RIGO Research en Advies
Woon- werk- en leefomgeving

Berkhout & Damen WOS 2014

An individual risk assessment tool based on registration data

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Background

Analysis of trends in occupational safety in The Netherlands

New in 2013: one-to-one merging of
- complete national registration of serious accident victims
- complete population at risk (from national registraions)
- 1999-201

Spin-off: individual risk assessment tool (RAT)

Conceptual framework

Assuming

- a given latent hazard potential intrinsic to the job
- workers are heterogeneous w.r.t. hazard handling skills
- each worker-job match translates into an observed accident rate

Employers

- do the matching of workers to jobs
- have no accurate information on hazard handling skills (since accidents are rare events)

Tool

- predicts absolute and relative position in risk distribution

Definitions and data (1)

Serious occupational accidents

- leading to death, permanent injury or hospitalisation
- registered as accidents by the Dutch Labour Inspectorate
- employed workers only
- excluded: traffic accidents, dangerous substances & natural resources (gas), and a few minor sectors

Complete registration?

- reporting mandatory, but
- suspicion of underreporting (at least 25% not reported)

Definitions and data (2)

Social statistical micro data (1999-2011)

- CBS (National Bureau of Statistics)
- all employed workers (no self-employed workers)
- personal background:
  age, gender, nationality
- work-related data:
  begin & end date of jobs,
  contract hours, type of contact,
  sector of industry
- part time jobs translated into full time equivalents
- exposure measured in contract days, not days worked
  (no data available on sick leave and vacation)

Definitions and data (3)

Merging results

- population at risk per month: ± 7,5 million workers
- 21,229 casualties were merged to population at risk
- comparable to StoryBuilder

- Time axis (1999-2011) measured in 156 months:
  data: date of accidents in months
  analysis: allowing for seasonal patterns
  (sick leave and vacation)

- Number of observations: 156 x 7,5 million = ± 1 billion

Method and model

Regression analysis

- Response Y: worker matched (=1) to casualties or not (=0)
- 1 billion observations too large for conventional methods
- grouping all combinations of explanatory variables X
- count the number of accidents within these 90,000 groups

