EUROPEAN HEALTH CARE OUTCOMES, PERFORMANCE AND EFFICIENCY

Finland-Norway AMI comparison: why is survival better in Norway?

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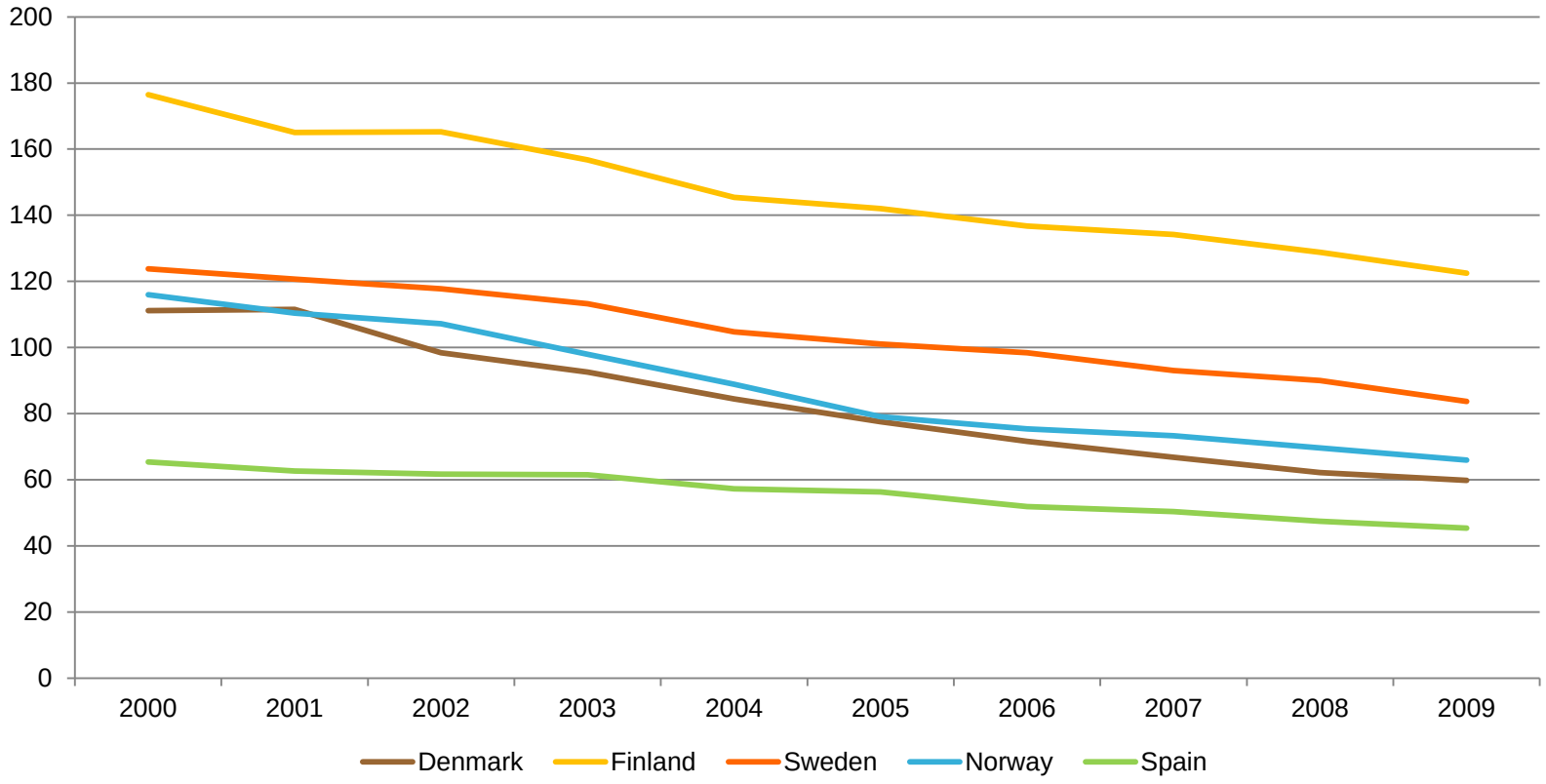
Background

