-term trends in adult and old-age mortality. Surprisingly, the modern social class pattern in mortality has not been confirmed. Instead, the opposite pattern — that high economic and social resources and high social status are associated with higher death risk — has been observed

in different regions with DDB data (Edvinsson & Broström, 2012; Edvinsson & Lindkvist, 2011). Edvinsson and Broström (2017, 2020) show that the present-day pattern of a distinct social gradient in mortality is a surprisingly recent phenomenon among adults and elderly in two regions in northern Sweden. It appears that, in historical Sweden, there was no consistent social gradient in adult and old-age mortality, something that did not appear until the 1970s and 1980s. There is, however, a clear gender dimension in the pattern. Among women there was a consistent gradient with better survival in the higher social classes, while the opposite was the case among men. Other Swedish studies analysing different data find similar patterns (Bengtsson & Dribe, 2011; Bengtsson, Dribe, & Helgertz, 2020; Dribe & Eriksson, 2018). The fact that males and females express different patterns makes the authors hypothesise that gendered and class-specific expectations regarding behaviour played an important role. The gender perspective is taken up by Willner (1999), who studied sex-specific mortality in Linköping. The sex differences were extremely large, pointing at a disadvantage for males in the 19th century, which Willner suggests has to do with behaviours, for example alcohol consumption. The differences decreased rapidly during the first half of the 20th century.

The role of public health and sanitation in the 19th-century urban context has been investigated by Nilsson (1994) using DDB data from Linköping. The last part of the 19th century was a period of increased initiatives and responsibilities for the local governments in cities and towns to improve the poor health conditions in urban environments, and urban mortality decreased considerably in the following decades. Nilsson, studying the role of the local government and the possible impact its initiatives had on health, found that the sanitary improvements had a substantial impact on the improved survival. Edvinsson (1992) found similar results, even if his results showed no clear associations between improved sanitation and better survival on the area level (see also Edvinsson & Nilsson,1999).

An important aspect of the Swedish mortality transition has been the regional differences, in both levels and trends (Brändström et al., 2000, 2002). One part of this is the disappearance of the urban penalty, partly due to sanitary improvements (see above). Regional differences in economy, schooling, traditions, and social structure became less important, even though they are still strong in Sweden today (and are perhaps even increasing again). That the mortality patterns did not necessarily stop at national borders has been shown by Edvinsson, Garðarsdóttir, and Thorvaldsen (2009) in their study of regional patterns of Nordic infant mortality.

3.3.2 DISEASE AND HEALTH RISKS

Quite a good deal of studies have been conducted on specific causes of death, particularly infectious diseases. These studies have provided us with a good overview of the components of the mortality pattern during the mortality transition. They have investigated conditions facilitating the spread of infections, and highlighted the actions and measures to prevent them from spreading as well as the role diseases have had throughout history. Puranen's (1984) thesis is an impressive work, dealing with a wide variety of aspects on tuberculosis in Swedish history. Besides analysing medical knowledge, treatments, and attitudes (their cultural history), she disentangled the epidemiological development of tuberculosis from 1750 to 1950. The disease was already endemic in all parts of Sweden in the 1750s. The regional distribution indicates that there was a close connection between a high incidence of tuberculosis and low living standards. Another thorough and ambitious work on a specific disease is Peter Sköld's (1996a) doctoral study of smallpox in Sweden from the 17th to the 20th century, with a focus on its decline. Sköld found that, although the decline had started as early as the 18th century, the introduction of a vaccination in the early 19th century was effective. The implementation was rapid and commonly accepted, partly due to the use of the Swedish church organisation. He also looked at revaccination and its effects on the life courses of survivors, and found that the disease had long-term consequences, for example on marriage chances (Sköld, 1996a, 1996b).

The life courses of people suffering from venereal diseases in the 19th century have been studied by Anna Lundberg (1999). The spread of syphilis and gonorrhoea was regarded as a major problem. Lundberg investigates the measures taken to deal with the diseases and how they affected the women. She also analysed how the lives of these women developed: mortality was higher, for both themselves and their infants. On the other hand, this likely had more to do with their socioeconomic position and living conditions than with the disease itself.

The incidence and mortality of scarlet fever and diphtheria increased in Sweden during the second half of the 19th century. Curtis (2004, 2008) analysed the spread of these diseases in the Sundsvall region during the period of intense industrialisation in the sawmill district, and how the large influx of migrants to the rural industries could even make the epidemic mortality higher than in the urban environment. He also found that a low nutritional status among mothers during pregnancy made their children more vulnerable to scarlet fever. The history of dysentery and its regional distribution in Sweden has been thoroughly studied by Helene Castenbrandt (2012). This was a very common disease in the 18th century, but declined thereafter.

Historically, one of the major health risks to adult women has been maternal mortality. Using longitudinal data on childbirth and maternal mortality in POPUM, the obstetrician Ulf Högberg (1985, 2004) investigated the development from the 18th to the 20th century, testing hypotheses regarding the determinants of the decline. In a seminal contribution within the field, he found a breaking point towards the end of the 19th century, when risks in connection to childbirth rapidly declined. Högberg's analysis showed a clear connection between the reduced mortality and improved practices of antiseptic methods by midwives at childbirth, a change supported by the emerging welfare state. Andersson, Andersson, Bergström, and Högberg (2000) has further studied this topic. The role of midwives, as mentioned, has been studied by Brändström (1984) and later by Curtis (2005).

Ethnicity has been an important aspect when it comes to health and mortality. Historically, Sweden was largely an ethnically homogenous country. However, parts of Sweden have long been inhabited by ethnic minorities, the most prominent and largest being Finns (many close to the Finnish border) and the Sámi population in the northern inlands — Sápmi. Brändström (1990) has analysed infant mortality among the Sámi population in the northern inlands of the country, finding higher infant mortality compared to the non-Sámi population. In recent years, this theme has been further analysed by Lena Karlsson and colleagues (Karlsson 2013, 2016, 2018; Karlsson, Häggström Lundevaller, & Schumann, 2019). The Sámi had a lower life expectancy, due partly to high infant mortality but also to mortality at other ages. There were clear seasonal differences depending on ethnicity and age group. Sámi infants who were born during winter suffered increased risks of neonatal mortality, while those born during the summer period suffered increased risks of dying after six months of age. The study shows how living in the same environment, but with differences when it comes to culture, economy, and social conditions, led to different patterns of mortality.

The studies of health and mortality among the Sámi relate to a topic that is becoming increasingly important: that of climate and health. Barbara Schumann and others have studied the role of climatic factors for morbidity and mortality in Sweden since the 18th century, using DDB data, looking for factors modifying the impact of climate on health (Karlsson, Häggström Lundevaller, & Schumann, 2020; Oudin Åström, Edvinsson, Hondula, Rocklöv, & Schumann, 2016; Oudin Åström, Forsberg, Edvinsson, & Rocklöv, 2013; Rocklöv, Edvinsson, Arnqvist, Sjöstedt de Luna, & Schumann, 2014; Schumann, Häggström Lundevaller, & Karlsson, 2019).

