Comparability of the methods

The Hague, 24 May 2016

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5/31/2016

Introduction

- Three main ways to collect data and to determine MAIS3+:
    1. *Applying a correction to police data*
    2. *Using hospital data*
    3. *Using linked police and hospital data*
- Method applied in a country depends on available data and knowledge and possibly other factors
- Method probably also affects estimated number of serious injuries:
    – *Differences between methods 1, 2 and 3*
    – *Differences in operationalization of methods*

Comparability between methods

- Comparison of estimated number of serious road injuries in the Netherlands using methods 1, 2 and 3

- Comparison of estimated number of serious road injuries in Austria using methods 1 and 2

Case study the Netherlands

- Common method: linking police and hospital data
  - *Common and remainder files, C/RC or Chances of registration*
- Hospital data
  - *SafetyCube selection (In/exclusion, AIS1990)*
- Correction to police data:
  - *Safetynet: 2 * 6 factors (Linked/police) derived for 6 modes of transport (1997-2003).*
    Derived from police reported Hospitalized and Slight casualties
  - *SafetyCube: 70 factors (HDR/police) derived for 5 modes of transport * 5 age groups * 2 genders (2004-2008).*
    Derived from the total of Killed + Hospitalized casualties
  - *Applied to police data 2004-2014*
- Compare results of these 3 methods

Combining two datasets

Police file contains records of road traffic casualties

- Includes fatalities (OTS, later), hospitalized and slight injuries
- Underreporting

Hospital files contains records of hospitalized in-patients

- Includes fatalities (later) and patients from other external causes
- Miscoding of the external cause or unknown (E928, X59)
- Injuries enable to score AIS and separate slight from seriously injured

List A

overlap

List B
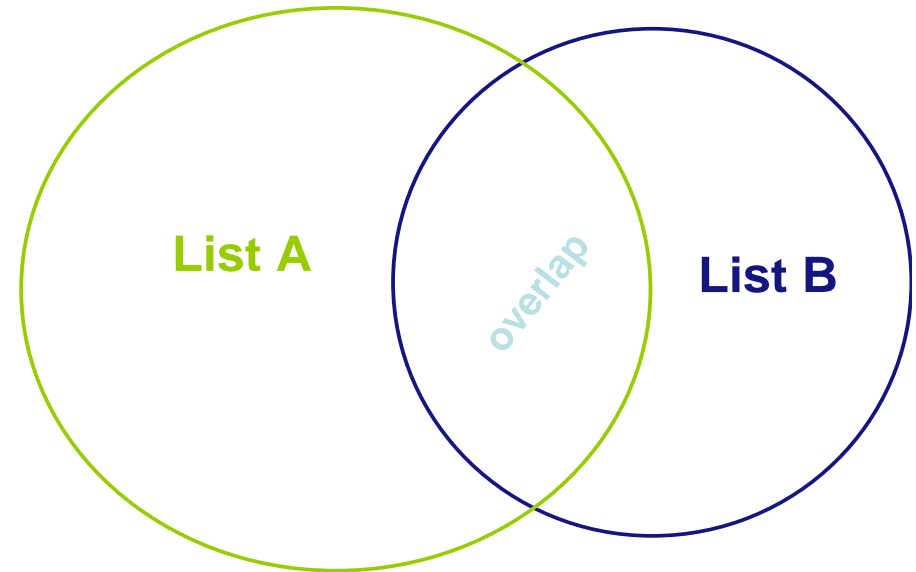
Linked data and remainder files

	in hospital: traffic casualty MAIS3+	in hospital: but other external cause MAIS3+	in hospital MAIS2-	not in hospital
in police: MAIS3+	common (1)	Common (2)	Not relevant	Remainder / "police only" data
in police: MAIS2-	Not relevant	Not relevant	Not relevant	
not in police: MAIS3+	Remainder/ "Hospital only" data	Unobserved /missed	Not relevant	Unobserved/ missed
not in police: MAIS2-	Not relevant	Not relevant	Not relevant	

Patients from Road crashes in Hospital file

	in hospital: traffic casualty MAIS3+	in hospital: but other external cause MAIS3+	in hospital MAIS2-	not in hospital
in police: MAIS3+	common (1)	Common (2)	Not relevant	Remainder / "police only" data
in police: MAIS2-	Not relevant	Not relevant	Not relevant	
not in police: MAIS3+	Remainder/ "Hospital only" data	Unobserved /missed	Not relevant	Unobserved/ missed
not in police: MAIS2-	Not relevant	Not relevant	Not relevant	