- Treatment of acute myocardial infarction (AMI) is considerably changed the last 10-15 years
  - Acute services:
    - Use of digital echograms for preliminary diagnostics
    - Rapid transportation to hospitals
    - Thrombolytic treatment is recommended in ambulances if more than 90 minutes to hospital
  - Diagnostics:
    - 2000: European Society of Cardiology (ESC) and American College of Cardiology decided to implement new guidelines for the definition of AMI
    - From 1999-2002: Troponin I or Troponin T used as standard marker of AMI in most European countries – however Troponin threshold values still differs a bit between countries and hospitals
  - Treatment:
    - From mid 90s: PCI (balloon angioplasty) introduced as standard treatment of AMI
    - From late 90s/early 2000: PCI is standard treatment in most European countries

IHD-mortality in the Nordic countries - reduced, but differences remain

Standardized death rates per 100 000 inhabitants
Source: Eurostat



Aims and motivation

- Present comparable data from Finland and Norway (2009)
  - 1 year mortality following AMI treatment
- Explain variation in mortality following AMI treatment between the two countries
- Discuss potential explanations of the unexplained variation

Methods

- Register based data linked at patient level
  - Hospital discharge registers (examples of variables: index day, age, sex, procedures)
  - Death cause registers (death date)
  - Prescription registers (comorbidities)

- Patients with AMI < 365 days before index admission are excluded

- Patients from Finnish health center are excluded

- Dependent variable: 365 days mortality (dichotomous)
- Logistic regressions

  D365 = F (age, sex, comorbidities, severity of AMI, treatment)

- Number of units (patients treated for AMI):
  - 20831 (2009)
    - Norway: 12309
    - Finland: 8522

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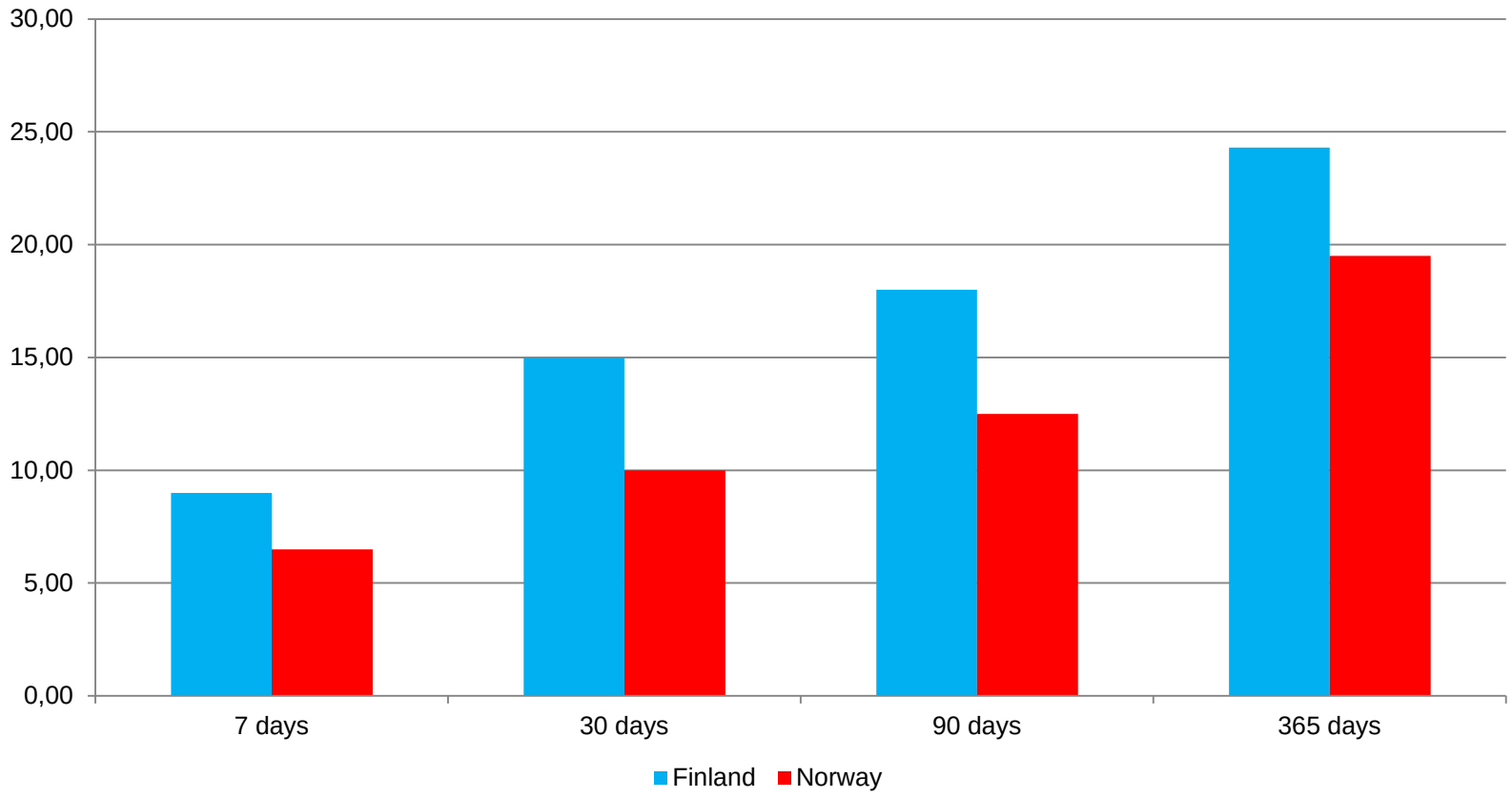
Results

