1st EUBIROD Network
General Assembly
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OECD Study on Lower limb amputation rates

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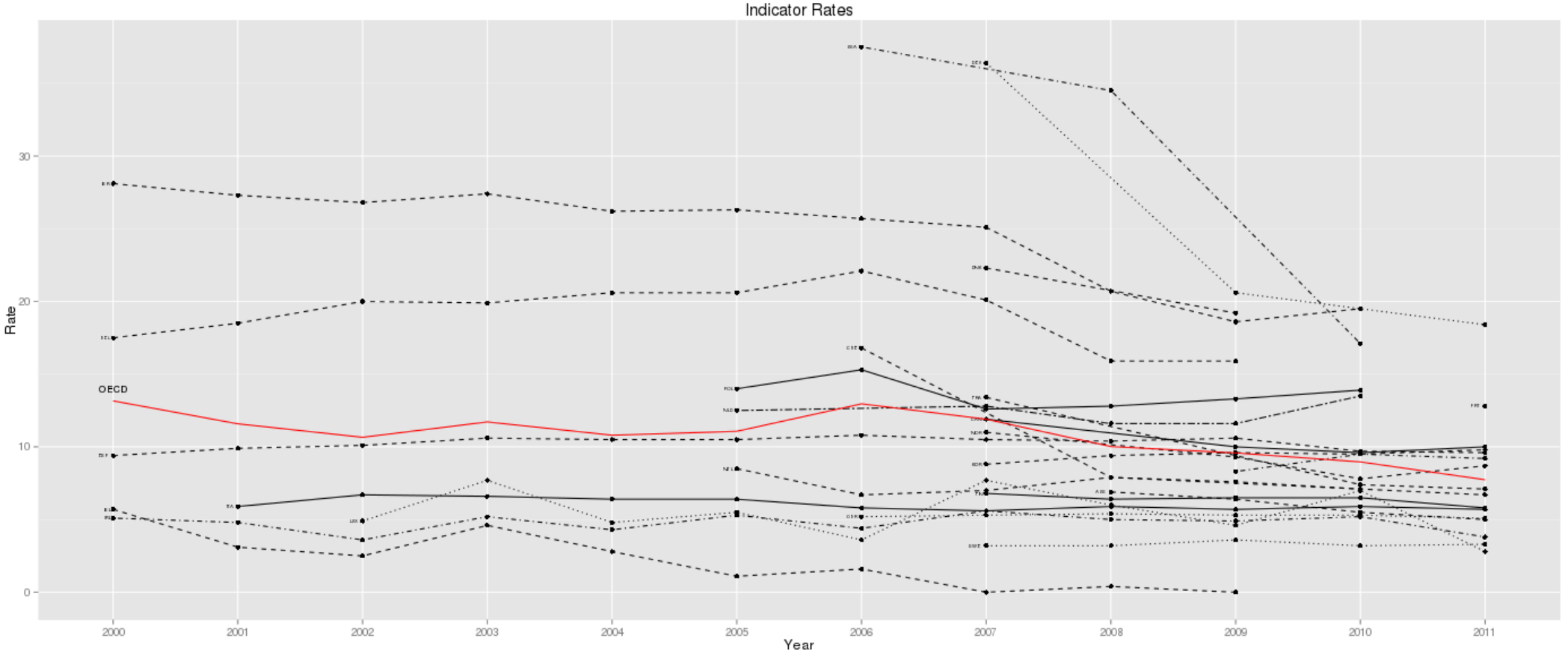
Athena SWAN Bronze Award

Lower Extremity Amputation Rates in Diabetes OECD 2000-2011

L.Uccioli, M.Massi Benedetti, N.Klazinga and F.Carinci, Lower extremity amputation rates in diabetes as an indicator of health systems performance: a critical appraisal of the OECD data collection 2000-2011, Submitted 2015