Casualties of road crashes in Police file

	in hospital: traffic casualty MAIS3+	in hospital: but other external cause MAIS3+	in hospital MAIS2-	not in hospital
in police: MAIS3+	common (1)	Common (2)	Not relevant	Remainder / "police only" data
in police: MAIS2-	Not relevant	Not relevant	Not relevant	
not in police: MAIS3+	Remainder/ "Hospital only" data	Unobserved /missed	Not relevant	Unobserved/ missed
not in police: MAIS2-	Not relevant	Not relevant	Not relevant	

Relevant data for Serious Road Injuries (MAIS3+)

	in hospital: traffic casualty MAIS3+	in hospital: but other external cause MAIS3+	in hospital MAIS2-	not in hospital
in police: MAIS3+	common (1)	Common (2)	Not relevant	Remainder / "police only" data
in police: MAIS2-	Not relevant	Not relevant	Not relevant	
not in police: MAIS3+	Remainder/ "Hospital only" data	Unobserved /missed	Not relevant	Unobserved/ missed
not in police: MAIS2-	Not relevant	Not relevant	Not relevant	

Relevant cells when Hospital file is complete

	in hospital: traffic casualty MAIS3+	in hospital: but other external cause MAIS3+	in hospital MAIS2-	not in hospital
in police: MAIS3+	$N \cdot p \cdot q$	$N \cdot p \cdot (1-q)$	Not relevant	"None"
in police: MAIS2-	Not relevant	Not relevant	Not relevant	
not in police: MAIS3+	$N \cdot (1-p) \cdot q$	$N \cdot (1-p) \cdot (1-q)$	Not relevant	"None"
not in police: MAIS2-	Not relevant	Not relevant	Not relevant	

p = chance of police reporting = reporting rate;
q = chance of correct coding on HDR

Calculation

NL 2014	in hospital: traffic casualty MAIS3+	in hospital: but other external cause MAIS3+	SUM
in police: MAIS3+	$N \cdot p \cdot q = 1{,}752$	$N \cdot p \cdot (1\text{-}q) = 90$	$N \cdot p = 1{,}842$
not in police: MAIS3+	$N \cdot (1\text{-}p) \cdot q = 5{,}417$	$N \cdot (1\text{-}p) \cdot (1\text{-}q)$	$N \cdot (1\text{-}p)$
SUM	$N \cdot q = 7{,}169$	$N \cdot (1\text{-}q)$	N

Solve p, q and N from these equations: N=7,537, p=24%, q=95%

Note that *Unobserved* = N (1-p) (1-q) is equal to the C/RC Petersen estimate

Note: HDR number is 7,169

          Police number cannot be determined as AIS is not in the dataset

Serious Road Injuries in HDR

- Selection of Road Traffic Casualties from Hospital file (2004-2014) based on
  - *External Cause*
    - *E-code (820-819+826, 828,829, 988.5)*
  - *Excluding readmissions and fatalities within 30 days*
  - *Rating the severity MAIS by mapping ICD9 injuries to AIS1990 by ICDmap90*
- Count numbers of MAIS3+ by Year, Mode, Agegroup, Gender

SafetyNet factors

In SafetyNet, 12 factors were derived to apply on the number of police reported casualties to approximate the estimated number of Serious Injuries MAIS3+ (average 1997-2003).
Now these factors will be applied again to 2004-2014 police data

| SafetyNet, Table 99	Hospitalized	Slight
Pedestrian	0,377	0,021
Bicycle NoMvh	0,768	0,033
Bicycle Mvh	0,768	0,033
Moped	0,402	0,015
Motorcycle	0,371	0,022
Car/Van	0,233	0,007
Other	0,225	0,008
ALL	0,391	0,016

SafetyCube factors

- Counts of police reported casualties (Killed + Hospitalized) by Mode, Agegroup, Gender

- HDR counts MAIS3+ by Mode, Agegroup, Gender

- Calculate Average factors 2004-2008.