Mortality (365 days) Unadjusted

Standardization	Finland	Norway
Unadjusted	1.13	0.91

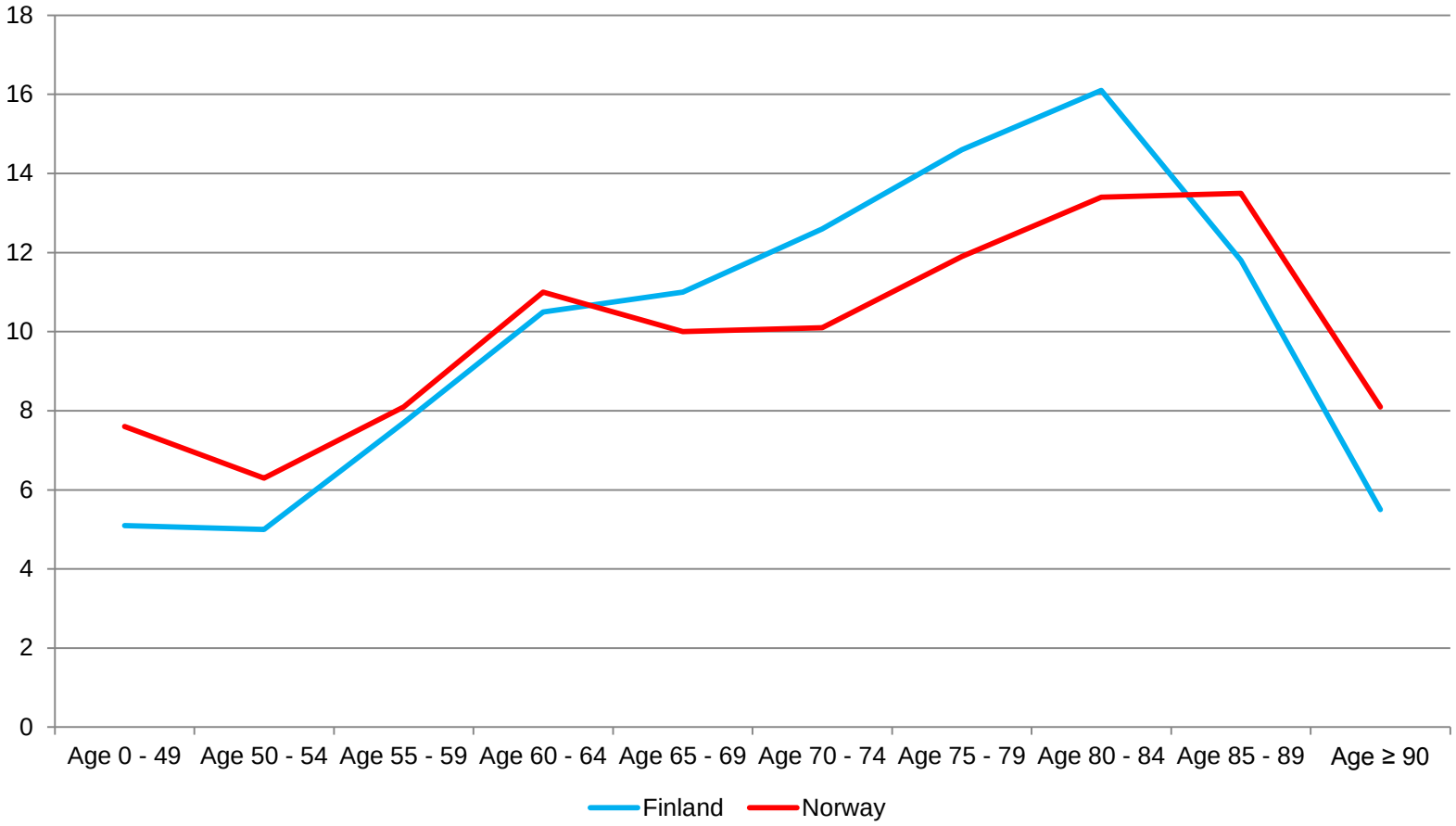
Mortality (7, 30, 90 and 365 days) Unadjusted