26 OECD countries (http://stats.oecd.org/)

AUS BEL CAN CHE DEU DNK ESP FIN FRA GBR HUN IRL ISL ISR ITA KOR LUX MEX NLD NOR NZL POL PRT SLV SWE USA



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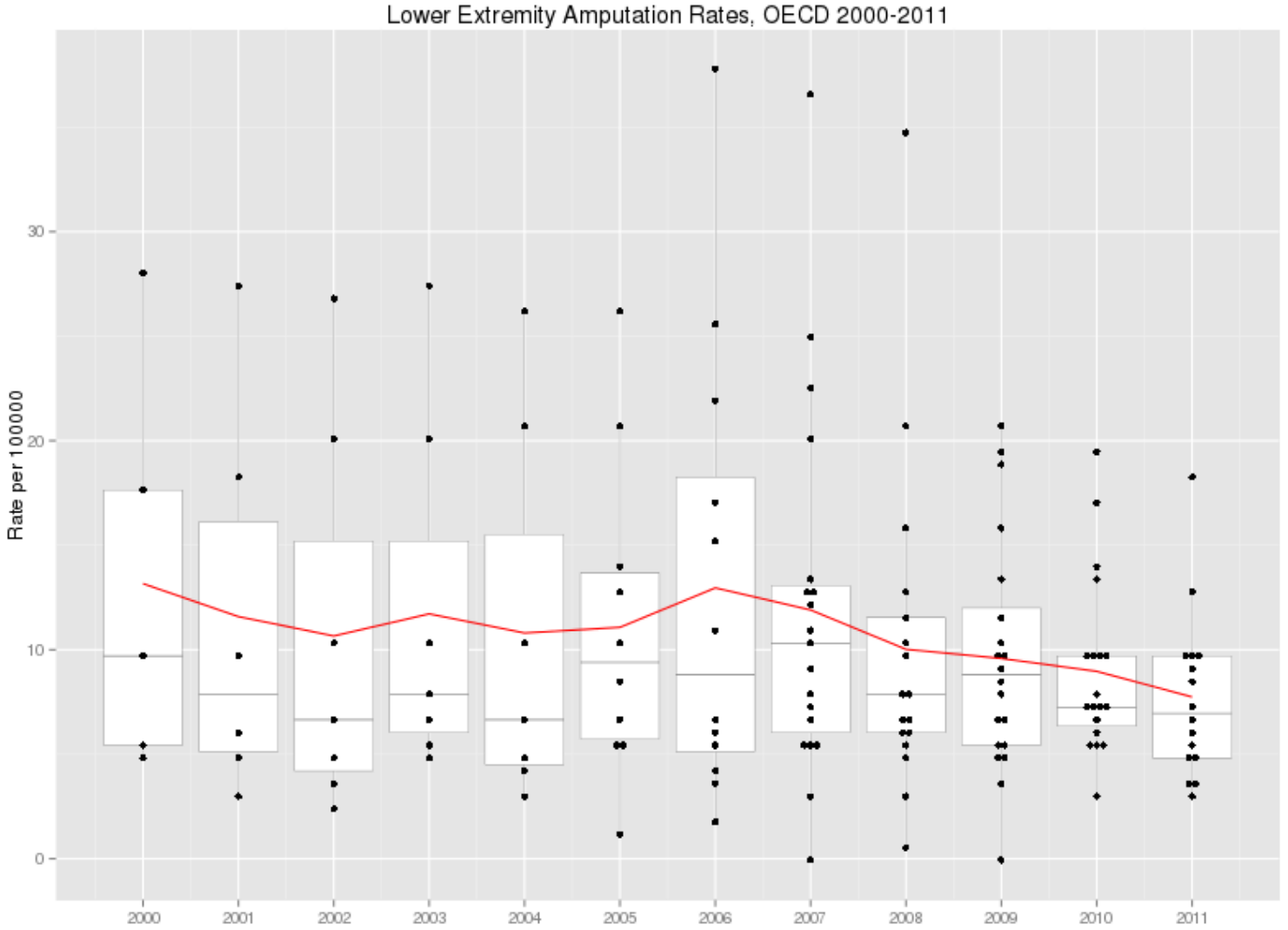

Lower Extremity Amputation Rates in Diabetes OECD 2000-2011

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Presentation of the results

Variable	Estimate	S.E.	95%C.I.	P>Z
Model 1 ***[Complete dataset; N countries=26]***				
Tax-based system	-5.0059	2.5437	-9.9915,-0.0203	**0.0491**
Average Year Change	-0.3156	0.1214	-0.5535,-0.0778	**0.0093**
Model 2 ***[Financing: Tax-based; N countries=12; Median LEARD: 7.55 (2001), 6.25 (2011)]***				
Average Year Change	-0.1599	0.0863	-0.3291,0.0093	0.0640
Model 2 ***[Financing: Social Insurance; N countries=14; Median LEARD: 17.50 (2001), 8.15 (2011)]*)**				
Average Year Change	-0.4267	0.1977	-0.8141, -0.0393	**0.0309**

OECD R&D on Lower Extremity Amputations in Diabetes

Study Workplan (July–November 2014)

Step 1 (June)

- Rapid Literature Review

Step 2 (July-September)

- Questionnaire on local approaches, data sources and experiences in the calculation of Lower Extremity Amputation Rates in Diabetes (LEARD)

Step 3 (September)

- Specification of test algorithms for different options in the calculation of amputation rates
- Data sheet(s) for data collection

Step 4 (October-November)

- Development of SAS source code
- Analysis of national hospital discharges
- Final report to the HCQI

OECD R&D on Lower Extremity Amputations in Diabetes
Step 1. Literature Review vs OECD Definitions

Current OECD definition

Coverage:
Population aged 15 and older.

Numerator:
All non-maternal/non-neonatal admissions with procedure code of lower extremity amputation excluding toe in any field and diagnosis code of diabetes in any field in a specified year.

Exclude cases:
- transferring from another institution
- MDC 14 (Pregnancy, childbirth, and puerperium)
- MDC 15 (Newborn and other neonates)
- with trauma diagnosis code in any field
- same day/day only admissions (admissions with a length of stay less than 24 hours). In those countries where a timestamp of admission or discharge is not available cases with a length of stay of 0 days shall be excluded.