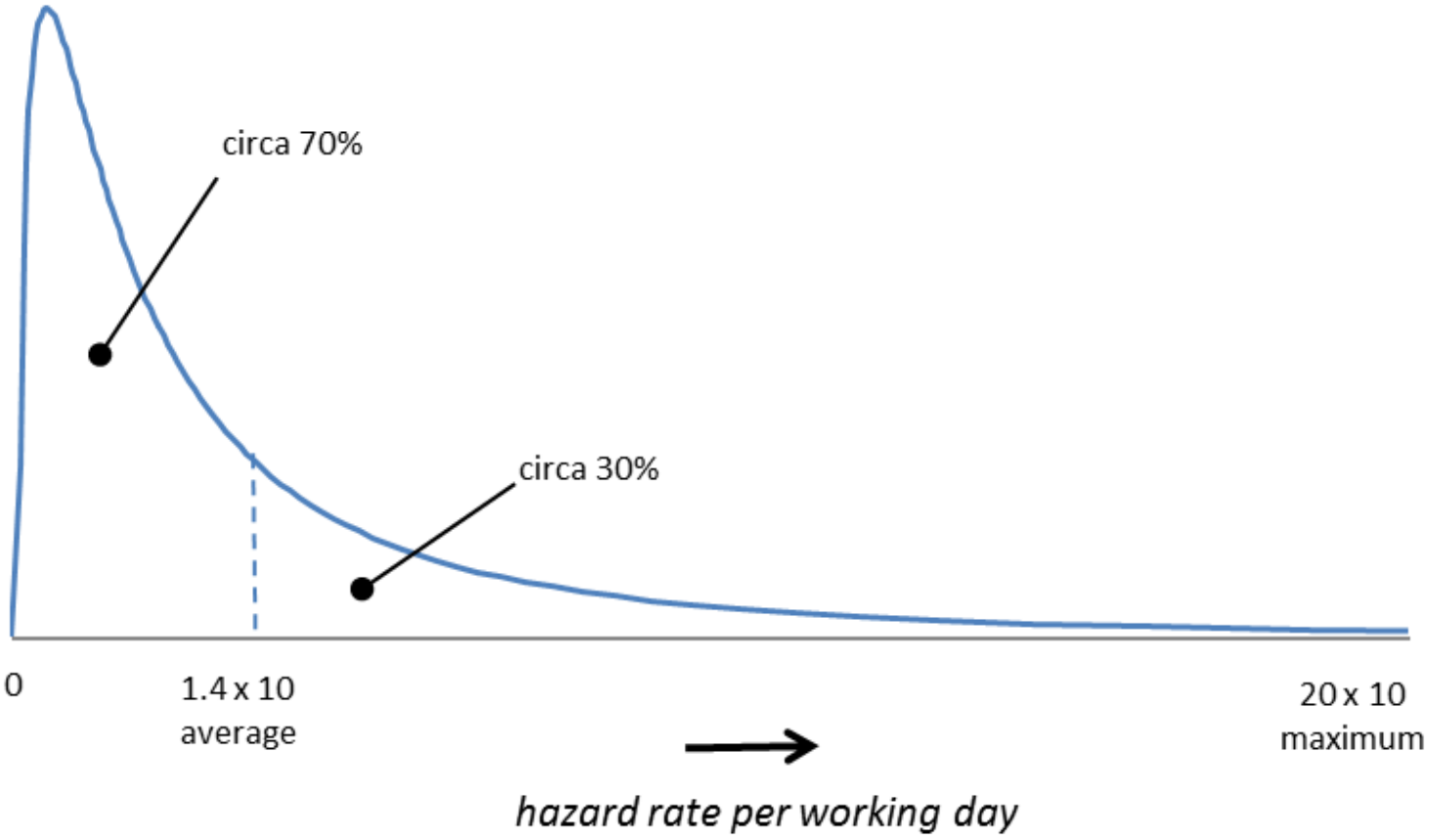
Negative binomial count model

- Explanatory variables
  - age, gender, nationality
  - exposure (duration)
  - type of contact (flex); job-size
  - sector of industry

Few empirical results