Why are there differences between the two countries?

- Potential explanations:
  - Age and sex
  - Risk factors
  - Severity of the MI
  - Use of procedures (PCI/CABG)

AMI-patients by age groups (%)



Mortality - Standardized ratios

Results from logistic regressions models

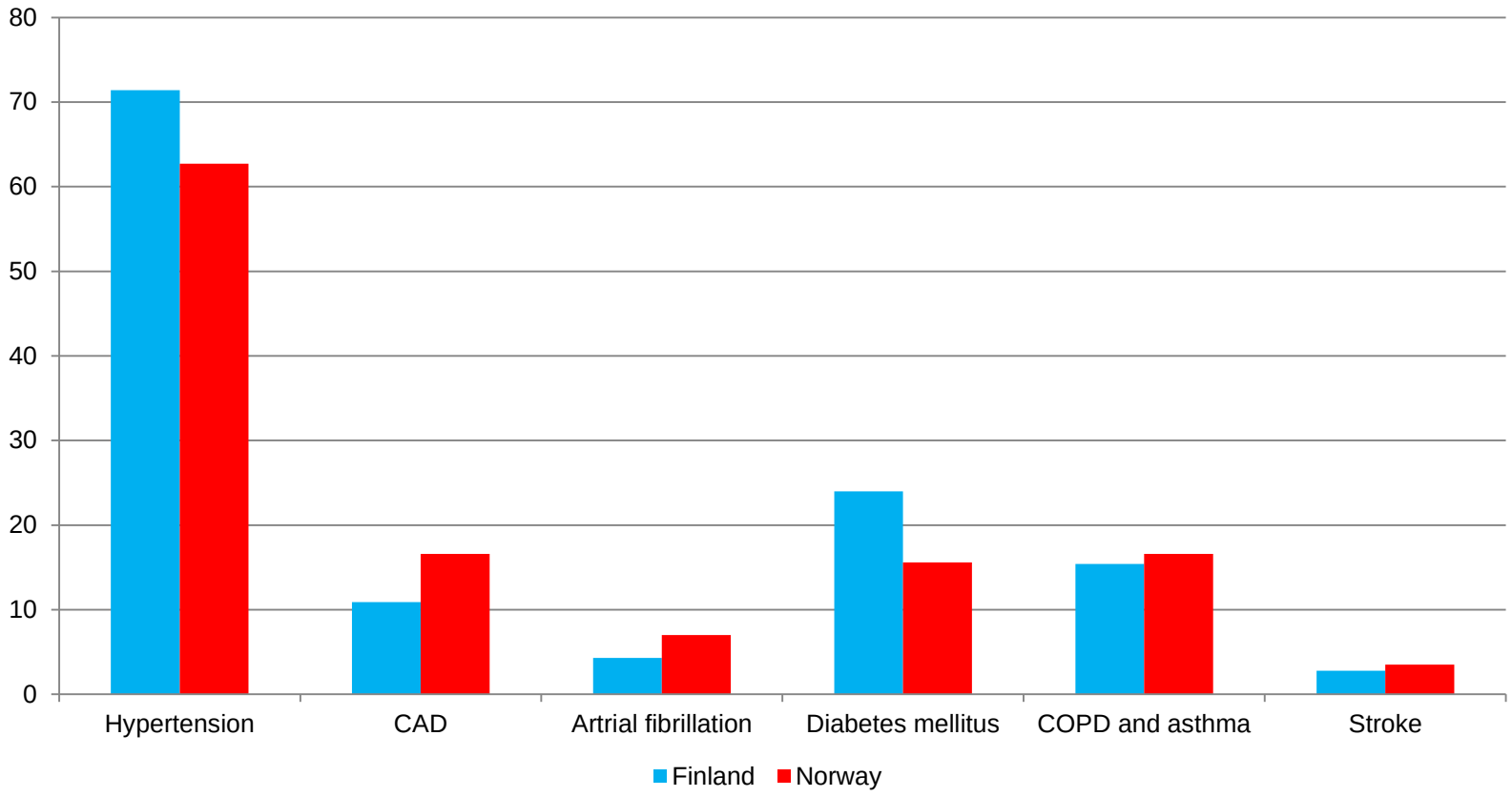
Standardization	Finland	Norway
Unadjusted	1.13	0.91
Age and sex	1.14	0.90