Denominator:
Population count.

No restriction on ages

Distinction between minor, major, unspecified, total

Diabetes diagnoses tracked from previous discharges (using person ID)

Not needed when using personal ID

Exclude also tumour-related amputations

- Use people with diabetes
- Use Minor/Major ratio (no need to estimate denominator)

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OECD R&D on Lower Extremity Amputations in Diabetes

Step 4. Analysis of hospital discharges

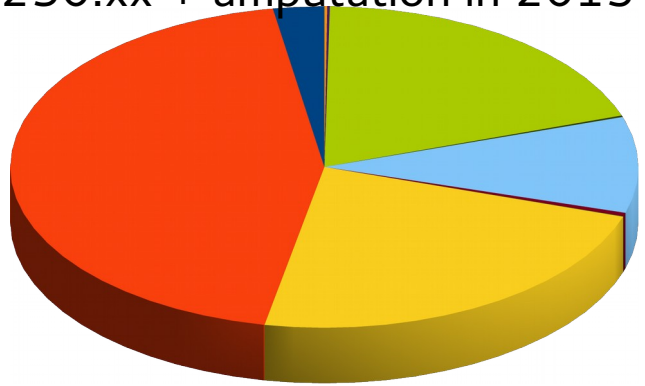
Italy 2002–2013 (N=99,649,200)
Total 2013: N=7,272,173; N 250xx=522,335 (7.2%)
[SAS Source code deployed to produce results from hospital discharges]

Distribution of Amputated Subjects by Procedure ICD Code

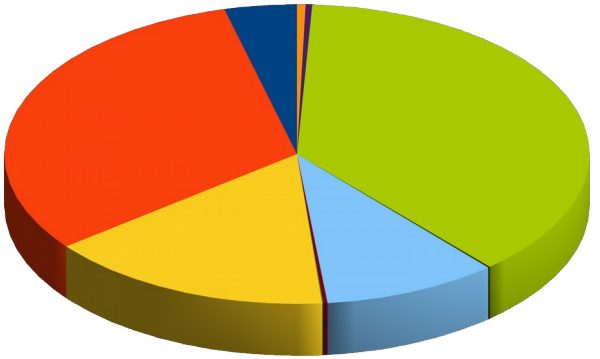
ICD 250.xx + amputation in 2013

ICD 250.xx 2002-2013

with diabetes
N=7,700

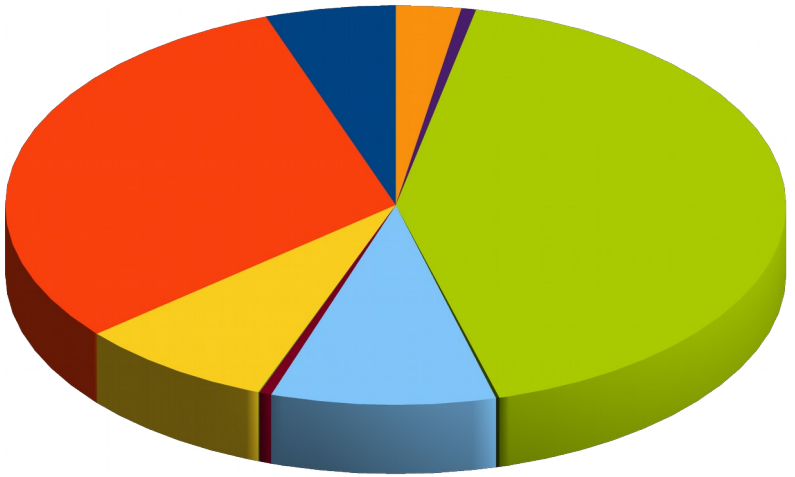


N=6,024 (78.2%)



N=1,676 (21.8%)

without diabetes
N=4,149



ICD Procedure ■ 84.10 ■ 84.11 ■ 84.12 ■ 84.13 ■ 84.14 ■ 84.15 ■ 84.16 ■ 84.17 ■ 84.18 ■ 84.19

