Health registries for research in Norway: examples and challenges

Stein Emil Vollset, M.D., Dr.P.H.
Director Medical Birth Registry,
Norwegian Institute of Public Health,
Professor, Department of Public Health and Primary Health Care, University of Bergen, Bergen, Norway
overview

• Introduction
• Examples of register studies
• Brief overview of population based health registries in Norway and the Nordic countries
• Legislation in Norway
• Central health registries and quality registries
• Health registry project – modernisation of health registry sector
• Challenges and summary
WHY REGISTRIES?

We know much about health and disease – but very little compared to what we do not know.

Randomised trials, clinical and basic research are not the answer to all questions.

Registries are a proven important source of information for medical knowledge building.
Live births in Norway 1846-2009

*highest since 1972

MBRN 1967-
Information about mother (father), child, disease, drug use, smoking, vitamins, birth weight, length of gestation, vital status, mode of delivery, birth and complications to mother and child

source('c:/data/hmd_2008/plot_births.spr')
Key data in Medical birth registry of Norway (MBRN)

• 1967: First national medical birth registry
• 2.5 million births
• 1.2 million mothers
• 1.1 million fathers
• Many born in 1967 or later are in the registry both as child and as mother or father (several times)
• 4 million individuals registered

• Unique in Norway and the Nordic countries are the data on risk factors, health and health outcomes that are collected for each birth and that can be linked to other registries and events in the past and in the future
Questions that registry data can answer

- Trends in still births, perinatal and infant mortality
- Trends in maternal/gestational diabetes
- Trends in use of caeserian sections
- Which drugs cause congenital malformations
- Long term prognosis of low-birth weight/prematurity
- Is assisted reproductive technology safe?
- How does preeclampsia recur across generations?
Long-Term Medical and Social Consequences of Preterm Birth

Dag Moster, M.D., Ph.D., Rolf Terje Lie, Ph.D., and Trond Markestad, M.D., Ph.D.

ABSTRACT

BACKGROUND

Advances in perinatal care have increased the number of premature babies who survive. There are concerns, however, about the ability of these children to cope with the demands of adulthood.

METHODS

We linked compulsory national registries in Norway to identify children of different gestational-age categories who were born between 1967 and 1983 and to follow them through 2003 in order to document medical disabilities and outcomes reflecting social performance.

RESULTS

The study included 903,402 infants who were born alive and without congenital anomalies (1822 born at 23 to 27 weeks of gestation, 2805 at 28 to 30 weeks, 7424 at 31 to 33 weeks, 32,945 at 34 to 36 weeks, and 858,406 at 37 weeks or later). The proportions of infants who survived and were followed to adult life were 17.8%, 57.5%, 85.7%, 94.6%, and 96.5%, respectively. Among the survivors, the prevalence of having cerebral palsy was 0.1% for those born at term versus 9.1% for those born at 23 to 27 weeks of gestation (relative risk for birth at 23 to 27 weeks of gestation, 78.9; 95% confidence interval [CI], 56.5 to 110.0); the prevalence of having mental retardation, 0.4% versus 4.4% (relative risk, 10.3; 95% CI, 6.2 to 17.2); and the prevalence of receiving a disability pension, 1.7% versus 10.6% (relative risk, 7.5; 95% CI, 5.5 to 10.0). Among those who did not have medical disabilities, the gestational age at birth was associated with the education level attained, income, receipt of Social Security benefits, and the establishment of a family, but not with rates of unemployment or criminal activity.

CONCLUSIONS

In this cohort of people in Norway who were born between 1967 and 1983, the risks of medical and social disabilities in adulthood increased with decreasing gestational age at birth.
Research question

How will prematurely born manage the competitive adult society?

Is it possible to design a study answering this question, including all gestational ages and not only the most immature?