- Range of these 70 factors
  min: female / 30 - 49 / car/van   0,09
  max: male / 70 + / bicycle nomvh 12,34

	Factor
Female / 00 - 17 / Bicycle NoMvh	1,96
Female / 00 - 17 / Pedestrian	0,34
Female / 00 - 17 / Bicycle Mvh	0,16
Female / 00 - 17 / Moped	0,19
Female / 00 - 17 / Motorcycle	0,90
Female / 00 - 17 / Car/Van	0,18
Female / 00 - 17 / Other	2,54
Female / 18 - 29 / Bicycle NoMvh	1,62
Female / 18 - 29 / Pedestrian	0,31
Male / 00 - 17 / Bicycle NoMvh	3,54
Male / 00 - 17 / Pedestrian	0,40
Male / 00 - 17 / Bicycle Mvh	0,19
Male / 00 - 17 / Moped	0,28
Male / 00 - 17 / Motorcycle	2,25

Preliminary results
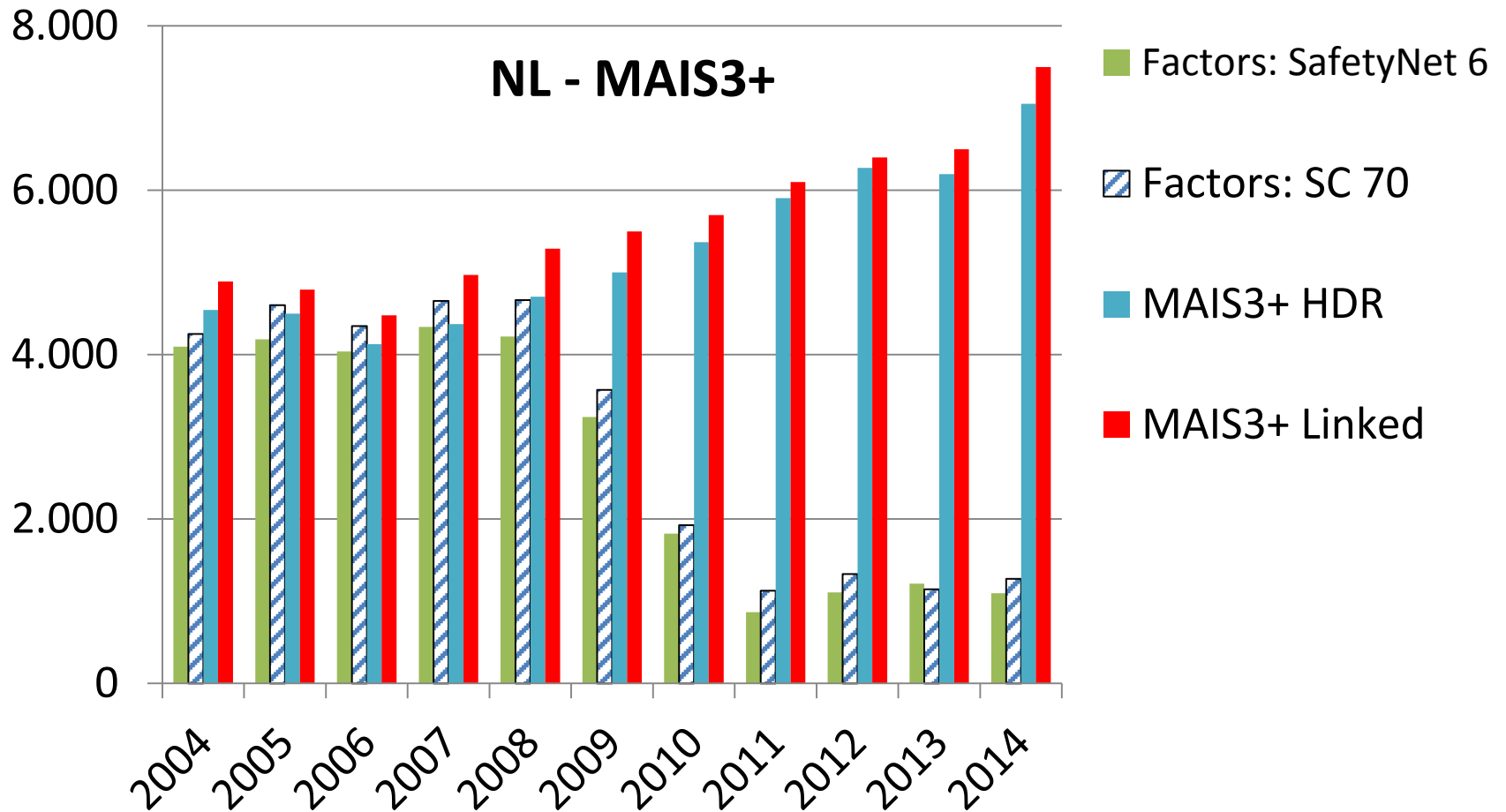
Preliminary conclusions

