



Vrije Universiteit Brussel



Costs for Society related to Major Bicycle Accidents in Flanders (Belgium)

ICSC 2014

18–19 November 2014, Gothenburg, Sweden

Bas de Geus (VUB)

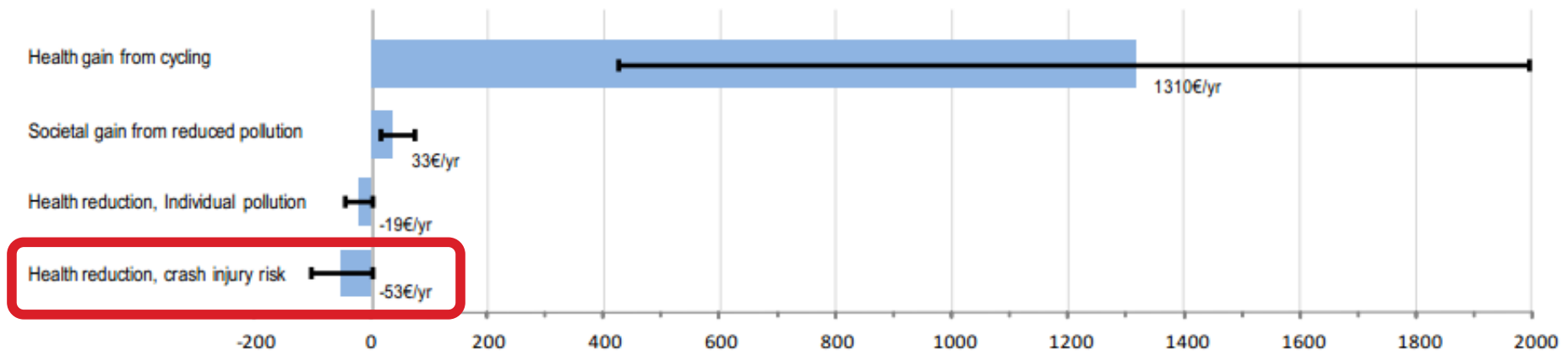
Joris Aertens (VITO), Stefanie Devos (VUB), Koen Putman (VUB), Luc Int Panis (VITO), Romain Meeusen (VUB)

Introduction



Economic cost of cycling

- ▶ Rabl & de Nazelle (2012)
 - ▶ Shift car → bicycling, by evaluating 4 effects:
 - individual exposure to ambient air pollution
 - health benefit by PA
 - public health benefit due to reduced pollution
 - individual risk of accidents
- Mortality → €€



* 2x5km daily roundtrip, 5 days per week, 46 weeks per year

Error bars represent upper and lower (%% confidence intervals.

Study aim

- ▶ Costs for society of bicycle accidents:
 - I. Costs **minor** (<24 hrs hospital) bicycle accidents → *Aertsens et al. 2010*
 - II. Costs **major** (>24 hrs hospital) bicycle accidents

