

SWEDISH REGISTERS

A UNIQUE
RESOURCE
FOR HEALTH
AND WELFARE

SWEDISH REGISTERS

A UNIQUE
RESOURCE
FOR HEALTH
AND WELFARE

Table of contents

| | |
|--|----|
| Edited by | 7 |
| Cutting-edge Swedish research | 9 |
| Background to SIMSAM | 10 |
| HEALTH RISKS | 12 |
| Ambient air pollution has a negative impact on birth outcome | 13 |
| Malformations are more common in children whose fathers have had cancer | 14 |
| Exposure to air pollution may result in increased risks of gestational diabetes and preeclampsia | 15 |
| Exposure to endocrine disrupting pollutants increases the risk of having boys with malformations | 16 |
| Increased risk of heart disease and suicide immediately after cancer diagnosis | 17 |
| Weak relationship between neurodegenerative diseases and conditions such as cancer | 18 |
| Emergency caesarean section increases the risk of childhood asthma | 19 |
| Antibiotic treatment does not increase the risk of asthma | 20 |
| Maternal smoking during pregnancy affects children's blood pressure | 21 |
| HEALTH CARE | 22 |
| Centralizing surgery for esophageal cancer saves lives | 23 |
| Obesity surgery and risk of developing cancer | 24 |
| Gallbladder removal increases the risk of cancer of the esophagus and of the bile ducts | 25 |
| Pharmaceuticals can induce inflammation of the pancreas | 26 |
| Surgery for heartburn does not affect the risk of developing esophageal cancer | 28 |
| Adults with ADHD commit fewer crimes when on medication | 29 |
| CHILDREN | 30 |
| Successful school performance reduces vulnerability of children in foster care | 31 |
| Gluten intolerance increases rapidly but breastfeeding may be protective | 32 |
| Children born after in vitro fertilization are often born prematurely and suffer from low birth weight | 33 |
| Link between reduced health at birth and poorer grades during the ninth school year | 34 |
| Low incomes are inherited from father to son in second generation immigrants | 35 |
| FAMILY | 36 |
| No effect of the "gender equality bonus" | 37 |
| Gender equal parents have more children | 38 |
| Swedish parents prefer to have a daughter in the family | 39 |

| | |
|---|----|
| SCHOOL AND EDUCATION | 40 |
| Free school choice increases the variation in grades between schools | 41 |
| Extended compulsory schooling in Sweden caused lower mortality after age 40 | 42 |
| Social origin still important for educational attainment | 43 |
| Parents with children of high educational attainment have reduced mortality | 45 |
| WORK AND POVERTY | 46 |
| Living with a Swedish born partner increases labor market opportunities for immigrants | 47 |
| Swedish men and women are equally affected by unemployment | 48 |
| Receiving income support for several years can result in durable poverty | 49 |
| Education, intelligence and personality important factors when high incomes are inherited | 50 |
| Social origin affects recruitment to the business elite | 52 |
| Residential segregation has little impact on immigrants' labor market integration | 53 |
| Contact SIMSAM | 54 |

Edited by

Magnus Stenbeck

Department of Clinical Neurosciences
Insurance Medicine
Karolinska Institutet
S-171 77 Stockholm, Sweden
magnus.stenbeck@ki.se
+46 (0)8 - 524 861 41

Gunnar Andersson

Department of Sociology
Demography Unit
Stockholm University
S-106 91 Stockholm, Sweden
gunnar.andersson@sociology.su.se
+46 (0)8 - 16 32 61

Anita Berglund

Institute of Environmental Medicine
Karolinska Institutet
S-171 77 Stockholm, Sweden
anita.berglund@ki.se
+46 (0)8 - 524 87 466

Erik Bihagen

Swedish Institute for Social Research (SOFI)
Stockholm University
S-106 91 Stockholm, Sweden
erik.bihagen@sofi.su.se
+46 (0)8 - 16 26 51

Jesper Lagergren

Department of Molecular Medicine and Surgery
Norra Stationsgatan 67
Karolinska Institutet
S-171 76 Stockholm, Sweden
jesper.lagergren@ki.se
+46 (0)8 - 517 76 012

Xavier de Luna

Department of Statistics,
Umeå School of Business and Economics
Umeå University
SE-901 87 Umeå, Sweden
xavier.deluna@stat.umu.se
+46 (0)90 - 786 55 59

Anna Rignell-Hydbom

Division of Occupational and
Environmental Medicine
Barnngatan 2
Lund University
S-221 85 Lund, Sweden
anna.rignell-hydbom@med.lu.se
+46 (0)46 - 222 16 30

Weimin Ye

Department of Medical
Epidemiology and Biostatistics
Karolinska Institutet
S-171 77 Stockholm, Sweden
Weimin.Ye@ki.se
+46 (0)8 - 524 86 184

Anna Holmström

Department of Clinical Neurosciences
Insurance Medicine
Karolinska Institutet
S-171 77 Stockholm, Sweden
anna.holmstrom@umu.se
+46 (0)70 - 818 88 14

Cutting-edge Swedish research

S **wedish medical and social research is world leading, and Swedish population registers constitute a gold mine for research. The organization of Swedish society, the health care system and other parts of the welfare state rest to a large extent on research on health and welfare. An important factor for success is the ability to use existing national population-based registers.**

Data on family, residence, education, and work can be combined with data on risk exposure, health, health care, and mortality. This network of personal data, based on a common personal identification number across all sectors, may seem to offer a frightening opportunity for society to control the individual. Research, however, is concerned only with combining individual data into large population groups in order to study complex associations between biological characteristics, acquired abilities, life style, living conditions, and health. By using registers encompassing the entire Swedish population or large parts of it, it is also possible to study unusual phenomena, such as rare diseases and treatments.

This booklet describes some of the research efforts that have been accomplished using existing Swedish register data. Register-based research does not differ from other research in any other respect than the use of registers as the main or complementary source of information. This is a rational and cost-effective way of gaining new knowledge by using resources spent by the society for a variety of purposes other than research.

During the research process, data from public registers are often combined with other data in the actual research projects. Using this approach it is possible to find answers on many questions rapidly and at a reasonable cost compared to the effort and resources required if the data had to be collected all over again each time a new question arises. For this

reason, register-based research can be closely tied to the reform of welfare policy, and scientific results can be translated into action quickly.

It is essential to handle personal data with the greatest possible care. Individuals must be safeguarded against inappropriate use of their personal information. There are, therefore, a number of rules and ethical principles guiding the utilization of personal data in research. All projects using sensitive information must be reviewed and approved by an ethics committee. Researchers must respect international treaties on human rights and comply with European and Swedish laws on data protection.

The Swedish Research Council has taken the initiative in providing a national focus on register-based research, through the "Swedish Initiative for research on Microdata in the Social and Medical sciences" (SIMSAM). The six designated SIMSAM research groups focus on social and medical research programs in the public interest. The results, as well as the improved data, are intended to be used to improve health and living conditions for the population.