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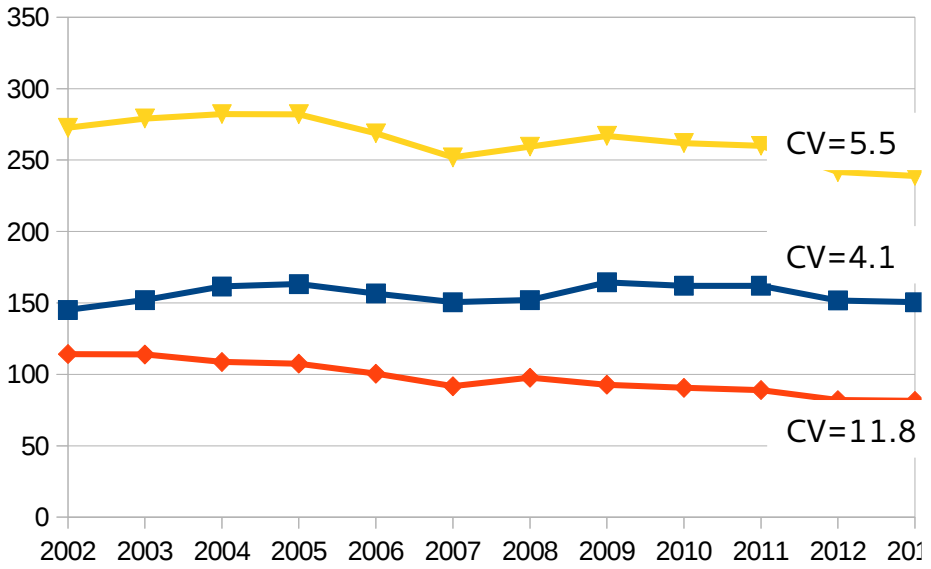
OECD R&D on Lower Extremity Amputations in Diabetes

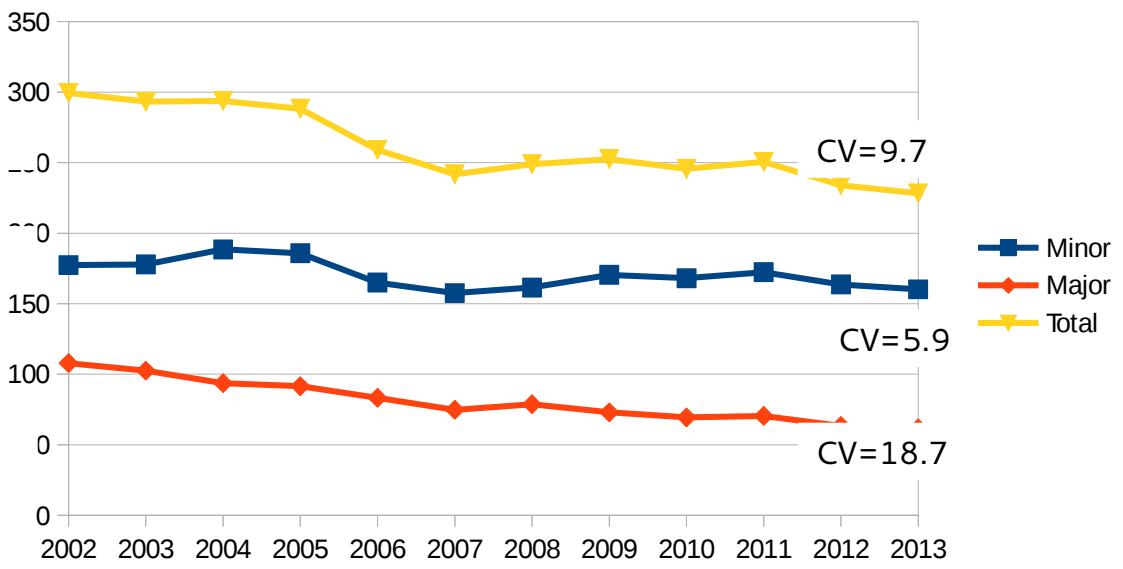
Step 4. Analysis of hospital discharges

Italy 2002–2013 (N=99,649,200)

Trends in LEA Rates (x100,000) in People with Diabetes



Person-based
(using patient Identifier)



Episode-based
(not using patient Identifier)

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OECD R&D on Lower Extremity Amputations in Diabetes

Recommendations for calculation

- ✓ Pilot analysis conducted on Italian hospital discharges suggests that using a personal identifier may reduce variation in amputation rates, particularly for major complications
- ✓ Splitting the analysis of amputation rates by severity of amputation may lead to substantially different results
- ✓ Using a personal identifier retrospectively may recover a substantial portion of diabetes cases not identified within the episode of amputation. Preliminary analyses run by Israel also confirm such result
- ✓ The frequency of major amputations among cases with diabetes (presumably) incorrectly not recorded at amputation is substantially higher, compared to the group with diabetes attributed at amputation
- ✓ Countries and researchers are greatly interested in improving the calculation of amputation rates through continued collaboration. Empiric results and following discussions helped recommending new OECD definitions

OECD R&D on Lower Extremity Amputations in Diabetes
Conclusions. Proposed revisions of OECD definitions

Current definition

Coverage: Population aged 15 and older.

Numerator: All non-maternal/non-neonatal admissions with procedure code of lower extremity amputation excluding toe in any field and diagnosis code of diabetes in any field in a specified year.

Exclude cases:
- transferring from another institution
- MDC 14 (Pregnancy, childbirth, and puerperium) - Refer to Appendix A of the technical guidelines
- MDC 15 (Newborn and other neonates) - Refer to Appendix B of the technical guidelines
- with trauma diagnosis code (see ICD codes below) in any field
- same day/day only admissions (admissions with a length of stay less than 24 hours). In those countries where a timestamp of admission or discharge is not available cases with a length of stay of 0 days shall be excluded.