Materials and Methods



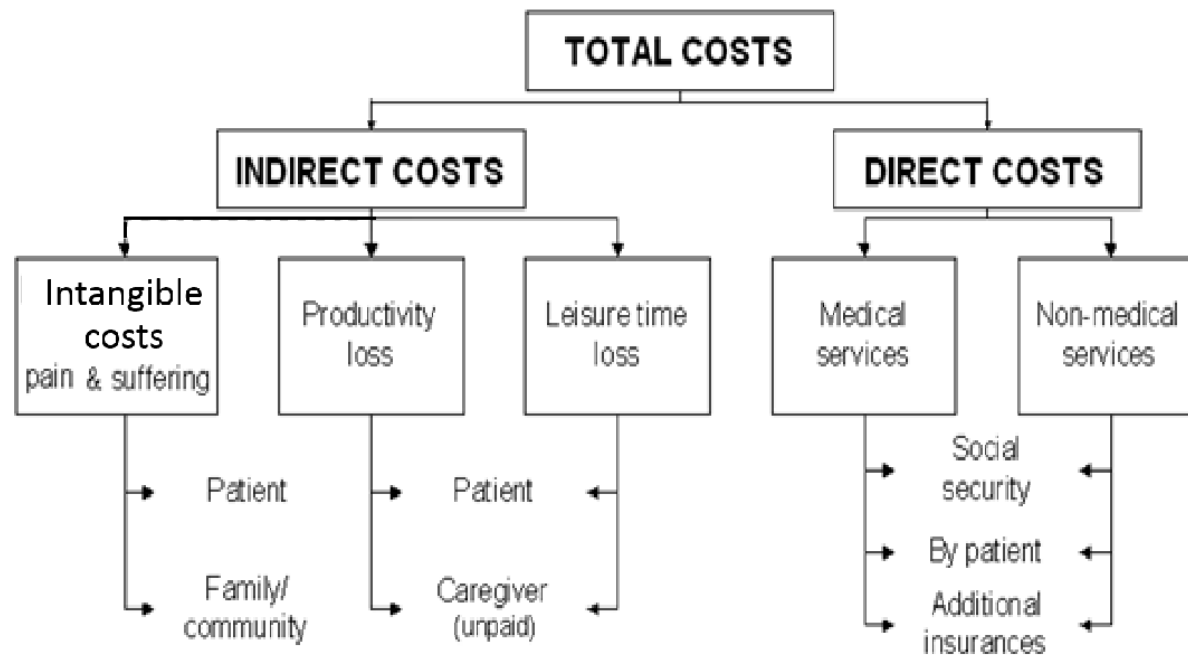
Data collection and response rate

- ▶ Federal Fund for Work related Accidents (FWA):
 - 2008: 4,877 accidents → 49.6% accidents involved cyclist
 - 2011 (3 years later): cost questionnaire was sent to 2,364 victims in Flanders
- ↓
- ▶ 282 questionnaires were returned
- ↓
- ▶ 27 major (>24h hospitalisation) bicycle accidents →
24 used for data analysis