SIMSAM-INFRA is a related but separate project focusing on making the SIMSAM efforts widely visible. This booklet is intended to provide some examples of SIMSAM's accomplishments and ongoing work in order to achieve this goal. We hope that this will offer an explanation and background as to why our work is supported by politicians as well as the scientific community within the medical and social sciences.

Background to SIMSAM



Since November 2008, the Swedish Research Council (VR) has provided considerable funding for SIMSAM, which is organized as a network consisting of six groups of researchers and a graduate school.

The groups focus on a number of more or less overlapping and/or specific research fields. Examples include: social stratification dynamics, Nordic demography, transmitted and acquired determinants of health, early life exposure and health, social and medical aspects of children's health and wellbeing and the diseases and surgery of the upper gastrointestinal tract. The Swedish Interdisciplinary Graduate School in register-based research (SINGS) provides courses and other activities complementary to node activities in educating the next generation of scientists to increase their ability to make use of the Swedish gold mine of register data.

Stockholm, April 2013

Magnus Stenbeck

Associate professor, Insurance Medicine
Karolinska Institutet
Project manager SIMSAM-INFRA

The research nodes collaborate both within and outside SIMSAM, nationally and internationally. SIMSAM's knowledge and efforts are made public, primarily via SIMSAM-INFRA, so that other researchers can benefit from the work and improve their own research efforts.

The production of this brochure is one example of the SIMSAM outreach program. Other examples include national SIMSAM meetings open also to non-SIMSAM members and our web page, www.simsam.nu. If you want to know more about SIMSAM's activities, please browse our web page and/or contact any of the editors of this brochure.

Anna Holmström

Ph.D., Insurance Medicine
Karolinska Institutet
Coordinator SIMSAM

Ambient air pollution has a negative impact on birth outcome

T here is a growing body of evidence that ambient air pollution levels during pregnancy has adverse effects on birth outcomes. It is not yet known which components contribute to the effects and what levels are needed to cause harm.

Two large groups were generated by linking data from the Medical Birth Register, the National Patient Register and the Prescribed Drug Register for mothers and their offspring in the Stockholm metropolitan area. Additional data on air pollution levels, pollen concentrations and weather for different time periods were collected from monitoring stations in the area.

Higher levels of ozone during the first trimester were associated with shorter mean gestation as well as with an elevated risk of preterm delivery (< week 37). Higher levels of nitrogen dioxide during the last week of pregnancy were also associated with preterm delivery.

Also the risk of preeclampsia increases with early ozone exposure and the effect of ozone was shown to be stronger in asthmatic women. These new results suggest that ozone levels need to be reduced in order to minimize adverse effects on birth outcome.

HEALTH RISKS

Olsson D, Ekström M, Forsberg B. Temporal variation in air pollution concentrations and preterm birth—a population based epidemiological study. *Int J Environ Res Public Health*. 2012 Jan;9(1):272-85. doi: 10.3390/ijerph9010272. Epub 2012 Jan 18.

Olsson D, Mogren I, Forsberg B. Air pollution exposure in early pregnancy and adverse pregnancy outcomes: a register-based cohort study. *BMJ Open*. 2013 Feb 5;3(2). doi:pii: e001955. 10.1136/bmjopen-2012-001955.

Malformations are more common in children whose fathers have had cancer

S

ince the survival rate among young men who have had cancer is very high, an important question is whether having had the disease affects these men later in life?

Another question is if it also can result in health risks for their children? The study in question aimed to investigate the presence of malformations in children of fathers who have had cancer.

The study was a collaboration between research groups in Sweden and Denmark. By linking population, multi-generation, and medical birth registers, all children born in Sweden between 1994 and 2004 were identified. Through matching to the Cancer Register, fathers who have had cancer were identified. The same procedure was carried out in Denmark. Out of 1,777,765 children included in the study, 8,670 had a father who had had cancer.

The prevalence of malformations was slightly higher among children of fathers who had had cancer compared to children whose fathers had not had cancer (3.7% as compared to 3.2%).

The prevalence of malformations was slightly higher among children of fathers who had had cancer compared to children whose fathers had not had cancer (3.7% as compared to 3.2%).

Exposure to air pollution may result in increased risks of gestational diabetes and preeclampsia

I

t is already known that very high levels of air pollution can cause negative health effects. But there is a knowledge gap on the impact of relatively low levels of air pollution such as those measured in Sweden. Some people are more susceptible to air pollution effects than others, for instance pregnant women who are already undergoing the physical strain of carrying a child in their wombs. The aim of the study was to analyse the risk of developing gestational diabetes and preeclampsia in relation to levels of air pollutants.

The study was based on information from the Medical Birth Register and included all women in Scania (landscape in south Sweden) who gave birth 1999-2005. The level of nitrogen oxides, a proxy for traffic exhaust, was modeled for all women at their residency for different periods of the pregnancies. In the statistical analyses other known risk factors for these diseases were included.

THE RESULTS SHOWED that both gestational diabetes and preeclampsia were more common among women living in areas of highest exposure despite the fact that the exposure levels were below current air quality guidelines. When we compared women in the highest exposure quartile with the women in the lowest exposure quartile, an odds ratio of 1.69 was obtained for gestational diabetes and an odds ratio of 1.51 for preeclampsia. Future studies should investigate whether these elevated risks can be explained by currently unknown factors such as socio-economic effects.



HEALTH CARE

Centralizing surgery for esophageal cancer saves lives

In Sweden, about 400 persons are diagnosed with esophageal cancer each year, and about 100 of these persons undergo surgery with curative intent. This surgery is, however, very demanding, with a limited chance of long-term postoperative survival. A comprehensive study was conducted in Sweden to provide scientific evidence to address whether esophageal cancer surgery should be centralized with fewer surgeons or fewer hospitals to optimize the chance of the surgery resulting in cure.

1335 patients underwent surgery for esophageal cancer
1987-2005

The 1,335 patients recorded in the National Patient Register and the Cancer Register as having undergone surgery for esophageal cancer in Sweden during the period 1987-2005 were included in the study. In addition to data from these registers, we also collected medical records to add clinical information. The annual

surgeon volume and annual hospital volume were analysed in relation to survival until 2011, and the results were adjusted for other factors known to predict survival.

This study provides scientific evidence that centralizing esophageal surgery to fewer surgeons saves lives.

Survival increased by 22%

The quality of the data relating to esophageal cancer surgery as recorded in The National Patient Register was found to be excellent. The survival after esophageal cancer surgery was improved by 22% when conducted by surgeons with a higher annual number of this type of surgery, but the annual hospital volume did not influence long-term postoperative survival results.



Lagergren K, Derogar M. Validation of oesophageal cancer surgery data in the Swedish Patient Registry. Acta Oncologica 2012;51:65-8.

Derogar M, Sadr-Azodi O, Johar A, Lagergren P, Lagergren J. Hospital and surgeon volume in relation to survival after esophageal cancer surgery in a population-based study. Journal of Clinical Oncology 2013 2013;31:551-7.