Comorbidities

- Co-morbidities described by
  - Hospital treatment <365 before index admission, and/or
  - Ddrug use <365 days before index admission
  - Example
    - DM:
      - Data from prescription register < 365 days (ATC)
      - Data from hospital discharge registers <365 days (ICD 10)
    - Stroke:
      - Data from NPR <365 days (ICD 10)
  - App. 15 comorbidities included in the analyses after initial testing

Selected comorbidities (%)

Medicine purchase or main diagnosis during previous 365 days. Stroke – main diagnosis only



Mortality - Standardized ratios

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Age and sex	1.14	0.90
Age, sex and comorbidities	1.14	0.90

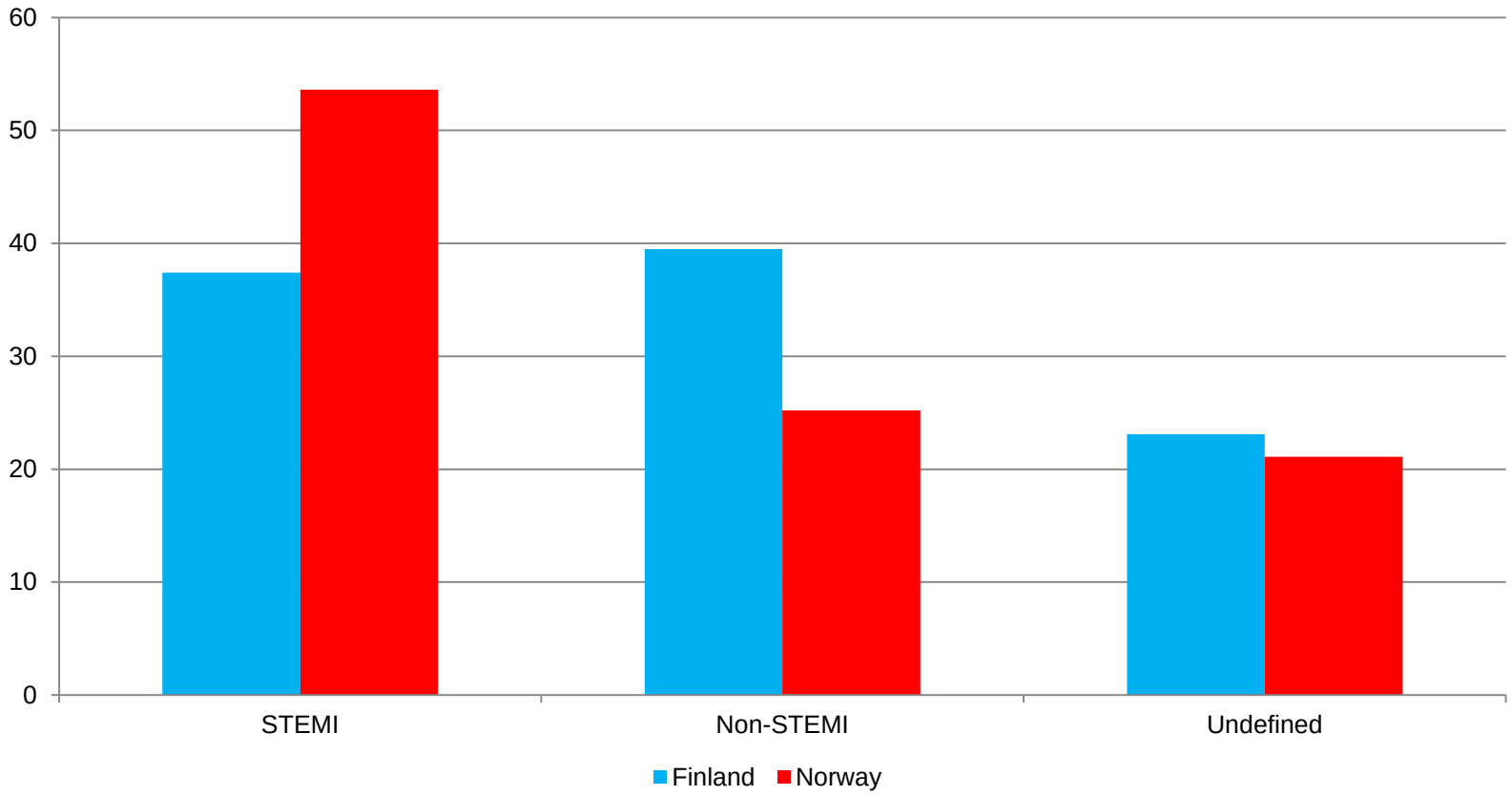
Type of AMI classified by severity

- AMI can be divided into different subgroups
  - STEMI (I21.0-I21.3, I22)
  - Non-STEMI (I21.4)
  - Undefined (I21.9)

- STEMI is an exstremly severe event with high expected mortality

Diagnostic groups (%)

STEMI (I21.0-I21.3, I22), Non-STEMI (I21.4), Undefined (I21.9)