3.3.3 MARRIAGE PATTERNS AND FAMILY STRUCTURE

Fertility, family-building, and family forms in history are also issues that have been addressed using DDB data, with the first studies published in the early 1980s (Larsson, 1984; Lockridge, 1981). In recent years, and with the addition of the POPLINK data, the interest in fertility studies has increased. In a comparative study, Reher, Sandström, Sanz-Gimeno, and van Poppel (2017) studied the propensity to have another child depending on the number of surviving children in the family. Their results indicate a strong role of agency in fertility, with couples regulating their reproduction according to their reproductive goals. Investigating the role of women's socioeconomic status and labour market activity in fertility in Sweden for the period 1900–1960, Glenn Sandström and Emil Marklund (2018) identified the appearance of a strong two-child norm. They also found a decline in a negative socioeconomic gradient of fertility, with white-collar women increasing their fertility more than others.

Among recent studies of fertility is Johan Junkka's (2018a; 2018b; 2018c; Junkka & Edvinsson, 2016) work on fertility patterns and the fertility transition in relation to social networks, in his case membership in voluntary associations and/or the presence of such in the local environment. This could be the free church movement, the temperance movement, or labour organisations. Junkka found that membership and the local presence of such organisations certainly promoted lower fertility, albeit with a somewhat different impact at different times and depending on the type of organisation.

Attitudes, norms, and knowledge were spread within these networks. Junkka's results are very much in accordance with what Paul Rotering (2017) and Rotering and Bras (2019) has found in a couple of studies on the Skellefteå region. Rotering has also focused on the role of networks, but whereas Junkka investigated the role of voluntary associations and the characteristics of the local population, Rotering considered the family context. He found that there was a clear intergenerational transfer of fertility, and also showed that power relations within the family as measured by the age difference between the spouses played an important role.

The ethnic dimension of fertility and family-building has been studied by Nordin (2009) and Nordin and Sköld (2012). The consequences on the marriage patterns of the meeting between the Sámi population in the north and the non-Sámi population colonising the area during the 18th and 19th centuries were the main object of Nordin's thesis. The Sámi had their own marriage traditions, which partly changed in the cultural meeting with the non-Sámi.

A comparison between patterns of family-building and migration in the two Swedish towns of Sundsvall and Linköping was drawn by Brändström, Sundin, and Tedebrand (2000). Sundsvall was the centre of a strongly developing industrial region in mid-Sweden while Linköping had a different character, that of an administrative centre in the southeast part of the country. However, the marriage pattern in both towns was characterised by strong social and geographical endogamy whereby migrants married migrants and town-born married town-born. These two towns were also compared by Nilsson and Tedebrand (2005), this time with a focus on family-building and the adoption of a new fertility regime, representing new family strategies. Through the use of mostly pre-industrial forms of fertility control as well as spacing and stopping, smaller families were achieved.

During the 20th century, divorce rates increased rapidly in the Western world. Glenn Sandström (2012) has thoroughly studied this in the Swedish context. Using microdata for Västerbotten county in a study of social position (SES) and divorce for the period 1880–1960, Sandström and Stanfors (2020) found a higher divorce rate in higher SES until 1930, which thereafter changed to a negative association when barriers to divorce diminished with industrialisation and modernisation.

Other aspects of family-building and family structure have been investigated by Ann-Kristin Högman (1999) concerning the living conditions of the elderly, and Leonardo Fusè (2008) concerning the proximity of parents to children and whom they transferred their properties to. Maria Bergman (2010) has studied family conditions in sawmill communities, and Inez Egerbladh (1989) peasant households.

3.3.4 MIGRATION

Migration to the expanding sawmill area around Sundsvall in the late 19th century has typically been described from primarily a male perspective, with workers searching for jobs in the new industries, for example in a study by Ostergren (1990). But this was just one side of the story. The in-migration to Sundsvall also had a large female component (Vikström, 2001, 2003) as the economic boom created new opportunities for women as well. Analysing the background and life courses of those moving to Sundsvall, Vikström showed that migrants were a highly mobile group but that the migration patterns were strongly gendered. See also Wall (2001) and Nygren (2009).

Migration and mortality have also been a recurrent theme in research using DDB data. Vikström, Marklund, and Sandström (2016) studied the demographic outcomes of colonisation in regions with a Sámi population, and found the Sámi to be a highly vulnerable group. The death rates in this group were higher, and the competition for land made migration rates high. They did find a 'healthy settler effect', however, and the consequences of colonisation were not necessarily ethnically determined. Colin Pooley (2013), comparing the role of locality in Britain and Sweden, found strong similarities in the patterns, as well as the fact that people were closely tied to localities, indicating the impact of family, friends, and community.

3.4 SOCIAL HISTORY AND THE STUDY OF MARGINALISED GROUPS IN SOCIETY

One of the main themes of the new social history that became an expanding field in the 1960s and 1970s was giving a voice to ordinary people, and to the poor and marginalised. With their completeness, detail, and richness of information, the Swedish sources have proven to be very well suited to studies of social and economic conditions, and of the lives and opportunities of people in the past. Disabilities,

criminality, and other personal traits were reported in the old parish registers, but this information has long been underused, something that has changed in recent times. In the above-mentioned thesis by Anna Lundberg (1999), she followed the lives of women with sexually transmitted diseases. The lives of unmarried mothers have been investigated by Anders Brändström (1996), who showed that they were certainly vulnerable but were not necessarily outcasts from society. Children of unmarried mothers, however, had much lower chances of surviving their first years (Brändström et al., 2002). By linking individual-level data to other sources, Elisabeth Engberg (2005, 2006) was able to study the determinants of rural poverty and vulnerability in a 19th-century population. The concept of poverty proved to be as complex then as it is today, and was foremost related to different kinds of crises, weak supportive networks, and marginalisation in society. There was also a great extent of lifecycle-associated poverty. Similar methods have been used by Lotta Vikström (2008, 2011) to study the lives of juvenile delinquents in the past. While being exposed to the legal system in youth did not necessarily lead to a criminal life or life in destitution, there were great differences in effects depending on gender. While male delinquents managed fairly well, young females were stigmatised and their life chances were much worse. Expectations depending on gender put women in a different situation compared to men.

Marginalised groups in society were also the focus of Vikström's and Helena Haage's studies on disability. Working with life-course data in POPUM, Haage showed that although marriage chances were smaller and risks of death higher for disabled persons in the 19th century, the disabled were nevertheless a heterogeneous group of individuals with different obstacles and opportunities in life (Haage, 2017; Vikström, Haage, & Häggström Lundevaller, 2017). See also the work on this theme by Olsson (1999) and De Veirman, Haage, and Vikström (2016).

In recent years, Lotta Vikström has continued to investigate the lives of people with disabilities. This is done in an interdisciplinary research group, funded by the ERC (Junkka, Sandström, & Vikström, 2020; Vikström, Haage, & Häggström Lundevaller, 2020; Vikström, Häggström Lundevaller, & Haage, 2017). In this project, disability is studied from many different aspects, in both historical time and contemporary society, and with both quantitative and qualitative sources. POPUM and POPLINK are central in the historical parts of the project. These studies confirm that disability leads to difficult lives for people, but they also document the complexity in this matter. The life courses illustrate both obstacles and possibilities when it comes to jobs, marriages, and a long life. Many could still find decent ways to make a living and build families. This differed substantially between types of disability (sensory/physical/mental), those with mental disorders being the most vulnerable.