Obesity surgery and risk of developing cancer

Obesity surgery is rapidly becoming increasingly popular in many countries, including Sweden. A number of cancer types are about twice as common among people who are overweight compared to those of normal weight. An interesting question is whether obesity-related cancer risk is reduced with time after obesity surgery.

A nationwide Swedish study was based on the 13,123 patients recorded in the National Patient Register as having undergone obesity surgery since the introduction of this type of surgery in 1980. By using data from the Cancer Register, the risk of obesity-related cancer was analysed among the operated patients in comparison with the cancer risk of the background population of corresponding age, sex and calendar year.

The study provided no support for the hypothesis that obesity surgery reduces the risk of obesity-related cancer over time after surgery. Rather, an increased risk of colorectal cancer with time was indicated after surgery.

SINCE OBESITY SURGERY does not seem to reduce the risk of cancer risk over time, but might, rather, be followed by an increased risk of colorectal cancer, this type of surgery should not be conducted for a cancer-preventive purpose.

Östlund MP, Lu Y, Lagergren J. Risk of obesity-related cancer after obesity surgery in a population-based cohort study. *Annals of Surgery* 2010;252:972-6.
Derogar M, Hull MA, Kant P, Östlund M, Lu Y, Lagergren J. Increased risk of colorectal cancer after obesity surgery in a retrospective cohort study. *Annals of Surgery* 2013 Mar 6. [Epub ahead of print].

Gallbladder removal increases the risk of cancer of the esophagus and of the bile ducts

Cholecystectomy means that the gallbladder is removed, typically because of gallstone disease. This is one of the most common surgical procedures. Such an operation influences the bile flow from the liver to the duodenum in a manner that might increase the level of bile in the esophagus and increase the pressure of the bile ducts and the liver. The research question was, therefore, whether cholecystectomy increases the risk of cancer of the esophagus, bile ducts or liver.

Nationwide Swedish studies were based on the 345,251 patients who had undergone cholecystectomy for gallstone disease since 1965 in Sweden according to the National Patient Register. The patients were monitored for the risk of developing cancer of the esophagus, bile ducts or liver according to the Cancer Register and their cancer risk was compared to the cancer risk of the corresponding background population regarding age, sex and calendar year.

The risk of cancer of the esophagus as well as cancer of the liver was moderately increased after cholecystectomy, which was not explained by confounding, by obesity or other potential confounders, while the risk of cancer of the bile ducts was not increased.

Cholecystectomy increases risk of cancer of the esophagus and the liver. This would not mean much for the individual patient, since the absolute risk of these tumors is still very low, but the results stress the importance of having strict indications for performing cholecystectomy.

345 251
patients underwent
cholecystectomy for gallstone
disease since 1965 in Sweden

Lagergren J, Mattsson F. Cholecystectomy as a risk factor for oesophageal adenocarcinoma. *British Journal of Surgery* 2011;98:1133-7.
Lagergren J, Mattsson F, El-Serag H, Nordenstedt H. Increased risk of hepatocellular carcinoma after cholecystectomy. *British Journal of Cancer* 2011;105:154-6.
Nordenstedt H, Mattsson F, El-Serag H, Lagergren J. Gallstones and cholecystectomy in relation to risk of intra- and extrahepatic cholangiocarcinoma. *British Journal of Cancer* 2012;106:1011-5.

Pharmaceuticals can induce inflammation of the pancreas

Certain types of medications seem to be associated with an increased risk of acute pancreatitis, but there is a lack of well-designed and large scale studies. Acute pancreatitis is a common and sometimes deadly disease. We evaluated whether certain groups of medication increase the risk of acute pancreatitis in large Swedish register-based studies.

The National Patient Register was used to identify 6,161 cases of acute pancreatitis during the period 2006-2008. These cases were compared with 61,637 control persons from the Registry of the Total Population in Sweden of the corresponding age, sex and calendar year. Information regarding medication was collected from the Prescribed Drug Register.

The validity of the diagnosis of acute pancreatitis in The National Patient Register was found to be excellent. Current use of antibiotics in the tetracycline group, as well as use of oral glucocorticoids, was followed by an increased

6,161 cases of acute pancreatitis was identified

2006-2008

risk of pancreatitis. Antidepressants and antipsychotic drugs did not influence the risk of acute pancreatitis after adjustment for confounding factors.

Current use of tetracycline and glucocorticoids seems to increase the risk of acute pancreatitis, while antidepressant and antipsychotic medications do not seem to have such an effect. It is important for physicians to be aware of this when prescribing drugs, particularly to patients who have previously had pancreatitis.

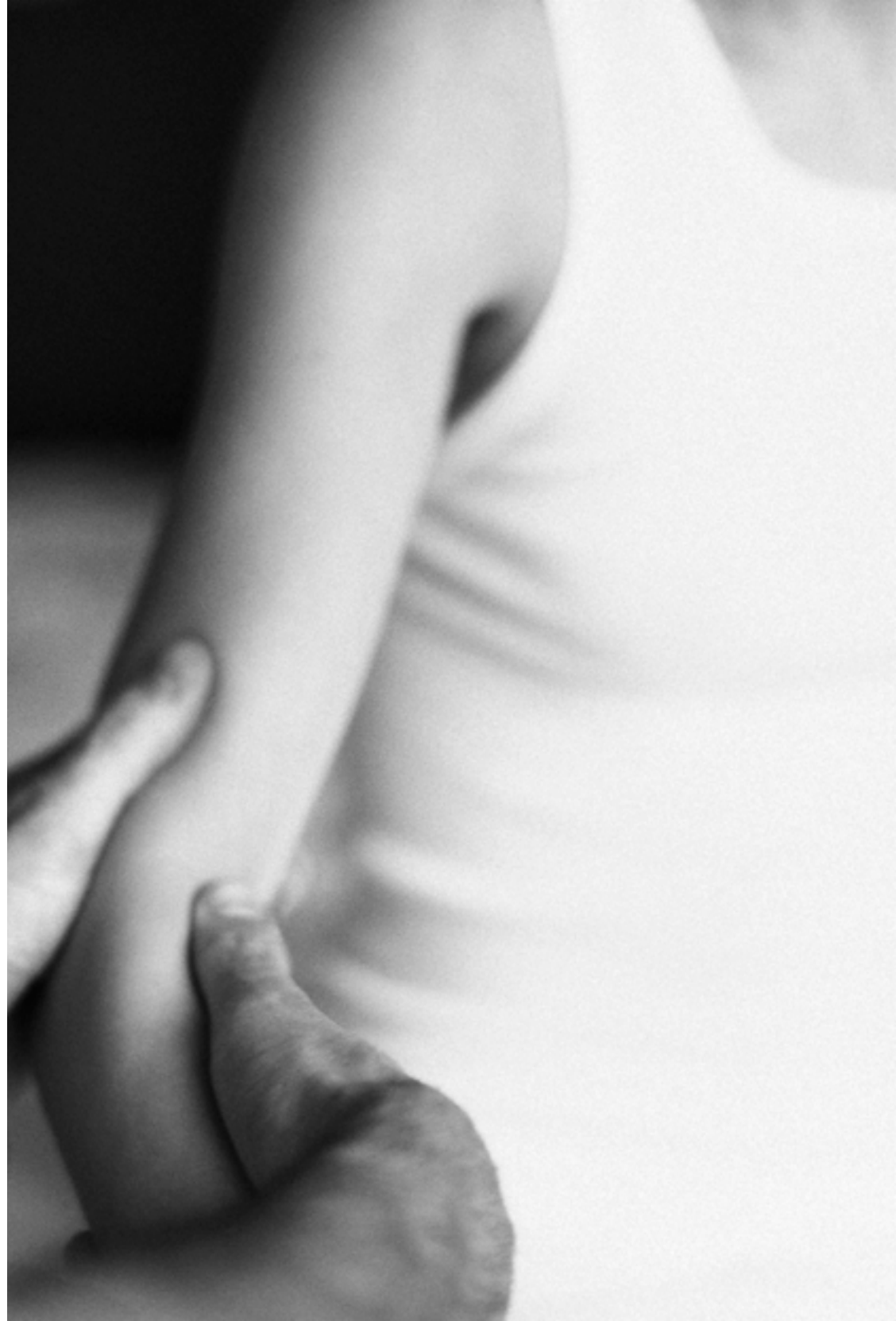
Razavi D, Ljung R, Lu Y, Andrén-Sandberg A, Lindblad M. Reliability of acute pancreatitis diagnosis coding in a National Patient Register: a validation study in Sweden. *Pancreatology* 2011;11:525-32.