Denominator: Population count.

Minor Revision

Coverage: Population with diabetes at all ages
Numerator: All non-maternal/non-neonatal admissions with procedure code of major lower extremity amputation (ICD9CM: 84.13-84.19) in any field and diagnosis code of diabetes in a specified year
Exclude cases:
- Transferring from another institution
- MDC 14 (pregnancy, childbirth and puerperium)
- MDC 15 (newborn and other neonates)
- Trauma diagnosis codes (ICD9CM: 89.50, 89.51, 89.60, 89.61, 89.62, 89.63, 89.70, 89.71, 89.72, 89.73, 89.74, 89.75, 89.76, 89.77)
- Tumour-related peripheral amputations (ICD9CM: 170.7,170.8)
- Same day/day only admissions

Denominator: Estimated total number of people with diabetes

Major Revision

Coverage: Population with diabetes at all ages
Numerator: Major amputations (ICD9CM: 84.13-84.19)
Use of unique person identifier:
- count each patient only once, recording only the most severe episode of amputation occurred in the reference year
- automated search of diabetes diagnoses (ICD9CM: 250.xx) for all subjects amputated in the reference year, among discharges occurred within the same and previous years (up to the first year with reliable and consistent unique person identifier), and/or records indicating diabetes status in any other relevant database e.g. pharmaceuticals, specialist visits and laboratory data.

Exclude cases:
- MDC 14 (pregnancy, childbirth and puerperium)
- MDC 15 (newborn and other neonates)
- Trauma diagnosis codes (ICD9CM: 89.50, 89.51, 89.60, 89.61, 89.62, 89.63, 89.70, 89.71, 89.72, 89.73, 89.74, 89.75, 89.76, 89.77)
- Tumour-related peripheral amputations (ICD9CM: 170.7,170.8)

Denominator: Estimated total number of people with diabetes

OECD Study on Lower Extremity Amputation Rates in Diabetes (1)

- In 2014, the HCQI Expert Group agreed to conduct a specific R&D activity aimed at improving the data collection for this indicator, based on different sets of definitions
- The following was agreed:
  - Major and minor amputations to be collected separately
  - Additional estimates of diabetes prevalence to be collected to test usage of people with diabetes at denominator
  - Further exclusion criteria to be applied (eg tumour-related amputations)
  - All age groups to be collected

OECD Study on Lower Extremity Amputation Rates in Diabetes (2)

- The 2015 HCQI data spreadsheet allowed 6 different indicators:

Admission-based:
- Number of Major amputations in diabetes on the Total population

N=22 countries
- Number of Minor amputations in diabetes on the Total population

N=17 countries
- Number of Major amputations among people with diabetes

N=12 countries
- Number of Minor amputations among people with diabetes

N=12 countries

Patient-based:
- Percentage of total population experiencing a major amputation

N=7 countries
- Percentage of people with diabetes experiencing a major amputation