3.5 POPULATION DATA IN BIOLOGY AND THE LIFE SCIENCES

Over the years, the multigenerational features of the data have also made it useful for research within the life sciences, particularly studies in which access to high-quality genealogies and reliable information on kinship are important. Data from the Skellefteå region was originally included in POPUM for a large project in genetic epidemiology, tracing the origins of Best's macular dystrophy, a rare ophthalmologic disease prevalent in the region (Forsman et al.,1992; Nordström, 1980; Nordström & Thorburn, 1980). Similar data has also been used to study consanguinity and for mapping other diseases (Bittles & Egerbladh, 2005a, 2005b).

An early example of how population data can be useful in studies with a biological approach can be found in a number of studies in the early 1990s by the evolutionary biologist Bobbi Low from the University of Michigan, using DDB data to investigate demographic patterns with a behavioural-ecological approach (Borgerhoff Mulder et al., 2009; Low, 1993; Low, 1994; Low, 2015; Low & Clarke, 1991; Low & Clarke, 1993). A major argument from these studies is that there are certain predictable ecological rules underlying patterns of fertility, mortality, and migration, albeit constrained by a variety of cultural complexities and interactions that cannot be fully measured in aggregate data (Low & Clarke, 1991; Low, Clarke, & Lockridge, 1991; see also Smith, Hanson, & Mineau, 2016). In the last ten years, access to longitudinal biobank data for cohorts and entire populations, along with effective methods for advanced statistical analysis and sequencing, has significantly increased the interest in multigenerational population data among researchers within the fields of medical epidemiology, public health, and genetics. Linking multigenerational population data to biobank samples and registry data makes it possible to follow present-day cohorts back in time and over generations. This offers new perspectives on issues of contemporary relevance, such as risk factors for cardiovascular disease, the interaction of heredity and lifestyle, and various aspects of aging and dementia. For a number of years now there has been an ongoing collaboration between the DDB and researchers in bio-informatics

and genetic epidemiology, developing and evaluating methods for linking and analysing biobank, registry, and population data for studies of risk factors of disease and biological effects in populations. So far this has resulted in two major publications, and more are to come (Kurbasic et al., 2014; Poveda et al., 2016). In a study from 2014, Kurbasic et al. used longitudinal population data in POPLINK, biomedical data, survey data, and prospective biobank data testing methods of imputing genome sequences to study gene-lifestyle interactions in complex diseases. Access to high-quality population data covering many generations has proven to be a valuable asset for this kind of study. Similar data and techniques were used by Poveda et al. (2016), showing that age, sex, and alcohol were likely to be major modifiers of genetic effects for cardiometabolic traits. Another study that can be mentioned in this context is Arslan et al. (2017) showing, based on multigenerational data for four centuries, that fathers of high age had less evolutionary success than others.

3.6 SOCIAL MOBILITY AND OCCUPATIONS

The rich information on occupations in the Swedish data and the long time spans make it possible to study historical social structures as well as inter- and intragenerational mobility and marital homogamy. Throughout their lives, occupations and social positions are recorded for adult men. The changing social structure in the expanding Sundsvall district has been shown in several studies, for example Brändström, Sundin, and Tedebrand (2000) and Nilsson and Tedebrand (2005).

Ineke Maas and Marco van Leeuwen have long worked with historical social mobility and social homogamy, and in different geographical settings. In a study of the 19th-century Sundsvall region, Maas and van Leeuwen (2002) investigated total and relative social mobility before and during industrialisation. Intergenerational mobility increased during industrialisation, but stagnated towards the end of the century. Barriers between sectors varied in time and between social groups. Their study indicates a decline in the importance of the transfer of resources, but an increasing importance of education. The Swedish data has also been used by Maas and van Leeuwen in international comparisons. With rich data from many countries' DDB data, they have analysed the long-term development of intergenerational social mobility, and successfully tested the hypothesis that 19th-century industrialisation was the origin of the later increase in mobility. The pre-industrial period was characterised by stable or decreasing mobility, while mobility increased during industrialisation (Maas & van Leeuwen, 2004, 2016).

Van Leeuwen and Maas (2002), in a study on long-term changes in how industrialisation affected homogamy, asked whether a sexual revolution connected to this process led to weakened homogamy through changed preferences among young people and less parental control. Their hypothesis that less control from parents made homogamy weaker was substantiated, while that of an association between industrialisation and weakened homogamy was only partly substantiated. Social and geographical endogamy has also been studied in the article by Brändström, Sundin, and Tedebrand (2000) mentioned earlier. Recently, Kolk and Hällsten (2017) addressed the intergenerational transfers of these issues: They analysed how reproductive success and social mobility in terms of education are transferred over generations, using socioeconomic and demographic information in DDB data from the Skellefteå region. When it comes to both fertility and education, the data suggests effects on lineages into modern times.

A serious problem with the Swedish parish registers as regards analysing social structure and labour in history is the large under-registration of female labour force participation. The family was defined primarily based on the occupation of the head of household, i.e. the husband and father. This easily leads us to underestimate the contribution of women. Lotta Vikström (2010) has compared occupational information from parish registers with that from other sources, and has thus been able to present a much more diverse and nuanced picture of female work. In the local newspapers, women involved in small businesses or other occupations offered their services. Sources such as hospital records also provided better information on female working activities.

4 CONCLUSIONS AND PROSPECTS

This has been a quite extensive overview of the history of the DDB and of the research based on DDB data. Still, a great deal of research has not been mentioned, for example studies in economics such as

Sofia Lundberg's work involving past and present public procurement, using data on children boarded out by auction in the 19th century (Lundberg, 2001). This is not to neglect these fields; rather, the selection has focused on the unique character of the microdata in the DDB databases, particularly on the life-course and intergenerational perspectives they offer. We have also aimed to provide examples from different parts of the history of the DDB and from different disciplines, illustrating the wide potential of the data, which can be used for numerous different purposes in a broad range of scientific fields. If we were to characterise the scientific contributions of the DDB data, we could argue that the analyses of microdata sometimes confirmed what was already regarded as common knowledge (but often without really having had the chance to analyse it thoroughly), while in other cases the results were unexpected. The lack of a modern social gradient in mortality during previous centuries is one such example, something that calls for the further development of models for mortality determinants. Also, studies with detailed life-course data revealed a much more complex picture of different phenomena than what has previously been assumed in hegemonic ideas. Furthermore, many of the studies have highlighted the importance of cultural, behavioural, and institutional aspects of demography and social conditions. This reminds us of the need to continuously develop our theoretical models while also taking such aspects into account.

When it comes to future research, it is often difficult to foresee how research infrastructures such as large historical population databases will be used. New opportunities will create new ideas. But we are confident that the most recent increased collaborations, both within Sweden and internationally, will have a fundamental impact on both future research topics and methodological developments. The integration of the Swedish databases within the SwedPop project, makes it possible to analyse central population issues on a national level and perform comparative studies of regional demographic patterns within Sweden. International initiatives such as the HISCO classification system for historical occupations, the development of a new classification of historical death causes within the SHIP project and the IDS standard for structuring and retrieving longitudinal population data substantially facilitate international comparisons. These new opportunities can shed light on a multitude of topics with high relevance for our understanding of the historical development and for the contemporary society, such as the increasing inequality in many countries with serious consequences for health and longevity; the catastrophic consequences of pandemics like the present outbreak of Covid-19, and the increasingly harmful effects of the climate crisis. All these topics can be better analysed and understood with access to rich historical data, telling us about past pandemics, as well as other crises such as famines, natural catastrophes and wars. There is time to consider what can be learnt from these crises, both regarding their causes and their outcomes and management in different historical situations. Finally, we also foresee increased interest from life sciences in long-term and transgenerational data, for example regarding the genetic aspects of diseases and possible intergenerational epigenetic effects.