Ljung R, Lagergren J, Bexelius TS, Mattsson F, Lindblad M. Increased risk of acute pancreatitis among tetracycline users in a Swedish population-based case-control study. *Gut* 2012;61:873-6.

Sadr-Azodi O, Mattsson F, Sjöberg Belius T, Lagergren J, Ljung R. Oral glucocorticoid use increases the risk of acute pancreatitis - a population-based nested case-control study. *JAMA Internal Medicine* 2013;173:444-9.

Bodén R, Bexelius TS, Mattsson F, Lagergren J, Lindblad M, Ljung R. Antidopaminergic drugs and acute pancreatitis: a population-based study. *BMJ Open* 2012 May 11;2(3).

Ljung R, Rück C, Mattsson F, Bexelius TS, Lagergren J, Lindblad M. Selective serotonin reuptake inhibitors and the risk of acute pancreatitis: a Swedish population-based case-control study. *Journal of Clinical Psychopharmacology* 2012;32:336-40.

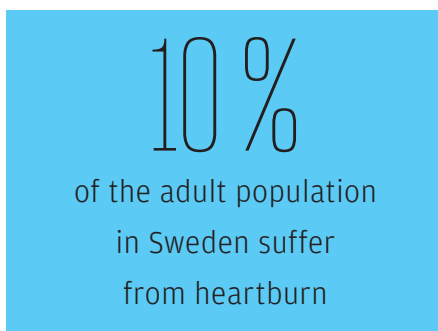


Surgery for heartburn does not affect the risk of developing esophageal cancer

H **heartburn might occur when acidic gastric contents reach the esophagus. Heartburn is a very common disorder, affecting about 10% of the adult population in Sweden and other Western countries. Heartburn is the main risk factor for esophageal cancer (adenocarcinoma). This study assessed whether anti-reflux surgery prevents this cancer.**

A nationwide Swedish study was conducted based on the 14,102 patients who underwent anti-reflux surgery in Sweden in 1965-2006 according to the National Patient Register. The operated patients were followed up for the risk of developing esophageal adenocarcinoma, using the Cancer Register, and were compared with the same risk in the background population of the corresponding age, sex and calendar year. In a separate study of patients who all underwent anti-reflux surgery, those who developed esophageal cancer were compared with those who did not.

The study did not show any indications of a decreased risk of esophageal adenocarcinoma



with time after anti-reflux surgery. Recurrence of reflux after anti-reflux surgery was an explanation for the lack of cancer preventive effect.

Anti-reflux surgery does not seem to prevent adenocarcinoma of the esophagus and should not be used for cancer preventive reasons. This might be explained by a high rate of recurrence of reflux after anti-reflux surgery.

Adults with ADHD commit fewer crimes when on medication

A **ttention-Deficit/Hyperactivity Disorder (ADHD) is a well-established risk factor for criminality. Prior research suggests that ADHD medications have positive effects on the core symptoms of ADHD, such as attention problems and impulsivity. However, the association between ADHD medication and criminality is largely unknown.**

We addressed this issue using data from about 25,000 individuals with a diagnosis of ADHD in the National Patient Register. These individuals were followed for 4 years regarding ADHD medications (the Prescribed Drug Register) and criminality (Crime Register). We compared risk

of criminality for periods in which ADHD patients were on and off medications. Studying the same individual over time is a particular advantage, since it controls for potential other explanations having to do with differences between ADHD patients on medication and those not taking medications.

Our study suggests that ADHD medication most likely decreases the risk for criminality while under treatment. We found that the crime rate was reduced by about 30% during treatment periods. One potential implication of this study is that ADHD medication should be seriously considered for adolescents and young adults with ADHD that are at risk for criminality.

Successful school performance reduces vulnerability of children in foster care

Young people who have been in long-term foster care have strongly elevated risks of suicide attempts, substance abuse, criminality and public welfare dependency.

Data from Swedish national registers for ten entire birth year cohorts (1972-1981) were used to examine psychosocial outcomes in young adulthood for young people who had been in long-term foster care. Their outcomes were compared with those of young people in the majority population and with young people with experience of other non-conventional family forms, such as national adoptees and peers who had received in-home interventions before age 13.

Poor school performance seems to be a major risk factor for future psychosocial problems among young people who have been in long term foster care. The study suggests that promoting foster children's school performance should be given high priority.



CHILDREN

Gluten intolerance increases rapidly but breastfeeding may be protective

Over the last decades, gluten intolerance has gone from being a rare disease of children in Europe to a world-wide public health problem affecting persons of all ages. Sweden has had a unique gluten intolerance epidemic among infants, and is experiencing the highest prevalence ever reported from this part of the world. Lifelong gluten-free diet is the only available treatment, which implies exclusion of all foods containing wheat, rye or barley.

A National Gluten Intolerance Register has been generated in collaboration with all paediatric clinics in Sweden. By reporting children with newly diagnosed gluten intolerance, this has enabled surveillance and in-depth studies about reasons for falling ill and consequences of living with the disease to be carried out.

In the 1970s, gluten intolerance was diagnosed in 1 out of 1000 children. Nowadays 30 out of 1000 young people in Sweden have the disease, and 2/3 of these remain without diagnosis and treatment, as revealed by a recent screening study. By combining the Gluten Intolerance Register with an incident case-referent study, it has been shown that the risk for developing the disease can be reduced if

In the 1970s, gluten intolerance was diagnosed in **1 out of 1000** children. Nowadays **30 out of 1000** young people in Sweden have the disease. Breastfeeding can reduce the risk!

the baby is breastfed and preferably introduced to gluten-containing foods while still being breastfed. These findings have influenced infant feeding recommendations in Sweden, and lately also in other parts of Europe and the USA. Still, due to a strong genetic risk, some persons develop the disease even though the recommendations are followed. People with the disease have the right to correct diagnosis and treatment, which can be achieved only through increased awareness about gluten intolerance among health professionals and the public. The search for contributing risk factors and protective factors over the whole life-span needs to be intensified to fight this new public health threat.