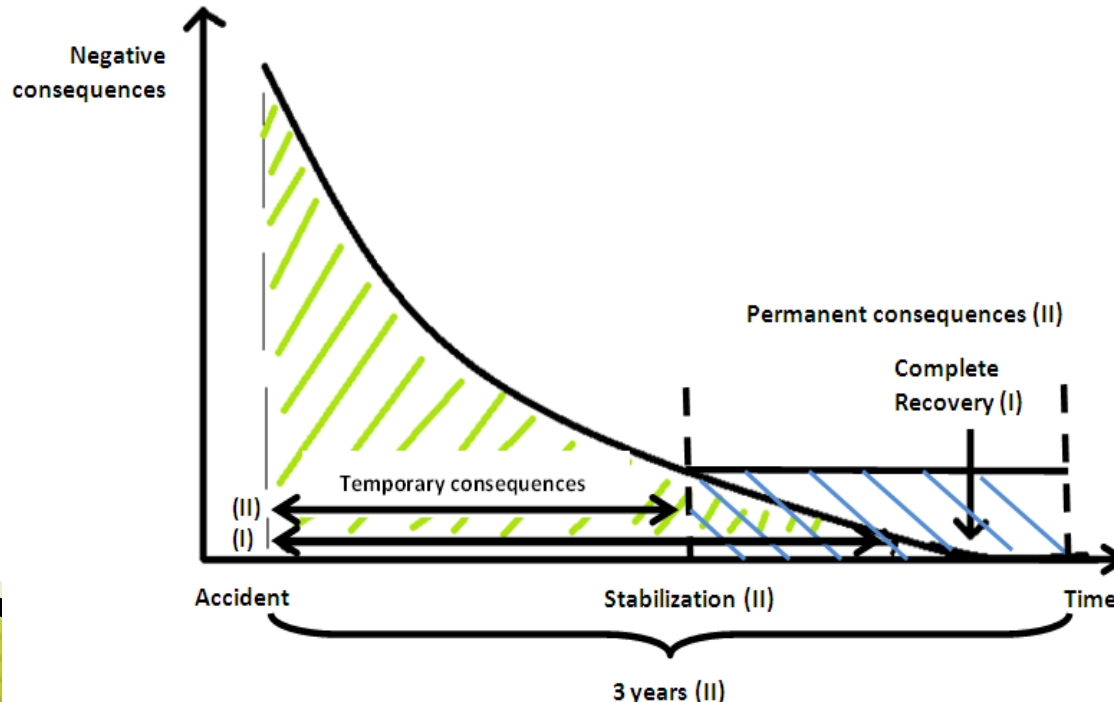
Theoretical framework

- Cost questionnaire based on Aertsens et al. 2010
- Cost of illness approach
 - estimate \neq different cost categories (US Environmental Protection Agency (EPA, 2006))



Consequences of the accident

- ▶ I. '*temporary consequences – recovery period*'
 - defined as consequences from which one recovered after a certain time to the status before the accident
- ▶ II. '*permanent negative consequences*'
 - defined as those impairments that would not allow recovery to reach the state before the accident



Results



Descriptive

- ▶ Regular adult cyclists: 45.1 ± 9.7 ; 24–58 years old
- ▶ 35% women
- ▶ Average cycling: 4.4 ± 1.2 times per week to work
- ▶ Mean cycling distance per trip: 10.6 ± 6.8 km; 2–30 km



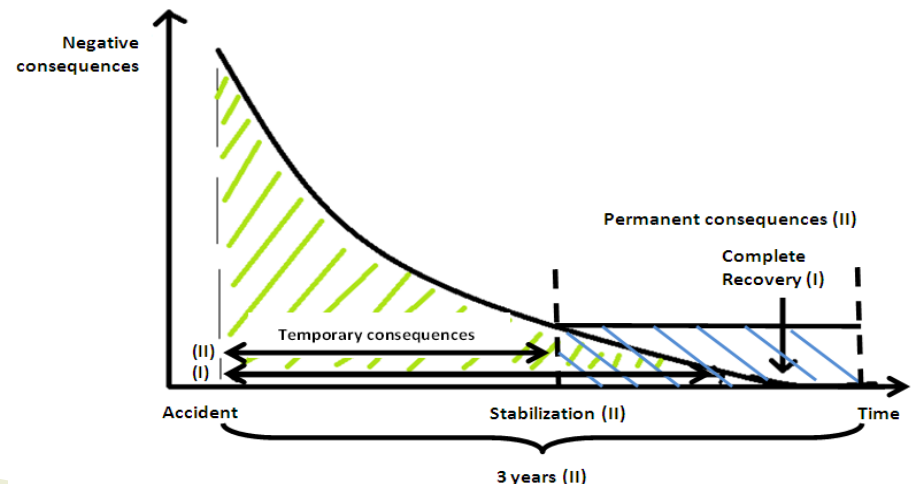
Accident location

- ▶ City centre: 17%
 - ▶ Agglomeration/built-up area outside the city centre: 50%
 - ▶ Outside the built-up area: 33%
-
- ▶ Bicycle lane (public road with markings for bicycles): 45%
 - ▶ Public road without any markings for bicycles: 33%
 - ▶ Bicycle path (section reserved for bicycles only): 20%



Consequences of the accident

- ▶ I. *'temporary consequences – recovery period'*
 - 9 respondents (35%)
 - on average 173 ± 145 (15–450) days to fully recover
- ▶ II. *'permanent negative consequences'*
 - 17 respondents (65%)
 - on average 13 ± 10 (range 4–36) months to arrive at a stage of 'stabilised' permanent consequences



Type of injuries

Types of injuries self-reported after major bicycle accidents

Injury type	Most important injury	2 nd most important injury
Bone fracture (closed)	17	4
Dislocation, sprain or strain	3	5
Superficial injury (e.g. bruise, graze, contusion)	1	5
Head trauma (e.g. concussion, internal bleeding)	3	2
Internal injury of trunk	1	0
Open wounds (e.g. cut, abrasion, ...)	0	4

Numbers indicate the absolute number of times a specific type of injury occurred

Injured body parts self-reported after major bicycle accidents

Body part	Most important injury	2 nd most important injury
Hip, knee and leg	5	2
Shoulder and arm	14	11
Head and neck	5	5
Back	1	0
Trunk (front side)	1	2

Numbers indicate the absolute number of times a specific body part was injured



Direct costs

- Costs calculated per victim (€, 2011)

		TC (N=9)		PC (N=17)		AVERAGE	
		mean	SD	mean	SD	mean	SD
Medical Costs							
	Doctor, specialist, physio (Recovery phase)	1042	1306	1829	1604	1557	1529
	Doctor, specialist, physio (Permanent phase, incl. med)	NA	NA	481	741	315	637
	Hospitalisation	2430	1492	4407	3538	3722	3105
	Ambulance intervention	45	26	31	30	36	29
	Medication and bandages (Recovery phase)	28	55	189	273	133	234
Non-medical costs							
	Material costs	120	135	548	1046	399	847
	Police intervention	94.5	0	94.5	0	94.5	0

TC: Temporary consequences; PC: Permanent consequences
NA: not applicable

Indirect costs

- Costs calculated per victim (€, 2011)

		TC (N=9)		PC (N=17)		AVERAGE	
		mean	SD	mean	SD	mean	SD
Productivity loss							
	Period unable to work	29432	37703	62272	78253	50904	66577
	Lower productivity	1512	2348	1888	3657	1758	3218
Leisure time loss							
	Personal medical care	571	922	2522	5852	1846	4805
	Administrative	14	18	174	257	123	218

TC: Temporary consequences; PC: Permanent consequences
NA: not applicable

Intangible costs

- Costs calculated per victim (€, 2011)

		TC (N=9)		PC (N=17)		AVERAGE	
		mean	SD	mean	SD	mean	SD
Intangible costs I: Government refund							
	Permanent invalidity (BAO – 3 year)	NA	NA	5044	9225	5044	9225
	Compensation for moral damage (1 lump sum)	NA	NA	3482	4109	3482	4109
Intangible costs II: Willingness To Pay							
	WTP: Recovery phase	33660	65431	28131	78718	29757	51512
	WTP: Permanent phase – 3 year	NA	NA	4731	5533	4731	5533