ACKNOWLEDGEMENTS

We want to express our gratitude to Umeå University for long term financial support, and to all data entry assistants, system developers, technical and administrative staff, and researchers that over the years have contributed to the development of the Demographic Data Base.

REFERENCES

Abbott, A. (1995). Sequence analysis: New methods for old ideas. *Annual Review of Sociology, 21*, 93–113. doi: 10.1146/annurev.so.21.080195.000521

Aisenbray, A., & Fasang, A. E. (2010). New life for old ideas: The "second wave" of sequence analysis bringing the "course" back into the life course. *Sociological Methods & Research, 38*(3), 420–462. doi: 10.1177/0049124109357532

Alter, G., & Mandemakers, K. (2014). The Intermediate Data Structure (IDS) for longitudinal microdata, version 4. *Historical Life Course Studies, 1*(1), 1–26. Retrieved from http://hdl.handle.net/10622/23526343-2014-0001?locatt=view:master

Andersson, T., Bergström, S., & Högberg, U. (2000). Swedish maternal mortality in the 19th century by different definitions: Previous stillbirths but not multiparity risk factor for maternal mortality. *Acta Obstetricia and Gynecologica Scandinavica, 79*(8), 679–686. doi: 10.1034/j.1600-0412.2000.079008679.x

Arslan, R. C., Willführ, K. P., Frans, E. M., Verweij, K. J. H., Bürkner, P.-C., Myrskylä, M., Voland, E., Almqvist, C., Zietsch, B. P., & Penke, L. (2017). Older fathers' children have lower evolutionary fitness across four centuries and in four populations. *Proceedings of the Royal Society B. Biological Sciences, 284*(1862). doi: 10.1098/rspb.2017.1562

Bengtsson, M. (1996). *The child at risk: Infant and child mortality in three generations in 19th century Linköping.* Linköping: Linköping University.

Bengtsson, T., & Dribe, M. (2011). The late emergence of socioeconomic mortality differentials: A micro-level study of adult mortality in southern Sweden 1815–1968. *Explorations in Economic History, 48*(3), 389–400. doi: 10.1016/j.eeh.2011.05.005

Bengtsson, T., Dribe, M., & Helgertz, J. (2020). When did the health gradient emerge? Social class and adult mortality in southern Sweden 1813–2015. *Demography, 57*, 953–977. doi: 10.1007/s13524-020-00877-5

Bergman, M. (2010). *Constructing communities. The establishment and demographic development of sawmill communities in the Sundsvall district, 1850–1890. (*Dissertation Umeå University). Umeå: Institutionen för idé och samhällsstudier. Retrieved from https://www.diva-portal.org/smash/get/diva2:345256/FULLTEXT01.pdf

Bittles, A. H., & Egerbladh, I. (2005a). Historical patterns of consanguineous marriage in northern Sweden and their influence on the present-day gene pool. Unpublished paper presented at the second international workshop *Genetics, Medicine and History in Brno, 11th–12th May 2005*.

Bittles, A. H., & Egerbladh, I. (2005b). The influence of past endogamy and consanguinity on genetic disorders in northern Sweden. *Annals of Human Genetics, 69*(5), 549–558. doi: 10.1046/j.1529-8817.2005.00179.x

Borgerhoff Mulder, M., Bowles, S., Hertz, T., Bell, A., Beise, J., Clark, G., Fazzio, I., Gurven, M., Hill, K., Hooper, P. L., Irons, W., Kaplan, H., Leonetti, D., Low, B., Marlowe, F., McElreath, R., Naidu, S., Nolin, D., Piraino, P., Quinlan, R., Schniter, E., Sear, R., Shenk, M., Smith, E. A., von Rueden, C., & Weissner, P. (2009). Intergenerational wealth transmission and the dynamics of inequality in small-scale societies. *Science, 326*(5953), 682–688. doi: 10.1126/science.1178336

Broström, G. (2012). *Event history analysis with R*. Boca Raton: Chapman and Hall/CRC Press.

Broström, G., Edvinsson, S., & Engberg, E. (2018). Intergenerational transfers of infant mortality in 19th-century northern Sweden. *Historical Life Course Studies, 7*(2), 106–122. Retrieved from http://hdl.handle.net/10622/23526343-2018-0005?locatt=view:master

Brändström, A. (1984). *"De kärlekslösa mödrarna": Nedgången i spädbarnsdödlighet i Sverige under 1800-talet, med särskild hänsyn till Nedertorneå*. (Acta Universitatis Umensis, Umeå studies in the humanities, 62). Umeå: Umeå University.

Brändström, A. (1990). Från förebild till motbild. Spädbarnsvård och spädbarnsdödlighet i Jokkmokk. In S. Åkerman & K. Lundholm (Eds.), *Älvdal i norr. Människor och resurser i Luledalen 1300–1800* (pp. 307–351). Stockholm: Almquist & Wiksell International.

Brändström, A. (1993). Infant mortality in Sweden. In P. P. Viazzo & C. A. Corsini (Eds.), *The decline of infant mortality in Europe, 1800–1950*: *Four national case studies*. (Historical Perspectives no. 2). Florence: UNICEF.

Brändström, A. (1996). Life histories of single parents and illegitimate children in nineteenth-century Sweden. *The History of the Family, 1*(2), 205–226. doi: 10.1016/S1081-602X(96)90007-X

Brändström, A. (2004). På återbesök i Nedertorneå. Spädbarnsdödlighet, utomäktenskaplighet och sociala nätverk. In A. Brändström, S. Edvinsson, T. Ericsson, & P. Sköld (Eds.), *Befolkningshistoriska perspektiv: Festskrift till Lars-Göran Tedebrand* (pp. 35–58). Umeå: Umeå University.

Brändström, A. (2009). Demografiska databasen och historisk demografi i Umeå — "en allvarlig felinvestering"? In R. Jacobsson (Ed.), *Thule: Kungliga Skytteanska Samfundets årsbok 2009* (pp. 211–222). Umeå: Kungliga Skytteanska Samfundet.

Brändström, A., Edvinsson, S., & Rogers, J. (2000). Infant mortality in Sweden: Creating regions from nineteenth-century parish data. *Historical Methods, 33*(2), 105–114. doi: 10.1080/01615440009598953

Brändström, A., Edvinsson, S., & Rogers, J. (2002). Illegitimacy, infant feeding practices and infant survival in Sweden 1750–1950: A regional analysis. *Hygiea Internationalis, 3*(1), 13–52. doi: 10.3384/hygiea.1403-8668.0231

Brändström, A., Sundin, J., & Tedebrand, L.-G. (2000). Two cities. Urban migration and settlement in nineteenth-century Sweden. *History of the Family, 5*(4), 415–429. doi: 10.1016/S1081-602X(00)00053-1

Brändström, A., & Tedebrand, L.-G. (1988). *Society, health and population during the demographic transition. Proceedings of the international conference.* Umeå: Umeå University.

Bäckström, A. (1999). *När tros- och värderingsbilder förändras. En analys av nattvards- och hushållssedens utveckling i Sundsvallsregionen 1805–1890.* Stockholm: Verbum Förlag.