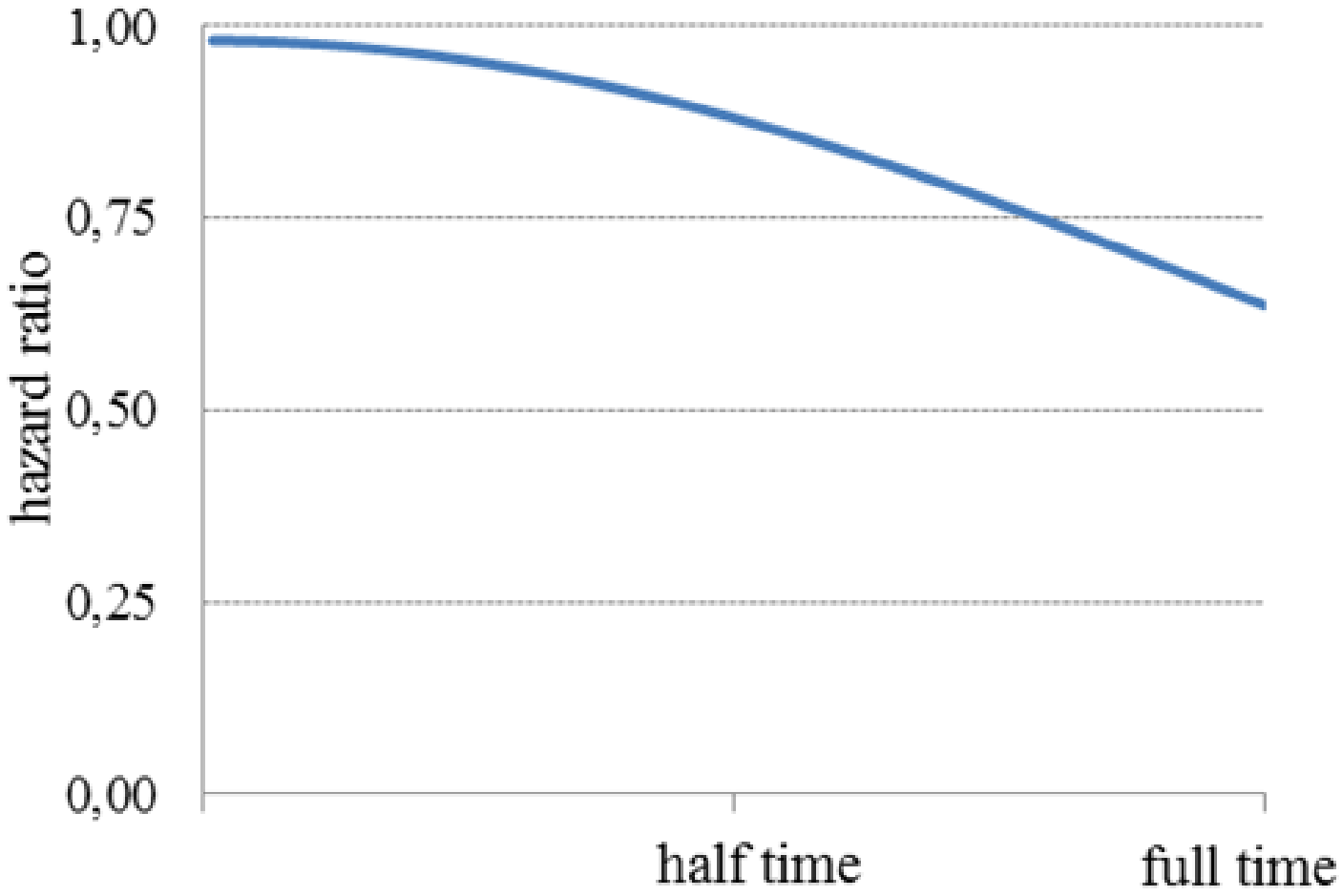
- Average hazard rate per 8-hour working day: 1.4×10^{-6}
- Skewed to the right: median=0.6×10^{-6}
- Hazard ratio 1st and 99th percentile: 700
- Male/female hazard ratio: 4.2
- Non-native/native hazard ratio: 1.3