N=6 countries

- Age below 15 did not seem relevant and was excluded from analysis

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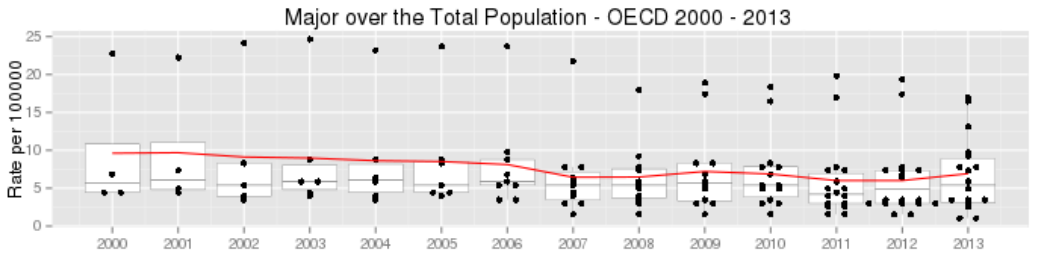
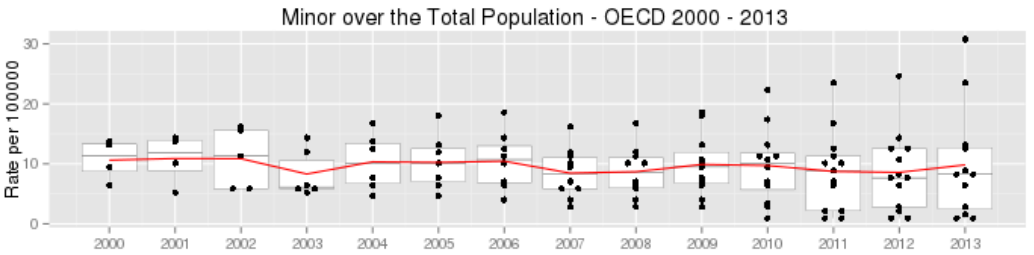
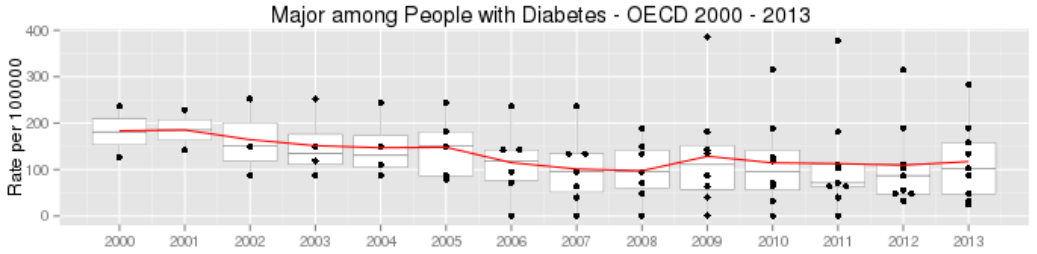
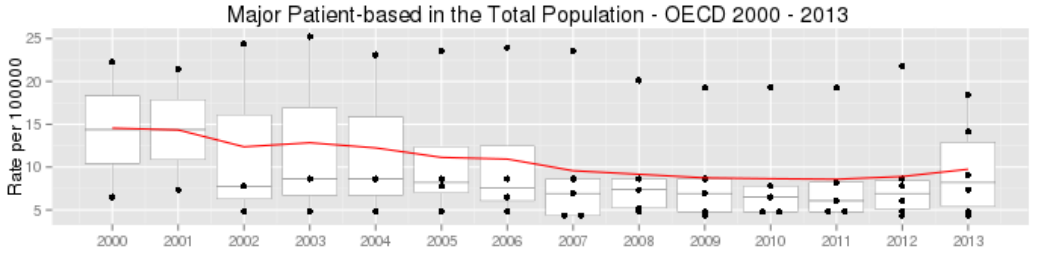
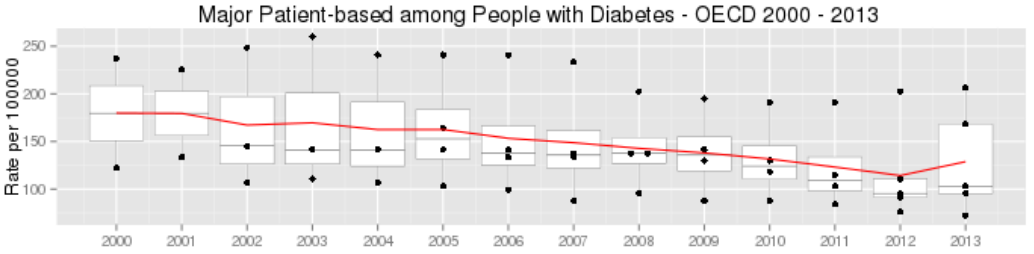
Results of HCQI data collection 2015 (1)
Dispersion plots









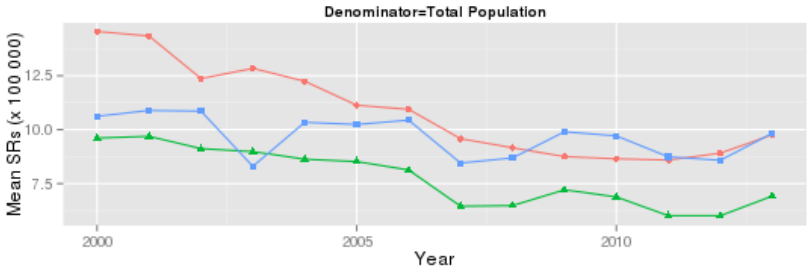


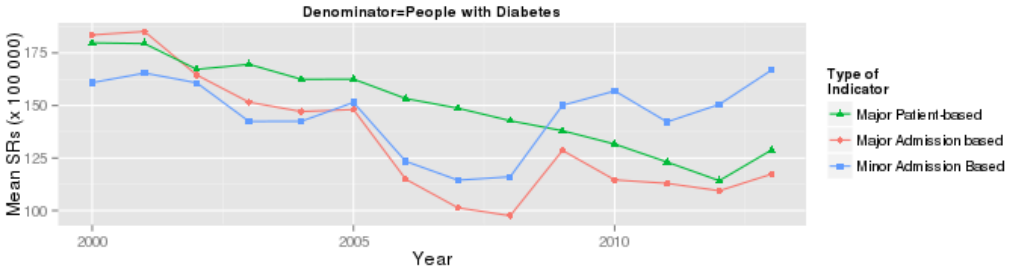
Lower Extremity Amputation Rates in Diabetes (3)