Castenbrandt, H. (2012). *Rödsot i Sverige 1750–1900: En sjukdoms demografiska och medicinska historia* (Doctoral dissertation, University of Gothenburg). Retrieved from http://hdl.handle.net/2077/30195

Curtis, S. M. (2004). Nutrition and scarlet fever mortality during the epidemics 1860–90: The Sundsvall region. *Social History of Medicine, 17*(2) 199–221. doi: 10.1093/shm/17.2.199

Curtis, S. M. (2005). Midwives and their role in the reduction of direct obstetric deaths during the late nineteenth century: The Sundsvall region of Sweden (1860–1890). *Medical History, 49*(3), 321–350. doi: 10.1017/s0025727300008905

Curtis, S. M. (2008). In-migration and diphtheria mortality among children in the Sundsvall region during the epidemics of the 1880s. *Journal of the History of Medicine and Allied Sciences, 63*(1) 23–64. doi: 10.1093/jhmas/jrm026

Curtis, S. M. (2011). The arrival and diffusion of academic medicine in rural Sweden: The case of the Sundsvall region in the late nineteenth century. *Hygiea Internationalis, 10*(1) 7–32. doi: 10.3384/hygiea.1403-8668.11101

De Veirman, S., Haage, H., & Vikström, L. (2016). Deaf and unwanted? Marriage characteristics of deaf people in eighteenth and nineteenth-century Belgium: A comparative and cross-regional approach. *Continuity and Change, 31*(2), 241–273. doi: 10.1017/S0268416016000230

Demographic Data Base. (2016). *Bibliography 1970–2016*. Umeå: Umeå University.

Dribe, M., & Eriksson, B. (2018). *Socioeconomic status and adult life expectancy in early 20th-century Sweden: Evidence from full-count micro census data*. (Lund Papers in Economic Demography, No. 1). Lund: Lund University, Department of Economic History. Retrieved from https://www.ed.lu.se/media/ed/papers/working_papers/LPED%202018%201.pdf

Edvinsson, S. (1992). *Den osunda staden: Sociala skillnader i dödlighet in 1800-talets Sundsvall* (Doctoral dissertation, Umeå University).

Edvinsson, S. (1993). Urban health and social class. In A. Brändström, & L.-G. Tedebrand (Eds.), *Health and social change. Disease, health and public care in the Sundsvall district 1750–1950* (pp. 55–110). Umeå: Umeå University.

Edvinsson, S. (2004a). Social differences in infant and child mortality in 19th century Sweden. In M. Breschi & L. Pozzi (Eds.), *The determinants of infant and child mortality in past European populations*. Udine: Forum.

Edvinsson, S. (2004b). Att ha omsorg om sina barn. Traditionens och miljöns betydelse för spädbarnsdödlighet. In A. Brändström, S. Edvinsson, T. Ericsson, & P. Sköld (Eds.), *Befolkningshistoriska perspektiv: Festskrift till Lars-Göran Tedebrand* (pp. 59–84). Umeå: Umeå University.

Edvinsson, S., Brändström, A., Rogers, J., & Broström, G. (2005). High-risk families: The unequal distribution of infant mortality in nineteenth-century Sweden. *Population Studies, 59*(3), 321–337. doi: 10.1080/00324720500223344

Edvinsson, S., & Broström, G. (2012). Old Age, health and social inequality. Exploring the social patterns of mortality in 19th century northern Sweden. *Demographic Research, 26*(23), 633–330. doi: 10.4054/DemRes.2012.26.23

Edvinsson, S., & Broström, G. (2017). *Life course and long-term perspectives of social inequality in mortality among elderly and adults In Northern Sweden 1801–2013.* Report presented at IUSSP XXVIII, 2017 International Population Conference, Cape Town, South Africa, 29 October–4 November 2017. Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-141173

Edvinsson, S., & Broström, G. (2020). Is high social class always beneficial for survival? A study of northern Sweden 1801–2013. (CEDAR Working Papers, No 2). Umeå: Umeå University. Retrieved from http://umu.diva-portal.org/smash/record.jsf?pid=diva2%3A1174011&dswid=-5834

Edvinsson, S., Garðarsdóttir, Ó., & Thorvaldsen, G. (2009). Infant mortality in Nordic countries, 1780–1930. *Continuity and Change, 23*(3), 457–485. doi: 10.1017/S0268416008006917

Edvinsson, S., & Janssens, A. (2012). Clustering of death in families: Infant and child mortality in historical perspective. *Biodemography and Social Biology, 58*(2), 75–86. doi: 10.1080/19485565.2012.738575

Edvinsson, S., & Lindkvist, M. (2011). Wealth and health in 19th century Sweden. A study of social differences in adult mortality in the Sundsvall Region. *Explorations in Economic History, 48*(3), 376–388. doi: 10.1016/j.eeh.2011.05.007

Edvinsson, S., & Nilsson, H. (1999). Swedish towns during industrialization. *Annales de Démographie Historique, 2*, 63–96. doi: 10.3406/adh.2000.2168

Egerbladh, I. (1989). From complex to simple family households: Peasant households in northern coastal Sweden 1700–1900. *Journal of Family History, 14*, 241–264. doi: 10.1177/036319908901400305

Engberg, E. (2005). *I fattiga omständigheter. Fattigvårdens former och understödstagare i Skellefteå sockenunder 1800-talet* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-503

Engberg, E. (2006). Life on the edge: Rural poverty and vulnerability in XIXth century northern Sweden. *Annales de Démographie Historique, 111*(1), 31–57. doi: 10.3917/adh.111.0031

Forsman, K., Graff, C., Nordström, S., Johansson, K., Westermark, E., Lundgren, E., Gustavson, K. H., Wadelius, C., & Holmgren, G. (1992). The gene for Best's macular dystrophy is located at 11q13 in a Swedish family. *Clinical Genetics, 42*(3), 156–159. doi: 10.1111/j.1399-0004.1992.tb03229.x

Fusè, L. (2008). *Parents, children and their families: Living arrangements of old people in the XIX century, Sundsvall region, Sweden* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-1638

Graff, H. J. (2009). Introduction to the history of literacy. In H. J. Graff, A. Mackinnon, B. Sandin & I. Winchester (Eds.), *Understanding literacy in its historical context: Socio-cultural history and the legacy of Egil Johansson* (pp. 14–22). Lund: Nordic Academic Press.

Graff, H. J., Mackinnon, A., Sandin, B., & Winchester, I. (Eds.). (2009). *Understanding literacy in its historical context: Socio-cultural history and the legacy of Egil Johansson*. Lund: Nordic Academic Press.

Gustafsson, L. (2002). *Novation i norr: Nya dopnamn och namngivningsmönster i Skelleftebygden 1791-1890* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-56801

Garðarsdóttir, Ó. (2002). Saving the child: Regional, cultural and social aspects of the infant mortality decline in Iceland, 1770–1920 (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-56811

Haage, H. (2017). *Disability in individual life and past society: Life-course perspectives of people with disabilities in the Sundsvall region of Sweden in the nineteenth century* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-130333

Haage, H., Vikström, L., & Häggström Lundevaller, E. (2017). Disabled and unmarried? Marital chances among disabled people in nineteenth-century northern Sweden. *Essays in Economic and Business History, 35*(1), 207–238. Retrieved from https://www.ebhsoc.org/journal/index.php/ebhs/article/view/54

Häggström Lundevaller, E., & Edvinsson, S. (2012). The effect of Rh-negative disease on perinatal mortality: some evidence from the Skellefteå region, Sweden, 1860-1900. *Biodemography and Social Biology, 58*(2), 116–132. doi: 10.1080/19485565.2012.720450

Hiltunen Maltesdotter, M., & Edvinsson, S. (2020). *Coding literate cause-of-death information originating from Swedish historical parish registers*. Demographic Data Base, Umeå. In manuscript.