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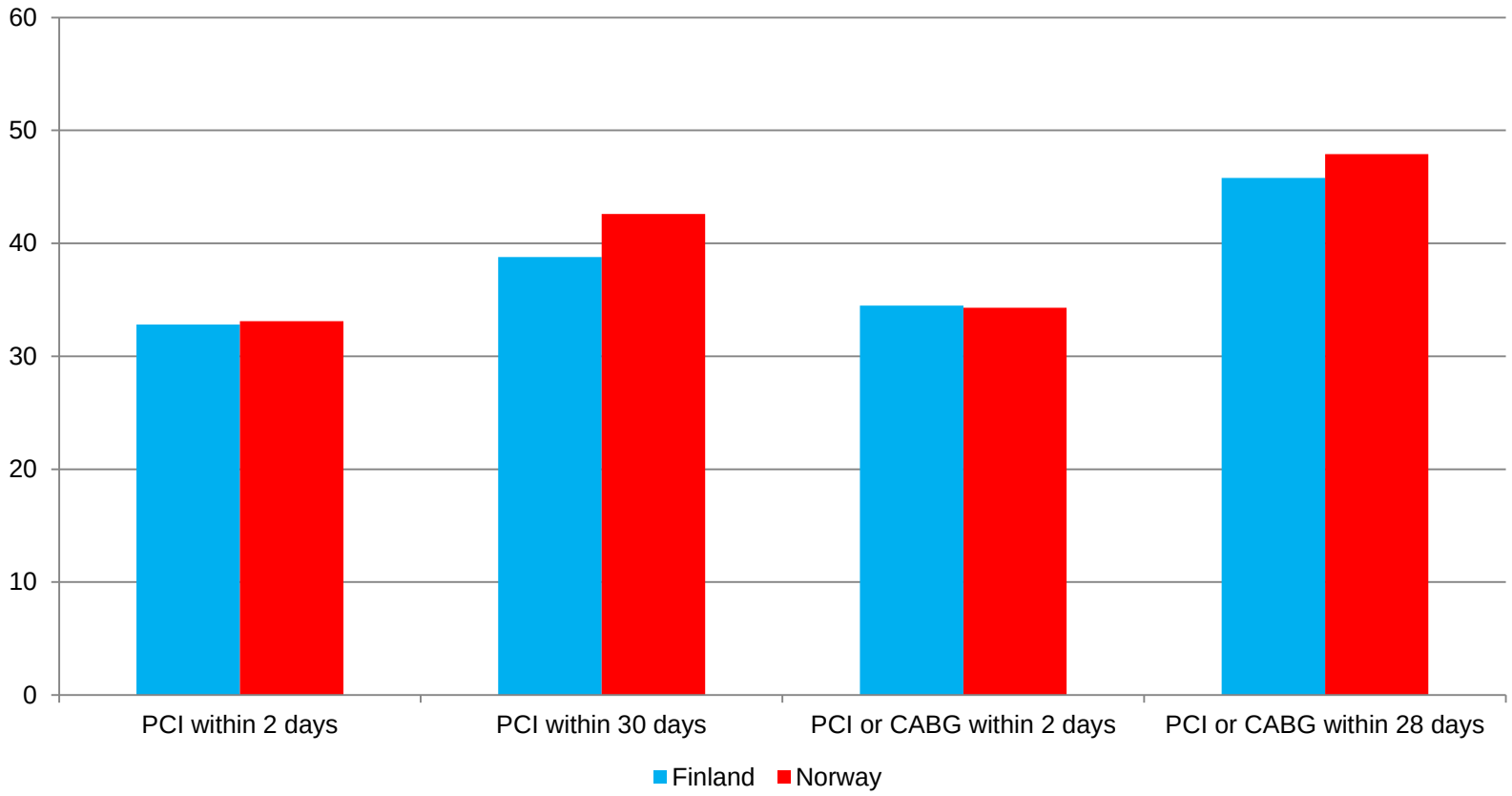
Age, sex, comorbidities and severity	1.15	0.90

Procedures (% of AMI patients)



Mortality - Standardized ratios

Results from logistic regressions models

Standardization	Finland	Norway
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Age and sex	1.14	0.90
Age, sex and comorbidities	1.14	0.90
Age, sex, comorbidities and severity	1.15	0.90
Age, sex, comorbidities seriousness, treatment	1.14	0.91