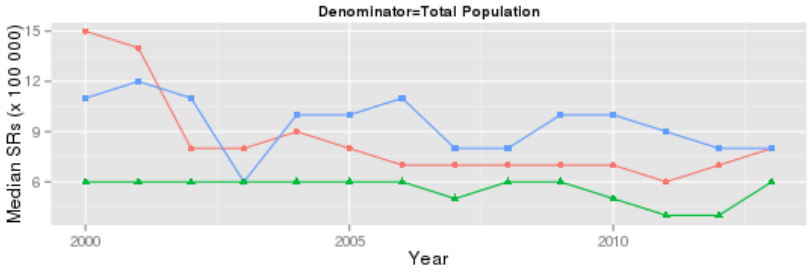
- As expected, different algorithms showed a different ability to discriminate between trends over time and differences between countries
- By far, using major amputations in a patient-based fashion showed the most marked reduction of amputation rates over time
- The total number of major amputations among people with diabetes also show a consistent decrease
- Measures over the total population show a steady state after 2006, which can indicate a "masking effect" of diabetes prevalence, i.e. countries where it increased continued to be successful in reducing the number of amputations
- Results are reinforced by a separate examination of the algorithms

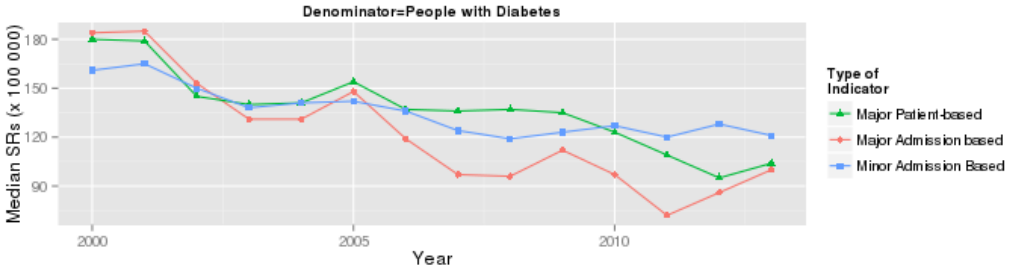
Results of HCQI data collection 2015 (2)

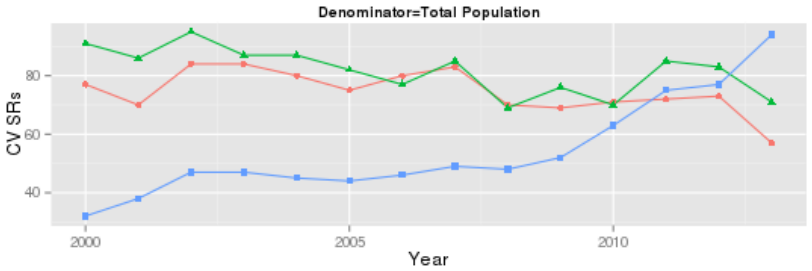
Trend of average values and coefficient of variation using alternative definitions