Holmberg, H. (2012). *Generalized linear models with clustered data* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-52902

Holmberg, H., & Broström, G. (2012). On statistical methods for clustering: A case study of infant mortality, northern Sweden 1831–1890. *Biodemography and Social Biology, 58*(2), 173–184. doi: 10.1080/19485565.2012.720446

Högberg, U. (1985). *Maternal mortality in Sweden* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-1866

Högberg, U. (2004). The decline in maternal mortality in Sweden. The role of community midwifery. *American Journal of Public Health, 94*(8), 1312–1320. doi: 10.2105/ajph.94.8.1312

Högman, A.-K. (1999). *Ageing in a changing society: Elderly men and women in urban Sweden 1830–1930* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-54194

Johansson, E. (1969/1970). Kvantitativa studier av alfabetiseringen i Sverige. Exempel på källmaterial, metoder och resultat. *Historielärarnas Förenings årsskrift*, 78–93.

Johansson, E. (1977). *The history of literacy in Sweden, in comparison with some other countries. (*Educational Reports, No. 12). Umeå: Umeå University. Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-62939

Johansson, E. (1983). *Kyrkböckerna berättar.* Stockholm: Liber Förlag.

Johansson, E., & Åkerman, S. (1973). "Faktaunderlag för forskning. Planering av en demografisk databas". *Historisk tidskrift, 3*, 406–414

Junkka, J. (2018a). *Shared practices. Social networks and fertility decline during the Swedish demographic transition, 1850–1950* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-147281

Junkka, J. (2018b). Voluntary associations and net fertility during the Swedish demographic transition. *European Journal of Population, 34*, 819–848. doi: 10.1007/s10680-018-9465-5

Junkka, J. (2018c). Membership and presence of voluntary associations during the Swedish fertility transition, 1880–1949. *Historical Life Course Studies, 5*, 3–36. Retrieved from http://hdl.handle.net/10622/23526343-2018-0012?locatt=view:master

Junkka, J. (2019). Spatial diffusion of fertility decline in Northern Sweden. *Annales de Démographie Historique, 138*(2), 83–117. doi: 10.3917/adh.138.0083

Junkka, J., & Edvinsson, S. (2016). Gender and fertility within the free churches in the Sundsvall region, Sweden 1860–1921. *History of the Family, 21*(2), 243–266. doi: 10.1080/1081602X.2015.1043929

Junkka, J., Sandström, G., & Vikström, L. (2020). The emergence of social gaps in mental health: A longitudinal population study in Sweden, 1900–1959. *PLoS ONE, 15*(4): e0232462 doi: 10.1371/journal.pone.0232462

Karlsson, L. (2013). Indigenous life expectancy in Sweden 1850–1899: Towards a long and healthy life? *Demographic Research, 28*(16), 433–456. doi: 10.4054/DemRes.2013.28.16

Karlsson, L. (2016). Advanced ages at death in Sápmi during the eighteenth and nineteenth centuries: With special attention to longevity among the Sami population. *Historical Methods: A Journal of Quantitative and Interdisciplinary History, 49*(1), 34–49. doi: 10.1080/01615440.2015.1033581

Karlsson, L. (2018). Indigenous infant mortality by age and season of birth, 1800–1899: Did season of birth affect children's chances of survival? *International Journal of Environmental Research and Public Health, 15*(1). doi: 10.3390/ijerph15010018

Karlsson, L., Häggström Lundevaller, E., & Schumann, B. (2019). Season of birth, stillbirths, and neonatal mortality in Sweden: The Sami and non-Sami population 1800–1899. *International Journal of Circumpolar Health, 78*(1). doi: 10.1080/22423982.2019.1629784

Karlsson, L., Häggström Lundevaller, E., & Schumann, B. (2020). Neonatal mortality and temperature in two northern Swedish rural parishes, 1860–1899: The significance of ethnicity and gender. *International Journal of Environmental Research and Public Health, 17*(4). doi: 10.3390/ijerph17041216

Kolk, M. & Hällsten, M. (2017). Demographic and educational success of lineages in northern Sweden. *Population and Development Review, 43*(3), 491–512. doi: 10.1111/padr.12091

Kurbasic, A., Poveda, A., Chen, Y., Ågren, Å., Engberg, E., Hu, F. B., Johansson, I., Barroso, I, Brändström, A., Hallmans, G., Renström, F., & Franks, P. W. (2014). Gene-lifestyle interactions in complex diseases: Design and description of the GLACIER and VIKING studies. *Current nutrition reports*, *3*(4), 400–411. doi: 10.1007/s13668-014-0100-8

Larsson, M. (1984). *Fruktsamhetsmönster, produktionsstruktur och sekularisering: En jämförelse mellan 69 härader vid 1800-talets slut* (Doctoral dissertation, Stockholm University).

Larsson, M., Berggren, M., & Engberg, E. (2019). Linkage of multiple Swedish Censuses: An evaluation. Unpublished paper presented at the *44th Annual Meeting of the Social Science History Association in Chicago, 2019*.

Larsson, M., & Engberg, E. (2015). *Automatic record linkage over administrative borders: New challenges*. Unpublished paper presented at the *40th Annual meeting of the Social Science History Association in Baltimore, 2015*.

Larsson, M., & Engberg, E. (2016). *How much do link metrics matter?* Unpublished paper presented at the *41st Annual Meeting of the Social Science History Association in Chicago, 2016*.

Laslett, P. (1965). *The world we have lost*. London: Methuen.

Lindmark, D. (1995). *Uppfostran, undervisning, upplysning: Linjer i svensk folkundervisning före folkskolan* (Doctoral dissertation, Umeå University).

Lockridge, K. A. (1981). *The fertility transition in Sweden. A preliminary look at smaller geographic units, 1855–1890.* (Report from the Demographic Data Base, No. 3). Umeå: Umeå University.

Low, B. S. (1993). Resources and reproduction: What hath the demographic transition wrought? *Behavioral and Brain Sciences 16*(2), 300. doi: 10.1017/S0140525X00030120

Low, B. S. (1994). Men in the demographic transition. *Human Nature, 5*, 223–253. doi: 10.1007/BF02692153

Low, B. S. (2015). *Why sex matters: A Darwinian look at human behavior.* Revised edition. Princeton: Princeton University Press. doi: 10.1002/ajhb.22861

Low, B. S., & Clarke, A. L. (1991). Family patterns in 19th century Sweden: Impact of occupational status and landownership. *Journal of Family History, 16*(2), 117–138. doi: 10.1177/036319909101600202

Low, B. S., & Clarke, A. L. (1993). Historical perspectives on population and environment: Data from 19th century Sweden. In G. Ness & W. Drake (Eds.), *Population-environment dynamics: Proceedings of the international symposium on population and environment* (pp.195–224). Ann Arbor: University of Michigan Press.

Low, B. S., Clarke, A. L., & Lockridge, K. A. (1991). *Family patterns in nineteenth-century Sweden: Variations in Time and Space*. (Report from the Demographic Data Base, No. 6). Umeå: Umeå University.