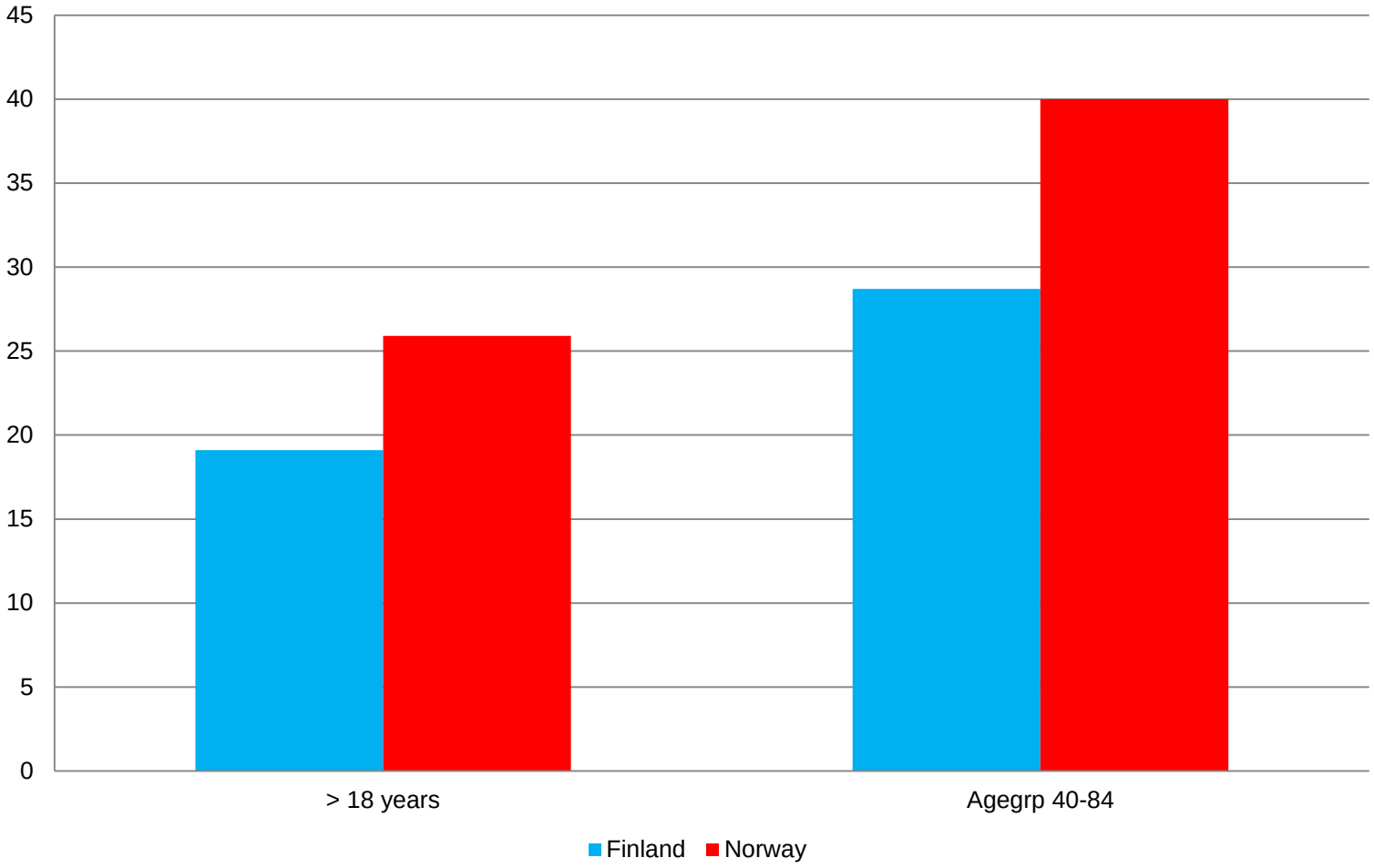
Furture work

- There are significant differences in mortality following AMI treatment in Finland and Norway
- The differences remains after correction for
  - Age and sex
  - Comorbidities
  - Severity
  - Treatment

- Which other factors can explain the differences in mortality?

Selection problems?

Number of AMI patients per 10000 inhabitants, 2009



- Selection problems
  - Treatment regimes: Are there higher thresholds for treatment in Finland?
  - Possible variations in diagnostic criteria should be inspected further. Some analyses are already done:
    - Differences in Troponin threshold values:
      - Inclusion of unstable angina does not change main conclusion
    - Differences in referral practices
      - Propensity score matching based on age, sex and comorbidities does not change the conclusions

- Cause of mortality registers should be studied further to accounts for deaths outside hospitals
  - If more patients die outside hospitals, patient treated for AMI could be less severe than if all reach hospitals

- Organization of ambulances and acute departments
  - Time to hospital door
    - Norwegian hospitals have invested heavily in car ambulances, helicopters and emergency call centers
  - “Door to balloon” – time
  - Evidence based treatment
    - PCI treatment in Norway is slightly more centralized than in Finland