Potential compulsory Norwegian registries

- The Medical Birth Registry
- The Cause of Death Register
- The National Insurance Scheme (disabilities, ICD codes)
- The Norwegian Population Database (demography)
- The National Education Database (education, mother and father; proxy for social class)
- The Norwegian Tax Administration’s register (income)
- The National Employment Service’s register (employment status)
- The Register of Social Services (social benefits)
- The Central Criminal and Police Information Register

The Medical Birth Registry
– Selection of study population

- Year of birth 1967-1983
- 903,402 livebirths without congenital anomalies
- 3,627 born 23-29 weeks of gestation
- Follow-up through 2003

Conclusion:

• There was a highly significant association between reduced gestational age at birth and medical disabilities.

• For those without disabilities, there was a weaker, but still significant association between preterm birth and level of education, income, need for social security benefits, establishing a family and having own children, but not for unemployment or criminality.

• There was a striking dose-response relationship between reduced gestational age and most outcomes studied.

• Most premature children who survived without medical disabilities functioned well as adults.

Family studies – 2\textsuperscript{nd} generation

- Recurrence of pre-eclampsia across generations: exploring fetal and maternal genetic components in a population based cohort.

\textit{Skjærvøen et al., BMJ, October 2005}
Generations: Mother’s and father’s influence

Mother:

two genetic pathways: transmission to the daughter of genes that enhance maternal susceptibility to preeclampsia, or transmission from the daughter to her fetus of fetal genes that are capable of triggering preeclampsia.

Father:

the father’s genes can be passed to the fetus and increase the risk of preeclampsia.

Skjærvøn et al. British Medical Journal 2005
Analytical strategy

• Preeclampsia recurrence
  – From mother to offspring (1)
  – From fathers to offspring (2)
  – From unaffected sisters to their offspring (3)
  – From unaffected brothers to their offspring (4)

Skjærven et al. British Medical Journal 2005
Risk for preeclampsia in the second generation, given a preeclamptic pregnancy in the first generation. (Brown area = preeclamptic pregnancies.)

<table>
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<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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</thead>
</table>

| Pregnancy at risk for pre-eclampsia | 2.2 (2.0 to 2.4) | 1.5 (1.3 to 1.7) | 2.0 (1.7 to 2.3) | 1.1 (0.9 to 1.4) |

| Odds ratio (95% CI) |

<table>
<thead>
<tr>
<th>Contribution from genes in:</th>
<th>Mother</th>
<th>None</th>
<th>High</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fetus</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

- Female: ◼️
- Male:  □
- Female or male: ●

Skjærven et al. British Medical Journal 2005
What this study adds

- Both mothers and fathers who come from preeclamptic pregnancies contribute to increased risk of preeclampsia in the next generation.
- The risk through affected mothers is higher, presumably because these mothers carry susceptibility genes and also transmit independent genetic risk factors to their fetus.
- Risk through affected fathers is lower presumably because fathers transmit only fetal risk factors.
- Familial associations appears to be stronger for the clinically more severe types of preeclampsia.

Skjærvén et al. British Medical Journal 2005
Factors considered: birth weight, gestational age, growth retardation, perinatal mortality in 2500 women who had conceived both naturally and by assisted fertilisation.
Nordic countries

- Total population of 25.6 million (Denmark 5.5, Finland 5.4, Iceland 0.3, Norway 4.9, Sweden 9.4)
- Social democracies, politically stable, sound economies, universal health coverage, generous social benefits
- Similar legislation/regulation in health registry area
Legislation

- Statistics Act (1989)
- Personal Data Act (2000) and Personal Data Regulations*
- Health Registry Act (2001)*
  - Series of regulations: Cause of death registry, Medical Birth Registry, Cancer registry, Prescription Registry, Norwegian Patient Registry etc
- Therapeutic Biobank Act (2003)
- Research Ethics Law (2006) ‡
- Health Research Act (2008) ‡

* Data Inspectorate
‡ Regional Committees for Medical and Health Research Ethics
Important central health registries

• Cause of death registry (individual electronic data since 1951)
• Cancer Registry (1952)
• Medical Birth Registry (1967)
• Norwegian Prescription Database (2004)
• Norwegian Patient Registry (hospital discharge registry 2008)
• Norwegian Cardiovascular disease registry (2012)
## Electronic nationwide Nordic registries

<table>
<thead>
<tr>
<th>Registry</th>
<th>Denmark</th>
<th>Finland</th>
<th>Norway</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause of death</td>
<td>1943</td>
<td>1969</td>
<td>1951</td>
<td>1952</td>
</tr>
<tr>
<td>Cancer</td>
<td>1943</td>
<td>1952</td>
<td>1952</td>
<td>1958</td>
</tr>
</tbody>
</table>

* Nationwide from the year in parenthesis


I am uncertain about some of the years in the slide - particularly Finland – please correct me
<table>
<thead>
<tr>
<th>National (central) health registries (hrl §8) 2010*</th>
<th>Established</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Norwegian Cause of Death Register (DÅR)</td>
<td>1925/1951</td>
<td>NIPH</td>
</tr>
<tr>
<td>2. The Medical Birth Registry of Norway (MFR)</td>
<td>1967</td>
<td>NIPH</td>
</tr>
<tr>
<td>3. The Abortion Registry</td>
<td>1979/2007</td>
<td>NIPH</td>
</tr>
<tr>
<td>5. The Tuberculosis Registry</td>
<td></td>
<td>NIPH</td>
</tr>
<tr>
<td>6. The Childhood Vaccination Register (SYSVAK)</td>
<td>1998</td>
<td>NIPH</td>
</tr>
<tr>
<td>7. The Norwegian Surveillance System for Resistance against Antibiotics in Microbes (NORM)</td>
<td>2003</td>
<td>NIPH</td>
</tr>
<tr>
<td>8. The Norwegian Surveillance System for Infections in hospitals (NOIS)</td>
<td>2005</td>
<td>NIPH</td>
</tr>
<tr>
<td>9. The Norwegian Prescription Database (NorPD)</td>
<td>2004/2010</td>
<td>NIPH</td>
</tr>
<tr>
<td>10. The Norwegian Cardiovascular Disease Registry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. The Cancer Registry of Norway (KRG)</td>
<td>1952</td>
<td>South-Eastern Norway Regional Health Authority</td>
</tr>
<tr>
<td>13. The Norwegian Information System for The Nursing and Care Sector (IPLOS)</td>
<td>2005</td>
<td>NorwegianDir of Health</td>
</tr>
<tr>
<td>14. ePrescription</td>
<td>2008</td>
<td>Norwegian Dir of Health</td>
</tr>
<tr>
<td>15. The Registry of the Norwegian Armed Forces Medical Services</td>
<td>2005</td>
<td>Ministry of defense</td>
</tr>
</tbody>
</table>

*Mandatory (consent not required)
19 national medical quality registries

South-Eastern Norway Regional Health Authority
› Child and youth diabetes
› Neonatal medicine
› Cerebral palsy
› Trauma
› Colorectal cancer
› Prostate cancer

Western Norway Regional Health Authority
› Intensive care
  Diabetes in adults
› Cleft lip and palate
› COPD (KOLS)
› Arthroplasties
› Hip fractures
› Cruciate ligaments
› Multiple sclerosis (register and biobank)

Central Norway Regional Health Authority
› Heart infarction
› Stroke
› Vascular diseases

Northern Norway Regional Health Authority
› Back surgery
› Hereditary and congenital neuromuscular diseases
National Health Registry Project

Good health registries – better health

Project initiated by Ministry of Health and Care Services
Secretariat at the Norwegian Institute of Public Health

**Vision:** In 2020 Norway shall have continuously updated, reliable and secure knowledge about quality of care and the population’s health condition through modernised health registers

Funding of 4 million euro combined for 2010-11
Main goals

Integration of quality registries and central health registries

Electronic reporting

Increased timeliness

Make registries an integral part of clinical and health policy decision making

Increased availability for research

Improved privacy protection
Summary

• Health registries are important for epidemiologic and medical research in Norway

• National Health Registry project aim to make registries also useful for clinical and health policy decisions

• Area where Nordic countries have clear advantage internationally

• Better integration nationally and increased collaboration among Nordic countries are key improvement points