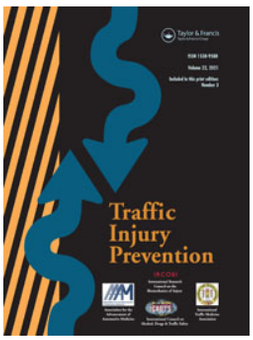

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An overview of tram tracks related cycling injuries in Ghent, Belgium

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ABSTRACT

Objective: There is a paucity of data on the incidence and severity of tram tracks related cycling injuries. The aim of this study is to get insight into the incidence, severity and characteristics of tram tracks related cycling injuries, potentially defining significant 'hotspots' in the Ghent city area.

Methods: A one-year, multicenter, prospective, observational study was conducted. Patients presenting to the emergency departments of all 4 Ghent hospitals with tram tracks related cycling injury, were included. Data on patient demographics, circumstances of the accident and type of injury were collected.

Results: 149 patients were included, with a median age of 31 years. 42 patients had fractures, 39 patients required wound sutures, 79 and 49 patients suffered from bruising and abrasions respectively. Only 5 patients required admission. No patients died or suffered life-threatening injuries. Women (65.1%) presented more frequently than men (34.9%). Forty-tree percent of all accidents happened in autumn ($p < 0.001$). Accidents happened more frequently in rainy conditions ($p < 0.001$). Mean number of days off work was 2.7 days, significantly increasing to 6.56 days when sustaining a fracture or dislocation ($p = 0.02$).

Conclusion: Tram tracks are potentially dangerous and may lead to clinically important injuries and significant number of days off work.

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KEYWORDS
Cyclist; injury; traffic; road users

Introduction

Ghent, Belgium, is a university city with approximately 260.000 inhabitants and about 65.000 students. Each year 1.1 million tourists visit Ghent (Vlaanderen 2018). After the car (39%), the bicycle is the most important transportation method for commuting in the Ghent region (32%) (Mobiliteitsbedrijf 2019). While cycling has been a common means of transportation for decades in Ghent, a further yearly increase of 4 up to 13% in cycling is noted. In a recent evaluation of the 'Ghent Circulation Plan', an increase of up to 50% more cyclists in the city center was described. