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Fonds Wetenschappelijk Onderzoek
Research Foundation – Flanders

- Introduction: research on safety risks for cyclists

- Methodology: questionnaire & defining causation

- Results: crash characteristics & crash causes

- Discussion

- Conclusion

Introduction: research on safety risks for cyclists

- Bicycle crash investigations
  - Hospital data
  - Police data
  - National statistics
  - Survey-interviews

- Shortcomings
  - The potential underreporting of minor bicycle crashes
  - Limited information about crash circumstances
  - Mostly on adult population

References: Thomas, Acton et al. 1994; Macpherson, To et al. 2002; Rivara, Thompson et al. 2015; Mehan, Gardner et al. 2009; de Geus, Vandenbulcke et al. 2012; Poulos, Hatfield et al. 2015; Vanparijs, Int Panis et al. 2015

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Aim

- In depth Bicycle crash analysis in adolescent population

  - Bicycle crash characteristics based on self-reported bicycle crashes from schools and insurance companies.

  - Analysis of the human & environmental causation factors in bicycle crashes.

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Methodology: data collection

- Data collected from two sources:

  1. Schools (8):
     - Voluntary
     - Questionnaires to students age 14-18 years

  2. Insurance companies
     - Ethias & KBC
     - Questionnaires send to victims of bicycle crashes (age 14-18 years)

- Al data was self reported by the victims

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Methodology: Questionnaire

- Based on previous study* (Description of the crash by the victims)
  - Weather and road circumstances
  - Protective clothing
  - Road characteristics

- Identical for school & insurance companies

*References: de Geus, Vandenbulcke et al. 2012

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Location

- Insurance companies covered Flanders and the Brussels capital region: 13.682 km² (7.500.000 inhabitants) with a road network of 70.604 km which comprises 4,3% of the surface.

- Black dots = participating schools

Built-up land	
Arable land	
Grassland	
Forest	
Water surface	

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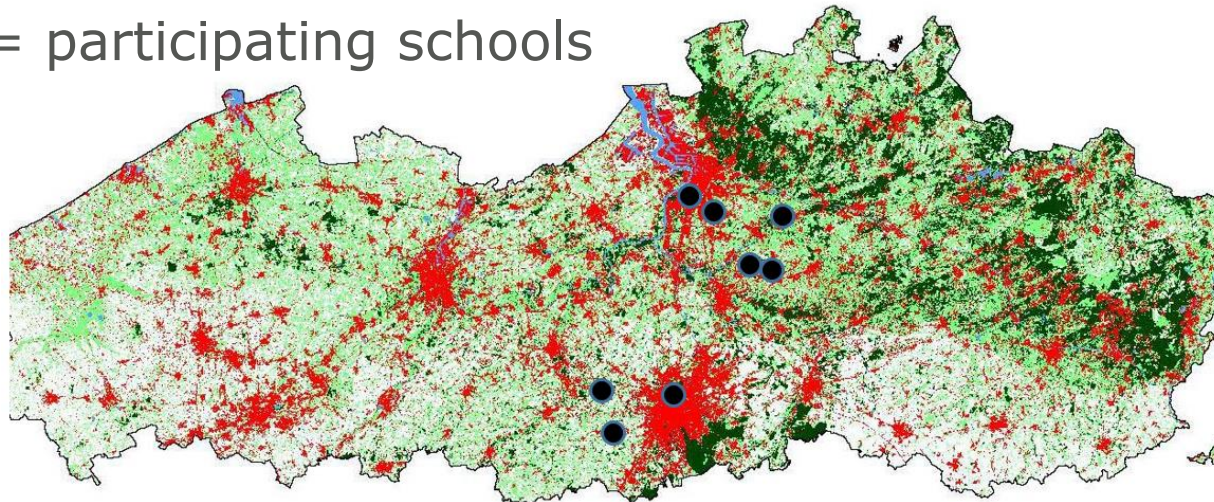
Methodology: Analysis of questionnaire

- Most questions ->multiple choice
- Two open questions -> nVIVO 10 to define cause of the crash
  - "Where were you cycling and what were the circumstances?"
  - "How did the crash happen, what went wrong?"

- Before analysis, possible variables were thought of based on bicycle crash literature: variables concerning road characteristics, cause of crash identified by the victim, involvement of third party and crash type

- After analysis, variables were redefined if needed

Defined causes

- Distracted (e.g. talking with another bicyclist)
- Infrastructure in bad state (e.g. holes in the road)
- Bad maintained infrastructure (e.g. ice, snow, or other debris on the surface)
- Traffic rule infringement of bicyclist (e.g. crossing road were not aloud, cycling on sidewalk)
- Third party crosses bicycle path (e.g. exiting driveway, turning at an intersection)
- Traffic rule infringement of third party if not crossing the bicycle path (e.g. opening door of car, hitting the bicyclist with the side mirror)
- Technique (e.g. failure of bicycle, shoe lace in the sprocket)

Primary and Secondary causes

- Only the primary causes are used in the data analysis:

- E.g. bicyclist is talking to his friend next to him. Therefore, he does not notice the hole in the road surface. He got surprised and falls.
  - Primary cause: distraction (talking with friend)
  - Secondary cause: bad infrastructure (hole in the road surface)

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Results: Participants

Schools

- 8 voluntary schools
- 1600 adolescents
- N recorded crashes: 86

Insurance companies

- 2 insurance companies
- Period 12 months
- 527 cases, response 16%
- N included crashes: 78

All included crashes occurred during commuter cycling

Infrastructure characteristics

Road type	Schools	Insurance companies
Bicycle on road	62%	66%
Side walk	7%	0%
Separated bicycle path	24%	19%
No motorized vehicles	7%	15%

	Schools	Insurance companies
Straight	56%	87%
Curve	16%	3%
Intersection	22%	10%
Other	6%	0%

Speed zone	Schools	Insurance companies
No cars	8%	8%
30 km/h	28%	43%
50 km/h	59%	44%
70 km/h	5%	5%

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Crash circumstances

Schools

- Weather: dry 26% - rain 8% - snow 7%

- Surface: dry 20% - wet 10% snow/ice 12% - dirt 1%

- 9% was in a hurry – 82% was relaxed

Insurance companies

- Weather: dry 55% - rain 10% - snow 1%

- Surface: dry 47% -wet 15% snow/ice 11% - dirt 3%

- 17% was in a hurry – 78% was relaxed

Schools

- Car: 47%
- Bicycle: 16%
- No third party: 35%
- Pedestrian: 2%

Insurance- registered

- Car: 38%
- Bicycle: 28%
- No third party: 26%
- Pedestrian: 5%

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Official registered bicycle crashes (police reported)

	bicycle crashes collected through schools & reported by the police	bicycle crashes collected through insurance companies & reported by the police	Weighted average
Single bicycle crashes	3%	16%	8%
Bicyclist	0%	5%	3%
Car *	5%	35%	17%
Pedestrian	50%	50%	50%
Motor cycle	/	50%	50%
Total *	5%	**21%**	13%

* sig. p<0.05

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Severity: medical attention

	Schools	Insurance Companies
Hospital > 24h	**0%**	**3%**
Hospital < 24 h	2%	17%
Medical doctor	10%	57%
Personal medical attention	21%	21%
No medical attention	67%	2%
Reported to insurance	14%	94%
Absenteeism (Abs)	98% no abs. / 2% 1 day abs.	43% no abs / 50% 1-5 days abs/ 7% > week abs.
ICISS*	0,99377	0,99023

*International Classification of Injury Severity Score (based on International Classification of Diseases and Survival Risk Ratio)

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Subjective acc. causation

Predefined cause	Percent of cases	Injury severity ICISS*
distracted	28,4%	0,9934
infrastructure in bad state	5,5%	0,9858
traffic rule infringement	6,1%	0,9685
traffic rule infringement of third party	15,2%	0,9960
third party crosses bicycle path (bicyclist not noticed)	28,4%	0,9786
ice, snow, branches or other	15,2%	0,9928
technique	0,6%	1

*International Classification of Injury Severity Score (based on International Classification of Diseases and Survival Risk Ratio)

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Discussion

- No ≠ crash circumstances or causes between schools and insurance data.

- Database insurance companies 5x larger compared to national statistics.

- "**Distraction" & "not noticed by third party" are main causes (57%)** -> need for a new strategy to coop with this problem.

- Crashes, directly caused by infrastructure account for 21%.
  - Ice, snow, debris, holes etc....

- Crashes registered at insurance companies seem to be more severe accordingly to the days of absenteeism but not accordingly to the ICISS

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Limitations

- Questionnaire filled out by adolescent victims -> subjective

- Role of primary and secondary crash cause is disputable

- Small number of crashes -> no infrastructure analysis possible

- No safety viewpoint since exposure was not included

Conclusion

- Potential data of insurance companies for national statistics: Better data -> better policy decisions?

- Impact of human factor in bicycle crashes in adolescent population is high (distraction).

- Is there a role of infrastructure in these accidents?

- To improve bicycle safety and infrastructure, bicycle crash causes should be taken into account.

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Thank You

Questions?

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