TC: Temporary consequences; PC: Permanent consequences
NA: not applicable

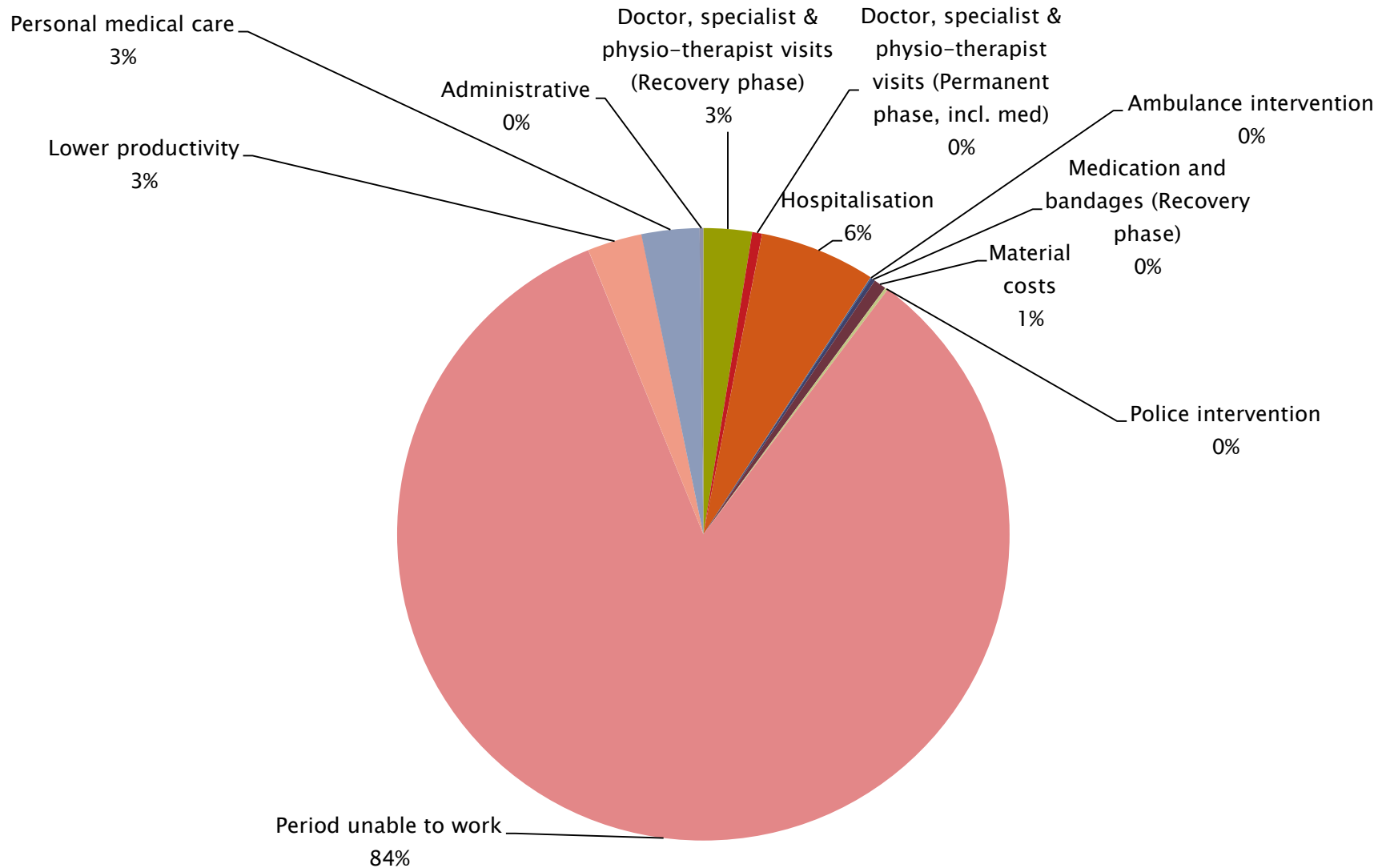
Total costs

- Costs calculated per victim (€, 2011)

		TC (N=9)		PC (N=17)		AVERAGE	
		mean	SD	mean	SD	mean	SD
	Total costs excl. WTP & excl. BAO&moral damage	35190	39317	74322	78718	60776	69433
	Total costs incl. BAO & moral damage	35190	39317	82848	86028	66351	75933
	Total costs incl. WTP	53890	60335	97241	91576	82235	83513