Ivarsson A, Persson LÅ, Nyström L, Ascher H, Cavell B, Danielsson L, Dannaeus A, Lindberg T, Lindquist B, Stenhammar L, Hernell O. Epidemic of celiac disease in Swedish children. *Acta Paediatr* 2000;89:165-71.

Ivarsson A, Hernell O, Stenlund H, Persson LÅ. Breastfeeding protects against celiac disease. *Am J Clin Nutr* 2002;75:914-21.

Olsson C, Hernell O, Hörnell A, Lönnberg G, Ivarsson A. Difference in celiac disease risk between Swedish birth cohorts suggests an opportunity for primary prevention. *Pediatrics* 2008;122:528-34.

Nordyke K, Olsson C, Hernell O, Ivarsson A. Epidemiological research drives a paradigm shift in complementary feeding - the celiac disease story and lessons learnt. *Nestle Nutr Workshop Ser Pediatr Program* 2010;66:65-79.

Ivarsson A, Myléus A, Norström F, van der Pals M, Rosén A, Högberg L, Danielsson L, Halvarsson B, Hammarroth S, Hernell O, Karlsson E, Stenhammar L, Webb C, Sandström O, Carlsson A. Prevalence of childhood celiac disease and changes in infant feeding. *Pediatrics*. 2013;131(3):e687-94.

Children born after in vitro fertilization are often born prematurely and suffer from low birth weight

It is well known that fertility among women decreases with increasing age. As more Swedish couples wait longer before they try to have children, more are affected by involuntary childlessness. Today some 3.5% of all children born in Sweden are the result of in vitro fertilization (IVF). Because of this, the interest in the health of these children is growing.

To enable these children to be studied, the Health Care Quality Register for IVF was linked to the Medical Birth Register for the years 2002-2006. Many of the rather poor results that have been reported for IVF have been related to multiple births, since twins and triplets are at higher risk of ill health. Between 2002 and 2006, 16% of all children born after IVF in Sweden were twins or triplets. The problem has decreased dramatically since the procedure in Sweden was changed to return only one embryo. When comparing the child-birth outcome among IVF children to the child-birth outcome among children born after spontaneous pregnancies, it is important to consider several contributing factors. Women receiving test tube fertilization are older, are often having their first child, and have often had a long period of involuntary childlessness.

Even when the above mentioned factors are considered and the comparison is based only on

There is a 70% risk increase for premature birth before 28 weeks and a 25% risk increase for low birth weight below 1500 g.

singleton births, you will nevertheless still find significant risks of premature birth and low birth weight among IVF children compared to children born after spontaneous pregnancies (70% risk increase for premature birth < 28 weeks and 25% risk increase for low birth weight < 1500 g). It is however important to remember that these outcomes are rare, and that most IVF children are born healthy. From a public health perspective, it should be emphasized that the 70% risk increase of IVF children being born before week 28 of pregnancy means that each woman statistically would have to give birth to about 500 test tube children in order to have a premature birth due to the fertility treatment.

Sazonova A, Källen K, Thurin-Kjellberg A, Wennerholm UB, Bergh C. Obstetric outcome after in vitro fertilization with single or double embryo transfer. *Hum Reprod*. 2011 Feb;26(2):442-50

Sazonova A, Källen K, Thurin-Kjellberg A, Wennerholm UB, Bergh C. Factors affecting obstetric outcome of singletons born after IVF. *Hum Reprod*. 2011 Oct;26(10):2878-86

Sazonova A, Källen K, Thurin-Kjellberg A, Wennerholm UB, Bergh C. Obstetric outcome in singletons after in vitro fertilization with cryopreserved/thawed embryos. *Hum Reprod*. 2012 May;27(5):1343-50

Sazonova A, Källen K, Thurin-Kjellberg A, Wennerholm UB, Bergh C. Neonatal and maternal outcomes comparing women undergoing two in vitro fertilization (IVF) singleton pregnancies with women undergoing one IVF twin pregnancy. *Fertility & Sterility* 2012. Epub ahead of print]

Link between reduced health at birth and poorer grades during the ninth school year

The Apgar-system was introduced 1953 by Virginia Apgar, and is a scoring system to estimate the health of a child at 1, 5 and 10 minutes after birth. The newborns are graded 0 to 2 (where 2 is the best) with respect to breathing, skin color, reflex irritability, muscle tone and pulse rate. The highest score that can be given is 10-10-10 at 1, 5 and 10 minutes respectively.

Clinically, children with Apgar scores of less than 7 at 5 minutes after birth are regarded as a risk group for future complications. The scoring system is used at all Swedish delivery wards as a measure of the health of the newborn children. Apgar scores have, however, been criticized as being too subjective to have any predictive value for future health.

To investigate the relationship between Apgar scores and school results, information from the Medical Birth Register was linked to the Register of Grade-9-Graduations, where information about grades from the ninth school year (graduating class) can be found.

It was found that individuals with Apgar scores below 7 at 5 minutes after birth had an increased risk of low grades in almost all school subjects (e.g. mathematics, Swedish, science-orientated subjects, societal-oriented subjects, handicrafts and sports). Furthermore, a strong correlation was found between low Apgar scores and the need to attend special school for children with intellectual

Clinically, children with Apgar scores of less than 7 at 5 minutes after birth are regarded as a risk group for future complications. The scoring system is used at all Swedish delivery wards as a measure of the health of the newborn children.

disabilities. The results should, of course, be interpreted as an elevated average risk for the whole group. Each individual has his or her own risk profile, which is affected by several factors. The results do, however, show that Apgar score is a relevant measurement as an indicator of the quality of the delivery care. The results also show that a good start in life is important for future health.

Low incomes are inherited from father to son in second generation immigrants

The level of intergenerational income mobility among immigrants and between immigrants and natives in contemporary Sweden was examined. The first aim was to estimate intergenerational income mobility among immigrant families and compare this with income mobility among natives.

The second aim was to explain disparities in intergenerational income "stickiness" between migrants and natives using the early health status of immigrant children.

We also examined whether entry into motherhood among contemporary Swedish women is affected by their exposure to exogenously-determined birth environments at the regional level.

The first study was based on the Swedish Longitudinal Immigrant Database and the second study used Swedish population and Social Security Registers to identify infant mortality rate at the time and in the region of a woman's birth to estimate the severity of exposure. Sibling comparisons were used to strengthen causal interpretation of the findings.

The study showed evidence of weaker intergenerational income mobility among immigrant families, exemplified by the fact that fathers' lifetime earnings predict sons' earnings to a greater extent among immigrant families than they do among natives. When using sibling fixed effects it was also found that second-generation immigrants whose early health environments were especially unfavorable tend to report even lower earnings than their first-generation immigrant fathers did.