Skewed distribution of the hazard rate

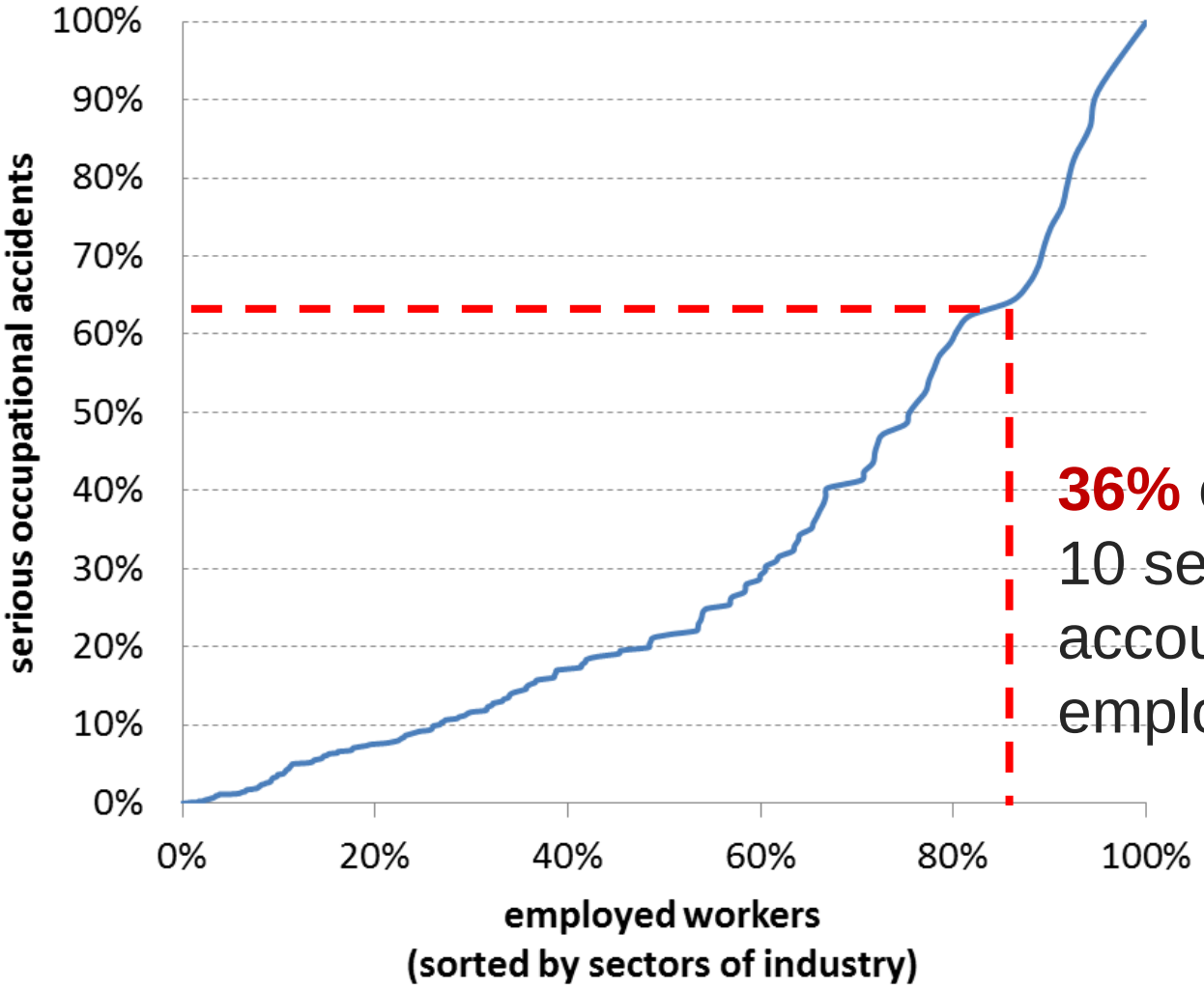


Worker age and hazard rate

Job size hazard ratio (8-hour working day)



Lorentzcurve of occupational accidents



36% of all accidents in 10 sectors (out of 262) accounting for **14%** of employment

10 High risk sectors

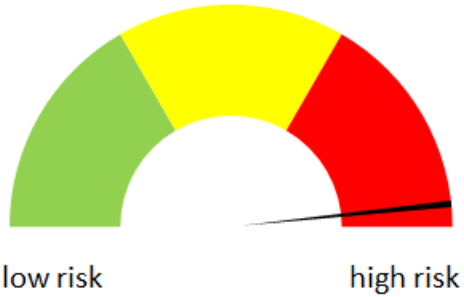
Sector (ISIC-code)	Share in accidents
Temporary employment agencies job pools (78.2)	8.8%
Roofing and other specialized construction (43.9)	4.6%
Construction installation (43.2)	4.0%
Construction of buildings (41.2);	3.6%
Manufacture of structural metal products (25.1);	2.7%
Other specialized wholesale (46.7);	2.6%
Building completion (43.3);	2.5%
Construction of roads, railways, bridges (42.1)	2.4%
Freight transport by road (49.4);	2.4%
Cleaning activities (81.2)	2.2%

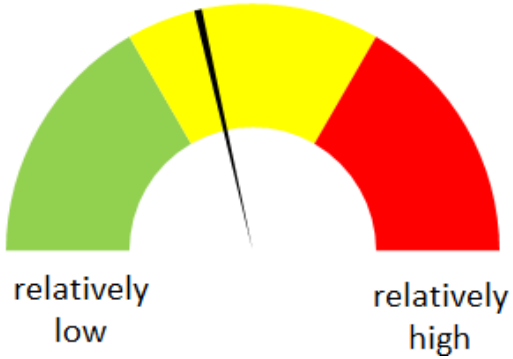
36% of all accidents
14% of employment

Individual risk assessment tool

Sector of industry	*Construction*
Branch within sector	*Construction of residential and non-residential buildings*
Percentage males in job	92%
Age (15 - 65)	58
Native	○ Yes ◉ No
Part time (0 - 100%)	60%
Flex worker	◉ Yes ○ No

compared to all workers	compared to workers in branch





Concluding remarks

Merging of registration data worked out well, will be easier in the future and there is more data which can be added (population, personal, job and company)

We have derived a national *quantified* risk distribution (based on 90.000 groups) which gives valuable information since accidents are rare events

We can identify the high risk groups or predict an individual's position within the distribution