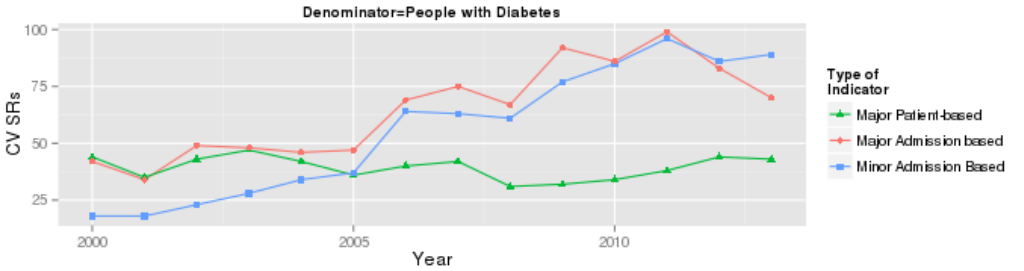












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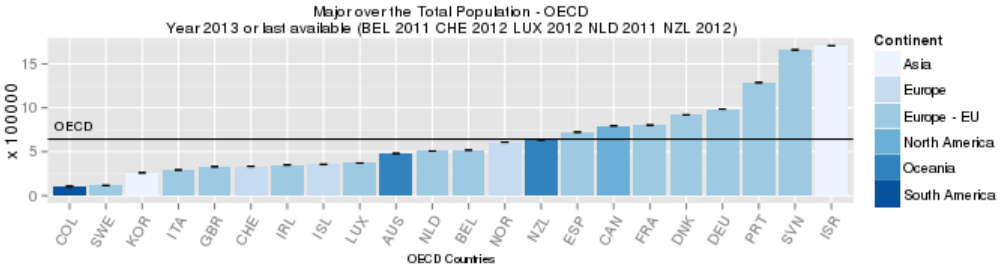
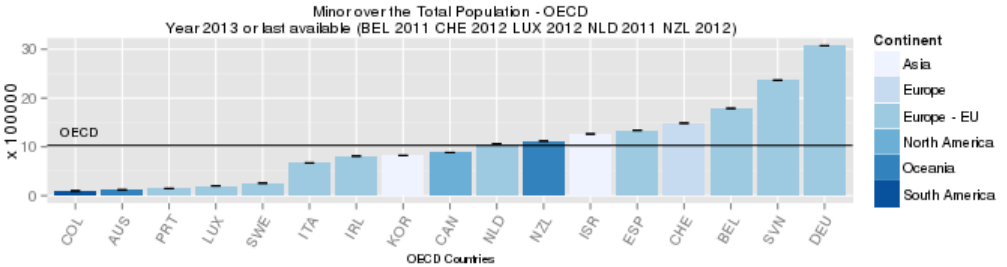
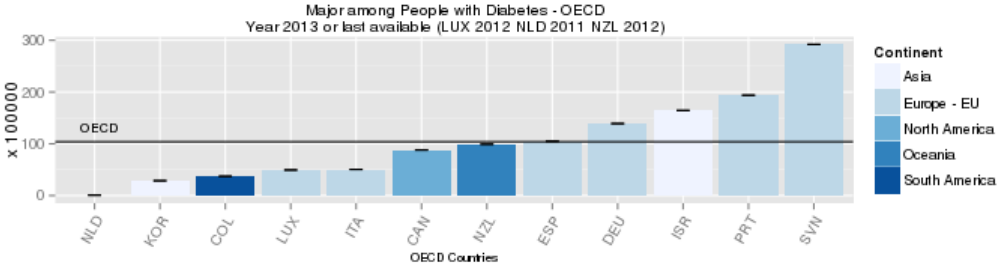
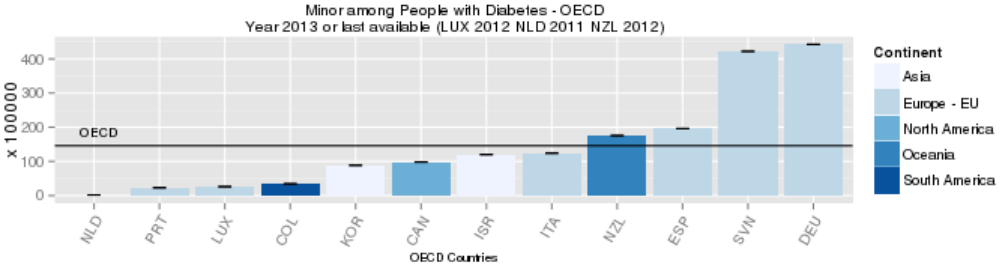
Results of HCQI data collection 2015 (3)

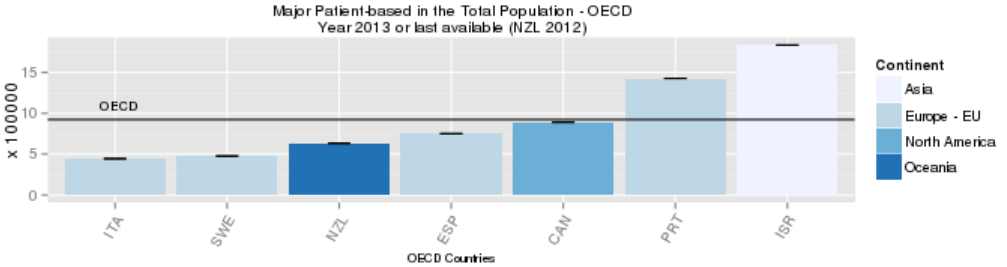
Ranking according to alternative definitions

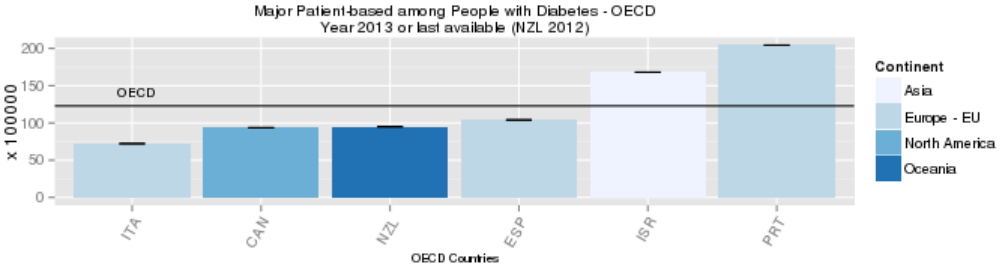












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Lower Extremity Amputation Rates in Diabetes (4)

- Despite the additional difficulty, a substantial number of countries responded favourably to the R&D
- Few countries (N=12) were able to deliver patient-based results that required stratified figures for diabetes prevalence by sex, age
- The output seems to indicate valid avenues for a finally refined version of this indicator that can be used for international comparisons of quality of care

Conclusions

- Our results seem relevant both from a methodological and an epidemiological perspective
- Improving the measure of amputation rates may definitely help increasing our ability to draw inferences on quality of care and health systems performance
- An increased ability to discriminate between major and minor amputations, coupled by a clearer definition of individual pathways, will help highlighting successful practices for in OECD countries
- The publication of lower extremity amputation rates in diabetes in "Health at a Glance" may be extremely important to raise the attention of policy makers on a matter of utter importance for public health and safety.