The study showed evidence of weaker intergenerational income mobility among immigrant families, exemplified by the fact that fathers' lifetime earnings predict sons' earnings to a greater extent among immigrant families than they do among natives.

This finding exhibits a clear country-of-origin pattern, with immigrants from distant backgrounds being especially vulnerable.

In the second study it was found that women born in years of elevated infant mortality relative to the region's trend, have a 5 % reduced probability of becoming pregnant, taking into account income, education, and other important predictors of fertility. This demonstrates that even fairly mild early exposures can have long-lasting implications on the probability of having children. The complex factors influencing future parenthood are social as well as biological, and this study shows that developmental effects should also be considered.

No effect of the "gender equality bonus"

Since the introduction of parental leave in Sweden a more gender-equal sharing of such leave has been favored. From 1995 one month was reserved for each parent, implying that the month was lost if not used by the same parent. From 2002 a second month was reserved. In 2008, a gender equality bonus was introduced, providing tax credits to parents who shared the leave equally.

The reserved months had an effect, while there was no noticeable effect resulting from the gender equality bonus.

The effects of these reforms on the sharing of parental leave were investigated by means of a comparison of parents of children born just before and just after the introduction of each reform. The study was based on register data from the Swedish Social Insurance Agency, which includes all parents residing in Sweden.

The results indicate a strong effect of the take-up of parental leave by fathers resulting from the introduction of the first reserved month, a more modest but clear effect resulting from the second reserved month and, so far, no effect resulting from the gender equality bonus.

FAMILY

Gender equal parents have more children

In the Nordic countries, gender equality is an explicit policy goal. Fertility is also considerably higher in these countries than in most other countries in Europe. Could gender equality in society and in the family be related to higher fertility?

The study examined the relationship between fathers' and mothers' sharing of parental leave in Sweden and Norway and the probability of these couples having a second or third child. The study was based on longitudinal data from social insurance registers containing information on the uptake of parental leave and on data on childbearing from the population registers of the two countries.

Families where the father uses longer parental leave have a higher probability of having another child. This positive association between gender equality and fertility was somewhat stronger in Norway than in Sweden.

Families where the father uses longer parental leave have a higher probability of having another child.

Swedish parents prefer to have a daughter in the family

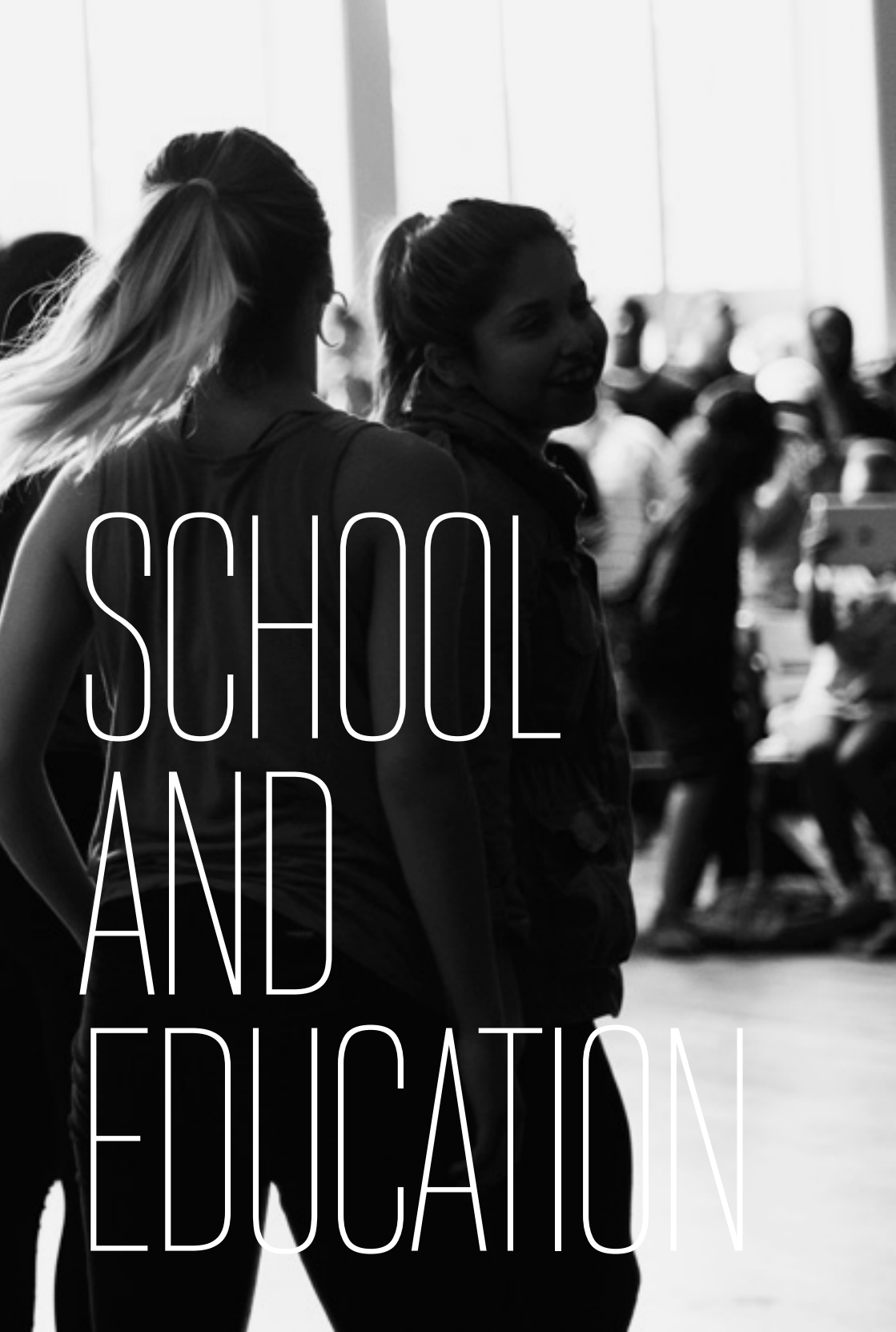
It is well-known that parents in South and East Asia have very strong preferences for having a son. But what about the situation in Sweden and the other Nordic countries, a region with strong focus on gender equality?

The study used register data identifying the sex and birth order of all children born in Denmark, Finland, Norway, and Sweden over recent decades. It compared the probability of having a third child for parents with two boys, two girls, or two children of different sex.

In all four countries, parents of two boys and of two girls have a higher propensity to have a third birth than parents with one child of each sex. This indicates a preference for having at least one child of each sex.



IN DENMARK, NORWAY AND SWEDEN, the parents of two boys have the highest probability of having a third child. This can be seen as an indication of dominant preferences for having at least one girl. In Finland there is a dominant preference for having a boy.



SCHOOL AND EDUCATION

Free school choice increases the variation in grades between schools

In recent years, structural changes to the school system, including the introduction of independent schools, have increased school choice alternatives in Sweden. Nowadays a large fraction of students attend a school other than the one closest to home.