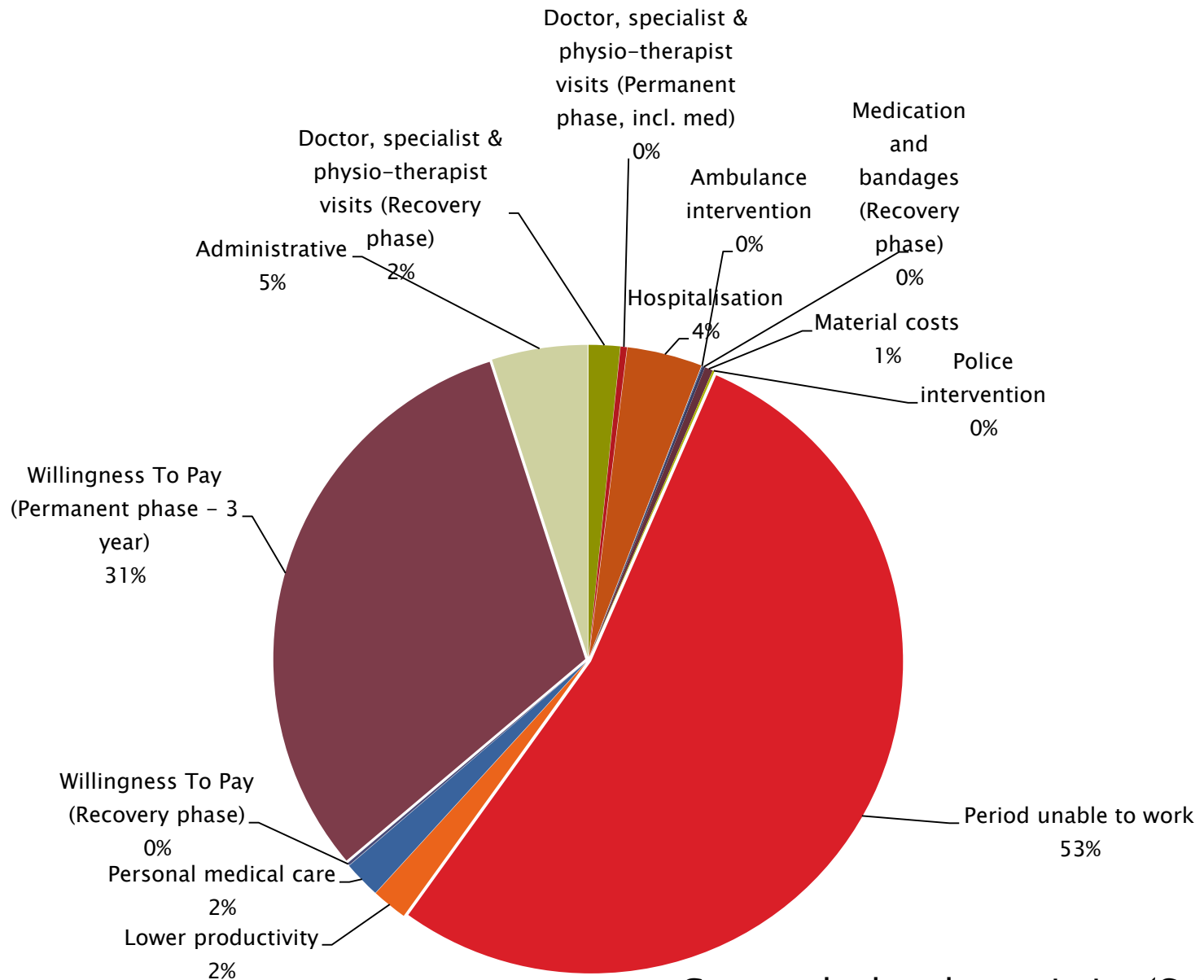
TC: Temporary consequences; PC: Permanent consequences