- Correction to police data is only possible with a stable police registration level (completeness)
  - *In NL registration rate went down after 2009, so this leads to an underestimation of the number of serious injuries*
  - *Numbers are less reliable*
- Use of hospital data only, results in an underestimation (in NL, 5%) and bias
- Linking is only possible in case there are a sufficient number of common characteristics in both datasets
  In order to apply C/RC the common part should not be too small
  The six requirements for C/RC should be checked

Comparability

- Can we compare countries using any method?
- Can we compare countries using the same method?
- Correction to police data :
  - *Results depend on how correction factors are derived*
  - *SafetyNet factors and SafetyCube factors result in similar* total *estimates, however for stratifications by age or gender the difference is bigger*
- Use of hospital data:
  - *Weight factors for* 'choices or data-limitations' *regarding in/exclusion criteria, recoding tools, number of injuries and truncation*
  - *Miscoding and unknown external causes*
- Linking police and hospital data:
  - *Differences in levels of underreporting*

Discussion

- Comparability of method 1 vs 2 and 3?
  - *What can we learn from the comparison in NL*
  - *Further research needed?*
  - *Should we recommend to apply method 2 or 3?*
  - *Do we all agree that part of the cases is unobserved/missing and that we need to make some estimate of that (Capture/Recapture)*

%MAIS3+ by Injury code

Aantal in registratie als % van rijtotaal		Licht (MAIS=1)	Matig (MAIS=2)	MAIS3+	Unknown	Maximum AIS
fracture of the scull (800-804)	800 Fracture of vault of skull	0,00%	33,39%	66,61%	0,00%	100,00%
	801 Fracture of base of skull	0,00%	0,00%	100,00%	0,00%	100,00%
	802 Fracture of face bones	49,09%	50,83%	0,08%	0,00%	100,00%
	803 Other and unqualified skull fractures	0,00%	47,02%	52,98%	0,00%	100,00%
	804 Multiple fractures involving skull or face with other bones	0,00%	0,00%	0,00%	100,00%	100,00%
	fracture of the scull (800-804)	**29,84%**	**36,92%**	**31,71%**	**1,53%**	**100,00%**
fracture of neck and Trunc (805-809)	805 Fracture of vertebral column without mention of spinal cord injury	0,00%	97,10%	0,02%	2,87%	100,00%
	806 Fracture of vertebral column with spinal cord injury	0,00%	0,00%	92,98%	7,02%	100,00%
	807 Fracture of rib(s), sternum, larynx, and trachea	19,28%	68,18%	12,55%	0,00%	100,00%
	808 Fracture of pelvis	0,00%	44,31%	55,69%	0,00%	100,00%
	809 Ill-defined fractures of bones of trunk	0,00%	0,00%	0,00%	100,00%	100,00%
	fracture of neck and Trunc (805-809)	**7,13%**	**69,80%**	**21,86%**	**1,21%**	**100,00%**
fracture Of Upper Limb (810-819)	810 Fracture of clavicle	0,00%	100,00%	0,00%	0,00%	100,00%
	811 Fracture of scapula	0,00%	100,00%	0,00%	0,00%	100,00%
	812 Fracture of humerus	0,00%	96,49%	3,51%	0,00%	100,00%
	813 Fracture of radius and ulna	0,00%	96,37%	3,63%	0,00%	100,00%
	814 Fracture of carpal bone(s)	0,00%	100,00%	0,00%	0,00%	100,00%
	815 Fracture of metacarpal bone(s)	0,00%	100,00%	0,00%	0,00%	100,00%
	816 Fracture of one or more phalanges of hand	100,00%	0,00%	0,00%	0,00%	100,00%
	817 Multiple fractures of hand bones	0,00%	99,41%	0,00%	0,59%	100,00%
	818 Ill-defined fractures of upper limb	0,00%	95,43%	4,57%	0,00%	100,00%
	819 Multiple fractures involving both upper limbs. rib(s) sternum	0,00%	0,00%	0,00%	100,00%	100,00%
	fracture Of Upper Limb (810-819)	**4,69%**	**92,89%**	**2,38%**	**0,05%**	**100,00%**
fracture Of Lower Limb (820-829)	820 Fracture of neck of femur	0,00%	0,13%	99,87%	0,00%	100,00%
	821 Fracture of other and unspecified parts of femur	0,00%	22,46%	77,54%	0,00%	100,00%
	822 Fracture of patella	0,00%	100,00%	0,00%	0,00%	100,00%