Lundberg, A. (1999). *Care and coercion: Medical knowledge, social policy and patients with venereal disease in Sweden 1785–1903* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-15000

Lundberg, S. (2001). *Going once, going twice, sold! The economics of past and public procurement in Sweden* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-73622

Lynch, K. A., & Greenhouse, J. B. (1994). Risk factors for infant mortality in nineteenth-century Sweden. *Population Studies, 48*(1), 117–133. doi: 10.1080/0032472031000147506

Lynch, K. A., Greenhouse, J. B., & Brändström, A. (1998). Biometric modeling in the study of infant mortality: Evidence from nineteenth-century Sweden. *Historical Methods, 31*(2), 53–64. doi: 10.1080/01615449809601188

Maas, I., & van Leeuwen, M. H. D. (2002). Industrialization and intergenerational mobility in Sweden. *Acta Sociologica, 45*(3), 179–194. doi: 10.1177/000169930204500301

Maas, I., & van Leeuwen, M. H. D. (2004). Occupational careers of the total male labour force during industrialization: The example of nineteenth-century Sweden. In D. Mitch, J. Brown, & M. H. D. van Leeuwen (Eds.), *Origins of the modern career* (pp. 227–258). Aldershot: Ashgate.

Maas, I., & van Leeuwen, M. H. D. (2016). Toward open societies? Trends in male intergenerational class mobility in European countries during industrialization. *American Journal of Sociology, 122*(3), 838–885. doi: 10.1086/689815

Mandemakers, K., & Dillon, L. (2004). Best practices with large databases on historical populations. *Historical Methods, 37*(1), 34–38. doi: 10.3200/HMTS.37.1.34-38

Nilsdotter-Jeub, U. (1993). *Parish Records: 19th century ecclesiastical registers.* Umeå: Demographic Data Base, Umeå University.

Nilsson, H. (1994). *Mot bättre hälsa: Dödlighet och hälsoarbete i Linköping 1860–1894* (Doctoral dissertation, Linköping University). Retrieved from http://liu.diva-portal.org/smash/record.jsf?pid=diva2%3A255928&dswid=5358

Nilsson, H. & Tedebrand, L.-G. (2005). *Familjer i växande städer: Strukturer och strategier vid familjebildning i Sverige 1840–1940.* Umeå: Umeå University. Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-13411

Nordin, G. (2009). Äktenskap i Sápmi: Giftermålsmönster och etnisk komplexitet i kolonisationens tidevarv, 1722–1895 (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-22093

Nordin, G., & Sköld, P. (2012). True or false? Nineteenth-century Sápmi fertility in qualitative vs. demographic sources. *History of the Family, 17*(2), 157–177. doi: 10.1080/1081602X.2012.687831

Nordström, S. (1980). Epidemiological studies of hereditary macular degeneration (Best's disease) in Swedish and Swedish-American populations. In. A. W. Eriksson, H. Forsius, H. R. Nevanlinna, P. L. Workman & R. K. Norio (Eds.), *Population structure and genetic disorders.* New York: Academic Press.

Nordström, S., & Thorburn, W. (1980). Dominantly inherited macular degeneration (Best's disease) in a homozygous father with 11 children. *Clinical Genetics, 18*(3), 211–216. doi: 10.1111/j.1399-0004.1980.tb00874.x

Nygren, V. (2009). *Mellan två samhällen: Inflyttat arbetsfolk i Linköping under det förindustriella 1800-talet* (Doctoral dissertation, Linköpings University). Retrieved from http://liu.diva-portal.org/smash/record.jsf?pid=diva2%3A293425&dswid=5358

Olsson. I. (1999). *Att leva som lytt: handikappades levnadsvillkor i 1800-talets Linköping.* (Doctoral dissertation, Linköpings University. Retrieved from http://liu.diva-portal.org/smash/record.jsf?pid=diva2%3A253397&dswid=7863

Ostergren, R. C. (1990). *Patterns of seasonal industrial labor recruitment in a nineteenth century Swedish parish: The case of Matfors and Tuna 1846–1873*. Umeå: Umeå University. Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-132355

Oudin Åström, D., Edvinsson, S., Hondula, D., Rocklöv, J., & Schumann, B. (2016). On the association between weather variability and total and cause-specific mortality before and during industrialization in Sweden. *Demographic Research, 35*(33), 991-1010. doi: 10.4054/DemRes.2016.35.33

Oudin Åström, D., Forsberg, B., Edvinsson, S., & Rocklöv, J. (2013). Acute fatal effects of short-lasting extreme temperatures in Stockholm, Sweden: Evidence across a century of change. *Epidemiology, 24*(6), 820–829. doi: 10.1097/01.ede.0000434530.62353.0b

Pooley, C. G. (2013). The influence of locality on migration: A comparative study of Britain and Sweden in the nineteenth century. *Local Population Studies, 90*(1), 13–27. doi: 10.35488/lps90.2013.13

Poveda, A., Chen, Y., Brändström, A., Engberg, E., Hallmans, G., Johansson, I., Renström, F., Kurbasic, A., & Franks, P. W. (2016). The heritable basis of gene–environment interactions in cardiometabolic traits. *Diabetologia, 60*, 442–452. doi: 10.1007/s00125-016-4184-0

Puranen, B.-I. (1984). *Tuberkulos: En sjukdoms förekomst och dess orsaker: Sverige 1750–1980* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-82513

Reher, D. S., Sandström, G., Sanz-Gimeno, A., & van Poppel, F. W. A. (2017). Agency in fertility decisions in western Europe during the demographic transition: A comparative perspective. *Demography, 54*, 3–22. doi: 10.1007/s13524-016-0536-0

Rocklöv, J., Edvinsson, S., Arnqvist, P., Sjöstedt de Luna, S., Schumann, B. (2014). Association of seasonal climate variability and age-specific mortality in northern Sweden before the onset of industrialization. *International Journal of Environmental Research and Public Health, 11*, 6940–6954. doi: 10.3390/ijerph110706940

Rosenthal, P. A. (2003). The novelty of an old genre: Louis Henry and the founding of historical demography. *Population, 58*(1), 97–130. doi: 10.2307/3246646

Rotering, P. (2017). Intergenerational transmission of reproductive behavior in Sweden, 1850–1889. *Historical Life Course Studies, 4*, 181–202. Retrieved from http://hdl.handle.net/10622/23526343-2017-0011?locatt=view:master

Rotering, P., & Bras. H. (2019). The age difference between spouses and reproduction in19th century Sweden. *Demographic Research, 41*(37), 1059–1090. doi: 10.4054/DemRes.2019.41.37

Sandström, G. (2012). *Ready, willing, able: The divorce transition in Sweden 1915–1974* (Doctoral dissertation, Umeå University. Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-60216

Sandström, G., & Marklund, E. (2018). A prelude to the dual provider family — The changing role of female labor force participation and occupational field on fertility outcomes during the baby boom in Sweden 1900–60. *History of the Family, 24*(1), 149–173. doi: 10.1080/1081602X.2018.1556721

Sandström, G., & Stanfors, M. (2020). *Growing more equal and growing apart? Socioeconomic status and the rise of divorce in Sweden.* (Lund Studies in Economic Demography, No. 4). Retrieved from https://lup.lub.lu.se/record/c4d0c6a1-1d5d-421d-b963-19946d830ff0

Schumann, B., Häggström Lundevaller, E., & Karlsson, L. (2019). Weather extremes and perinatal mortality – Seasonal and ethnic differences in northern Sweden, 1800-1895. *PLoS One, 14*(10): e0223538. doi: 10.1371/journal.pone.0223538

Selander, S.-Å. (1986). *Livslångt lärande i den svenska kyrkoförsamlingen. Fleninge 1820–1890* (Doctoral dissertation, Lund University).