At the same time, the inter-school variation in grades has increased. The question is whether the increasing variance can be explained by these structural changes?

Registers of students' school grades were matched with registers of their residential location. The students' variations in grades were compared between observed schools of graduation and hypothetical schools of graduation based on where students live. The latter situation would reflect that of previous periods of no school choice.

The study indicates that school choice seems to increase inter-school variation of grades.

The students' variations in grades were compared between observed schools of graduation and hypothetical schools of graduation based on where students live. The latter situation would reflect that of previous periods of no school choice.

Extended compulsory schooling in Sweden caused lower mortality after age 40

The association between education and health is well established; years of schooling are positively related to survival. However, it is unclear whether this association reflects a causal effect. On the one hand, well-educated individuals, on average, have better jobs and higher incomes, factors that may promote health.

In addition, education might give individuals greater ability and opportunity to change their health behavior. On the other hand, individuals with differential education may also differ in a number of other ways. This makes it difficult to disentangle causal effects from alternative explanations.

In Sweden during the 1950's, compulsory schooling was extended by one year from eight to nine years. The implementation of the nine-year comprehensive school was gradual. Each year, a number of Swedish municipalities adopted the new educational system. This school reform resembles an experimental situation since there was no individual choice in length of compulsory schooling, which instead was determined by year

of birth and municipality. Hence, any difference in life expectancy between individuals with different lengths of compulsory education may be due to this extra year of education. Information on type of compulsory schooling as well as timing and cause of death was available at the individual level.

IN THE FOLLOW-UP of 1.2 million Swedes born between 1943 and 1955 who were exposed to different lengths of compulsory education, we observed a lower mortality risk after age 40 among individuals who received an extra year of basic schooling. This was due to lower mortality in overall cancer, lung cancer and accidents. The effects are small, however, and not statistically significant on average across ages.

Social origin still important for educational attainment

Education is important for life chances in several respects, e.g. social class, income and health. Here we study possible changes over time in the importance of several dimensions of social background for attained education.

Information from several censuses, the Education Register and the Income and Tax Register is used to construct measures of a number of aspects of individuals' social background for cohorts of individuals born from the late 1940s to the early 1970s.

Overall, the association between social origin and education remains unchanged between these birth cohorts. There is only a possible slight reduction in the importance of parents' social status over time. A comparison of the importance of parents' education, social class, social status and earnings shows that parents' education is most important for children's education and parents' earnings are least important.

ALTHOUGH LITTLE OR NO CHANGE in the importance of social origin to children's education is found, the difference in educational attainment between men and women has changed substantially. Among those born in the 1940s, women had lower qualifications than men, while women born in the 1970s had higher qualifications than men born in the same period.

Parents with children of high educational attainment have reduced mortality

In health inequality research, the focus tends to be on the relationship between an individual's social and economic circumstances and his or her own health outcomes. If external resources are considered, research has typically considered only the resources of partners or parents.

This study takes a new perspective and examines the importance of adult children's resources - measured as education - for aging parents' health and survival. Since adult children are, in general, important persons in their parents' social network, it is possible that the parents might benefit from their children's resources. For example, well-educated adult children may be better able to influence parents' health behavior and/or give advice and guidance in connection with health care providers.

Since children's educational attainments are largely dependent on their parents' social and economic position, it is difficult to determine whether an association between children's education and parents' survival is due to confounding factors or if some of the association could be an effect of children's resources and related abilities and possibilities. Alternative explanations are taken into consideration in two ways in the present study: First, we statistically control for parents' (and parents' partners') education, occupation and income. Second, by comparing siblings in the parent generation, we exclude factors that siblings share with each other. Utilizing the Swedish Multi-generation Register, parents are linked to their children and followed-up in the Cause of Death Register. The study includes more than six hundred thousand individuals born between 1932 and 1941.

THERE IS A STRONG RELATIONSHIP

between children's education and parents' mortality, which can only partly be explained by parents' socioeconomic resources. In the most restrictive analyses - where siblings are compared with each other - the risk of dying for parents whose children had tertiary education is **21 percent lower** than for parents whose children did not progress beyond compulsory education.

This difference might, of course, be explained by factors not reflected in parents' socioeconomic resources or factors that siblings share. Still, it is possible that children's education affect parents' health and survival. Children's resources, the 'social foreground', could contribute to our understanding of health inequalities and the results indicate that we need to look beyond individual resources.

WORK AND POVERTY

Living with a Swedish born partner increases labor market opportunities for immigrants

How important are contacts with the native population for immigrants' employment and earnings? The study focuses on social domains relating to family, school, housing and working life.

Examples of research questions are: To what extent are immigrants who are exposed to a large proportion of the majority population more likely to obtain employment and good incomes? How is housing segregation linked to work place segregation?

Labor market outcomes are analysed by using register data on individuals, households and firms. Using this approach, the sequence of events can be studied, which is helpful in identifying causes and effects.

Being married to a person from the majority population seems to have a positive effect on employment, but no effect is seen on earnings. With respect to earnings, working together with a high proportion of natives is more beneficial for immigrants than residing in neighborhoods with a high proportion of majority population. The studies also show that low housing segregation tends to reduce work place segregation, regardless of whom you are married to.

Being married to a person from the majority population seems to have a positive effect on employment, but no effect is seen on earnings.

Tammaru, T., Strömgen, M., Stjernström, O. & Lindgren, U. (2010): Learning through contact? The effects on earnings of immigrant exposure to the native population. *Environment and Planning A*, 42, 2938-2955.

Strömgen, M., Tammaru, T., Danzer, A.M., van Ham, M., Marcinczak, S., Stjernström, O. & Lindgren, U. (submitted): Factors shaping workplace segregation between natives and immigrants.

Swedish men and women are equally affected by unemployment

The aim of this study was to analyse the role of gender in the relationship between unemployment and mental wellbeing in Sweden, with similar labor market participation rates for women and men, and Ireland, representing a country with a more gender-differentiated labor market.

By combining data from the Swedish national employment office with a questionnaire, we have been able to study the effect of unemployment over time. Swedish data have been compared to Irish data in order to investigate the importance of contextual factors such as family life, work life and labor market regimes.

The results show that unemployment was more strongly associated with poor mental health among men than among women in Ireland,

while the mental health of Swedish men and women were equally affected by unemployment. Factors related to the family and to the economic situation, as well as gendered selection into the unemployment population, explains the difference in mental health between unemployed men and women in Ireland. The overall conclusion is that contextual factors have a major influence on the relationship between unemployment, gender and mental health, thus pointing to a need to consider not only individual, but also contextual factors, when tackling the negative effects of unemployment.

Receiving income support for several years can result in durable poverty

Poverty is an issue of primary importance in the welfare state, but the proportion of the population in poverty at any given point in time does not say anything about whether the poor are the same persons over an extended time period. A given level of poverty implies a more serious situation if the poor tend to be poor for a long time, rather than a shifting group of individuals with temporary economic problems.