Average costs excl. WTP & excl. BAO&moral damage



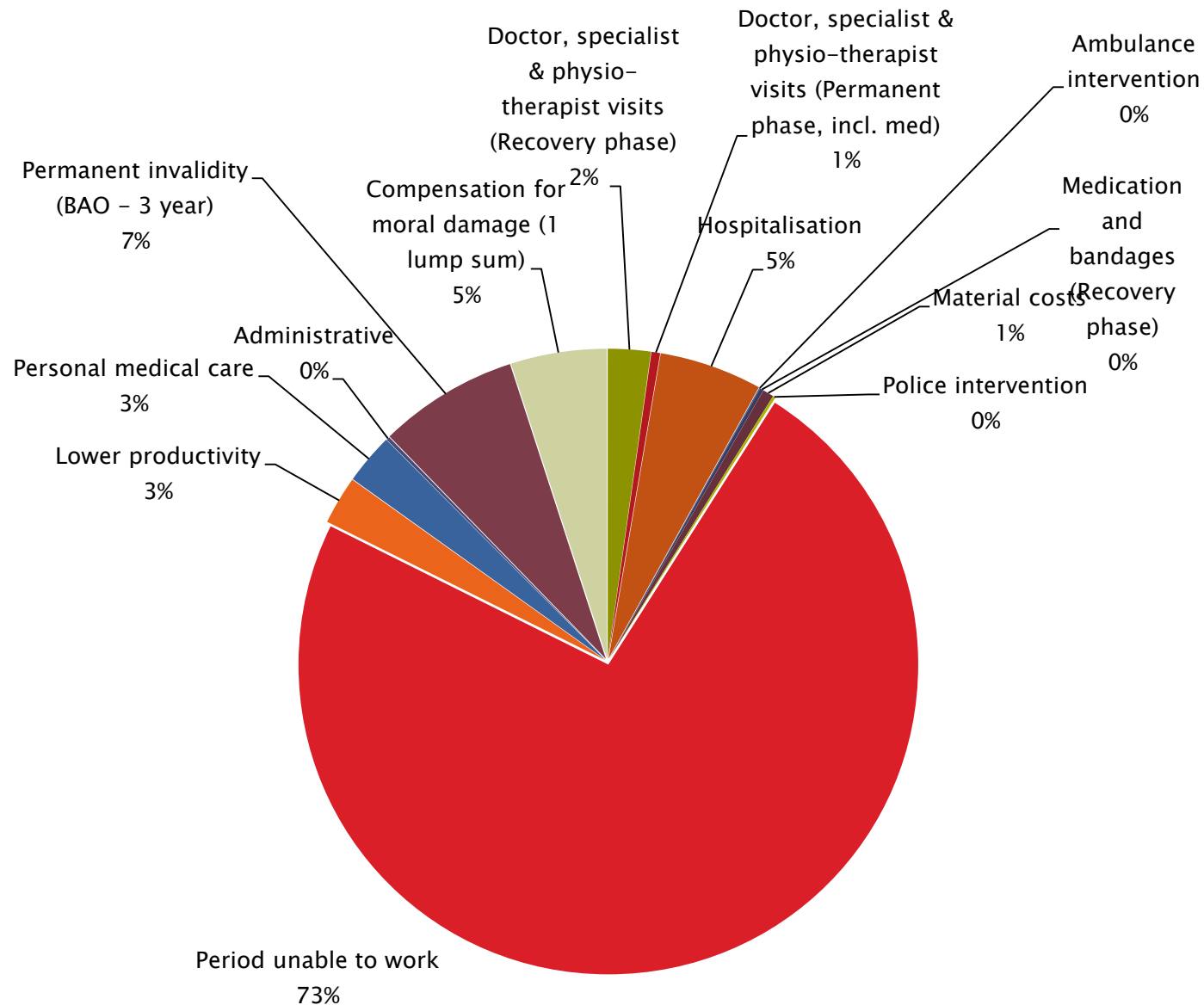
Costs calculated per victim (€, 2011)

Average costs incl. WTP



Costs calculated per victim (€, 2011)

Average costs incl. BAO&moral damage



Costs calculated per victim (€, 2011)

Estimation of the Total Cost of bicycle accidents in Belgium



Total cost (incl WTP) of bicycle accidents in Belgium

	Casteels (2011)	Official reporting	Estimated # accidents	Cost/accident	Total Average
Fatal	86	98% ^a	88	2,178,000 ^d	191,664,000
Major accidents	774	18% ^b	4,300	82,235 ^e	353,610,500
Minor accidents	6017	7% ^c	85,957	872 ^f	74,954,629
TOTAL	6877		90,345	2,261,107	620,229,129

^a based on HEATCO (2006), all transport modes together

^b based on Nuyttens (2013)

^c self-reported from Aertsens et al. (2010) and de Geus et al. (2012)

^d based on Ricardo-AEA, euro 2011 prices

^e costs cut off 3 year post accident

^f based on Aertsens et al. (2010), euro 2011 prices



Value of Statistical Life (VSL)

	Ricardo–AEA (2014)	Our studies de Geus et al (2014) Aertsens et al (2010)
Fatal	€2,178,000	
Major	€330,400	
Permanent consequence		€97,241
Temporary consequence		€53,890
Minor	€21,300	€841





Vrije Universiteit Brussel



Thanks for your attention