Sköld, P. (1996a). *The two faces* of *smallpox: A disease and its prevention in eighteenth and nineteenth-century Sweden* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-55842

Sköld, P. (1996b). From inoculation to vaccination: Smallpox in Sweden in the eighteenth and nineteenth centuries. *Population Studies, 50*(2), 247–262, doi: 10.1080/0032472031000149336

Sköld, P. (2010). From inoculation to vaccination: Smallpox in Sweden in the eighteenth and nineteenth centuries. *Population Studies, 50*(2), 247–262. doi: 10.1080/0032472031000149336

Smith, K. R., Hanson, H. A., & Mineau, G. P. (2016). A six-pack of big ideas for historical demography. In K. Matthijs, S. Hin, J. Kok, & H. Matsuo (Eds.), *The future of historical demography: Upside down and inside out*. Leuven: ACCO Publishers. Available from https://soc.kuleuven.be/ceso/fapos/files/The-future-of-historical-demogr-KM_SH_HM_JK.pdf

Sundin, J. (1995). Culture, class and infant mortality during the Swedish mortality transition. *Social Science History, 19*(1), 117–145. doi: 10.1017/S0145553200017247

Sundin, J., Söderlund, E. (1977). *Time, space and man: Essays on microdemography*. Reports from the symposium in Umeå, Sweden. Umeå: Umeå University.

Svensson, I., Lundholm, E., de Luna, X., & Malmberg, G. (2015). Family life course and the timing of women's retirement – A sequence analysis approach. *Population, Space and Place, 21*(8), 856–871. doi: 10.1002/psp.1950

Tedebrand, L.-G. (2000). *Sex, state and society: Comparative perspectives on the history of sexuality*. Stockholm: Almqvist & Wiksell International.

Tedebrand, L.-G. (2012). *Historiedemografisk forskning vid Umeå universitet 1982–2004: En personlig ämbetsberättelse*. Umeå: Kungliga Skytteanska samfundet.

Universitets- och högskoleämbetets författningssamling. (1978). *Förordning med bestämmelser för demografiska databasen vid universitetet i Umeå 1978-06-29*, UHÄ-FS 1978 (75).

Universitets- och högskoleämbetets författningssamling. (1990). *Förordning om demografiska databasen vid universitetet i Umeå 1990-05-03*, UHÄ-FS 1990 (8).

Vandezande, M., & Edvinsson, S. (2012). Measuring death clustering: Comparing and explaining the spread of infant mortality between families in nineteenth century Belgium and Sweden. In M. Vandezande (Ed.), *Born to die: Death clustering and intergenerational transfer of infant mortality, the Antwerp district, 1846–1905* (pp. 114-143). Leuven: KU.

van Leeuwen, M. H. D., & Maas, I. (2002). Partner choice and homogamy in the nineteenth century: Was there a sexual revolution in Europe? *Journal of Social History, 36*(1), 101–123. doi: 10.1353/jsh.2002.0111

van Leeuwen, M. H. D., Maas, I., & Miles, A. (2002). *HISCO. Historical International Standard Classification of Occupations*. Leuven: Leuven University Press.

van Leeuwen, M. H. D., Maas, I., & Miles, A. (2004). Creating a historical international standard for classification of occupations an exercise in multinational interdisciplinary cooperation. *Historical Methods: A Journal of Quantitative and Interdisciplinary History, 37*(4), 186–197. doi: 10.3200/HMTS.37.4.186-197

Vikström, L. (2001). Women migrants in a Swedish sawmill town: The socio-spatial paths of single women migrants heading for Sundsvall in the 1870s. In L.-G. Tedebrand & P. Sköld (Eds), Nordic demography in history and present-day society (pp. 367–384). Umeå: Umeå University. Scandinavian Population Studies. Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-8549

Vikström, L. (2003). *Gendered routes and courses: The socio-spatial mobility of migrants in nineteenth-century Sundsvall, Sweden* (Doctoral dissertation, Umeå University). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-14689

Vikström, L. (2006). Vulnerability among paupers: Determinants of individuals receiving poor relief in nineteenth-century northern Sweden. *The History of the Family, 11*(4), 223–239. DOI: 10.1016/j.hisfam.2006.12.004

Vikström, L. (2008). Societal change and individual past in connection with crime: Demographic perspectives on young people arrested in Northern Sweden in the Nineteenth Century. *Continuity and Change, 23*(2), 331–361. doi: 10.1017/S0268416008006814

Vikström, L. (2010). Identifying dissonant and complementary data on women through the triangulation of historical sources. *International Journal of Social Research Methodology, 13*(3), 211–221. doi: 10.1080/13645579.2010.482257

Vikström, L. (2011). Before and after crime: Life-course analyses of young offenders arrested in 19th century northern Sweden. *Journal of Social History, 44*(3), 861–888. doi: 10.1353/jsh.2011.0001

Vikström, L., Haage, H., & Häggström Lundevaller, E. (2017). Sequence analysis of how disability influenced life trajectories in a past population from the nineteenth-century Sundsvall, Sweden. *Historical Life Course Studies, 4*, 97–119. Retrieved from http://hdl.handle.net/10622/23526343-2017-0006?locatt=view:master

Vikström, L., Haage, H. & Häggström Lundevaller, E. (2020). Marriages among people with disabilities in 19th-century Sweden: Marital age and spouse's characteristics. *The History of the Family, 25*(2), 322–344. doi: 10.1080/1081602X.2020.1719859

Vikström, L., Häggström Lundevaller, E., & Haage, H. (2017). First a job, and then a family? Impacts of disabilities on young people's life courses in a nineteenth-century Swedish region. *Disability Studies Quarterly, 37*(4). doi: 10.18061/dsq.v37i4.6095

Vikström, L., Marklund, E., & Sandström, G. (2016). Demographic outcomes during colonisation: Migration and mortality among indigenous and non-indigenous populations in nineteenth-century Sweden. *Journal of Migration History, 2*(1), 148–176. doi: 10.1163/23519924-00201006

Wall, R. (2001). The family circumstances of women migrating permanently or temporarily to Sundsvall in the nineteenth century. *Scandinavian Economic History Review, 49*(3), 46–61. doi:

10.1080/03585522.2001.10419852
Westberg, A., Engberg, E., & Edvinsson, S. (2016). A unique source for innovative research: The POPLINK database. *Historical Life Course Studies, 3*, 20–31. Retrieved from http://hdl.handle.net/10622/23526343-2016-0003?locatt=view:master
Willner, S. (1999). *Det svaga könet? Kön och vuxendödlighet i 1800-talets Sverige* (Doctoral dissertation, Linköping University).
Wisselgren, M. J., Edvinsson, S., Berggren, M., & Larsson, M. (2014). Testing methods of record linkage on Swedish censuses. *Historical Methods: A Journal of Quantitative and Interdisciplinary History, 47*(3), 138–151. doi: 10.1080/01615440.2014.913967