People who are poor can have a large non-response rate in surveys, and the poorest are too small a group to be reliably studied using survey data. Durations of poverty are particularly hard to study in surveys, as people tend to leave surveys over time. With register data of the entire population, poor people and people receiving income support can be followed over time to assess their periods of poverty, identify the factors which affect the risk of persistent problems, and the factors which contribute to exiting from poverty.

Even if most of the people who enter poverty at all have brief poverty episodes, it is the long-term poor who carry most of the burden of poverty: 5 percent of the population accounts for 50 per cent of all poverty years over an 18-year-period. It is clear that the study of exits from poverty must be amended with studies of re-entry, which is very high: Five years after poverty exit, 30-40 percent have experienced poverty again for a shorter or

Five years after poverty exit, **30-40 percent** have experienced poverty again for a shorter or longer time period.

longer time period. The dynamics of receiving income support largely follow similar patterns, but are affected strongly by the proportion of recent immigrants, as they do not normally have access to other benefits to compensate for low incomes.

An important question which has traditionally been extremely difficult to study is whether the duration of poverty or receiving benefits per se affects the risk of continued poverty/receiving benefits. Such so-called duration dependence may stem from negative side effects of receiving benefits, such as becoming passive. Register data covering the entire population has made it possible to develop and use a new method of identifying the effects of duration dependence on the receipt of income support, and the results suggest that the phenomenon actually exists and affects behavior. The probability of continuing to receive income support increases by 2-5 percentage points during the first five years a person receives benefits, which is a substantial but not dramatic effect.

Education, intelligence and personality important factors when high incomes are inherited

T here are substantial correlations in education and income across generations in Sweden and other countries. Children of parents with higher incomes or higher education tend to acquire higher incomes and higher education themselves. But what are the mechanisms behind these associations?

By using the Multi-generation Register, data on income and education for parents and children can be connected for several cohorts, allowing reliable estimates of magnitudes and trends of the intergenerational correlations. The Conscript Register and School Registers provide unique opportunities to better understand the correlations (for sons), since it is possible to estimate to which degree the correlation is mediated through school grades, cognitive capacity (intelligence) and personality characteristics (as assessed by a psychologist during enlistment).

The magnitudes and trends of income correlations over generations depend strongly on how income is defined and at which age incomes are measured. High income is more clearly transmitted across generations than low income. Parental income has a persistent and non-negligible effect on child income despite very extensive controls for other parental characteristics (such as education, social class and occupation).

WE FIND THAT THE intergenerational educational correlation to the greatest extent is mediated by cognitive ability, while personality traits and physical characteristics are of little importance. The income correlation is also mediated by cognitive ability, but in addition by personality traits – characteristics such as social maturity, emotional stability, and leadership capacity appear to gain their importance directly in the labor market rather than through schooling.

Jonsson, J.O., C. Mood och E. Bihagen. 2010. "Fattigdomens förändring, utbredning och dynamik." Kapitel 3 (sid. 90-126) i Social Rapport 2010. Stockholm: Socialstyrelsen.
 Jonsson, JO, Mood C, and Bihagen E. 2011. "Poverty in Sweden: Change, dynamics, and intergenerational transmission of poverty during economic recession and growth." Working Paper 11/2011, Swedish Institute for Social Research, English version of "Fattigdomens förändring, utbredning och dynamik.", Chapter 3 in Social Rapport 2010. Stockholm: Socialstyrelsen.

Mood, C. 2010. The importance of income definitions for the magnitudes and trends in intergenerational income correlations. Manuscript.

Mood C, Jonsson JO and Bihagen E. 2012. Socioeconomic persistence across generations: Cognitive and non-cognitive processes Chapter 3 in: John Ermisch, Markus Jäntti, and Timothy Smeeding (eds.), From Parents to Children: The Intergenerational Transmission of Advantage. New York: Russell Sage



Social origin affects recruitment to the business elite

The degree of social mobility between generations can be seen as an indication of the openness of a society, that is, as an important measure of the equality/inequality of opportunity. Recruitment to top positions is, however, rarely studied, to a large extent due to the small number of top position respondents that are found in ordinary questionnaire surveys with a limited number of participants.

Top positions are interesting both because they have a considerable impact on other people's lives, and because occupying such positions is a clear indicator of success.

Through the use of register data (the wage structure statistics), the highest-paid individuals working in large Swedish firms could be identified. Their social origin was compared to the social origin of other gainfully employed individuals. Information from the censuses was used to

THOSE WITH UPPER MIDDLE CLASS origins (that is, where parents have occupations where tertiary education is normally required) have a greater chance of reaching top positions than others. This is to a large extent due to the fact that they more often have tertiary education themselves. Over time, however, the importance of education is reduced and personality traits become more important: these trends result in almost constant social origin differences over time.

measure social origin. The population was restricted to men, since military enlistment data was also used.

Residential segregation has little impact on immigrants' labor market integration

International migrants relatively often occupy subordinate positions in the labor market. They also often live in neighborhoods without much contact with Swedish-born people. It is therefore relevant to study whether their residential segregation has a negative impact on their labor-market integration.

The study used register data from Statistics Sweden on socioeconomic mobility and residential location of the foreign-born adult populations in two Swedish cities from 1993–2002. Patterns of labor-market outcomes of foreign-born and Swedish-born populations were compared, focusing on variations between 'distressed' neighborhoods and surrounding city-regions.

FOREIGN-BORN PEOPLE EXPERIENCE a high labor turnover, generally with increasing employment stability, but considerable vulnerability still remains. However, there are surprisingly small differences between residents of 'distressed' and other neighborhoods. Hence, ethnic origin rather than residential status seems to influence the employment situation of foreign-born adults in Swedish cities.

Contact SIMSAM



Anna Holmström, Ph.D.
Coordinator SIMSAM

Department of Clinical Neurosciences
Insurance Medicine
Karolinska Institutet

Phone: +46 (0)70 - 818 88 14
E-mail: anna.holmstrom@umu.se

Magnus Stenbeck, associate professor
Project manager SIMSAM-INFRA

Department of Clinical Neurosciences
Insurance Medicine
Karolinska Institutet

Phone: +46 (0)8 - 524 861 41
E-mail: magnus.stenbeck@ki.se

www.simsam.nu



Swedish medical and social research is world leading, and Swedish population registers constitute a unique resource for research. The organization of Swedish society, the health care system and other parts of the welfare state rests to a large extent on research on health and welfare. An important factor for success is the ability to use existing national population-based registers.

To enhance the benefits even further, The Swedish Research Council has taken the initiative in providing a national focus on register-based research, through the "Swedish Initiative for research on Microdata in the Social and Medical sciences" (SIMSAM). The six designated SIMSAM research groups focus on social and medical research programs in the public interest. The results, as well as the improved data, are intended to improve health and living conditions for the population.

This booklet is intended to provide some examples of SIMSAM's accomplishments and ongoing work that has improved health and welfare in Sweden. We hope that this will offer an explanation and background as to why our work is supported by politicians as well as the scientific community within the medical and social sciences.

Stockholm

April 2013

www.simsam.nu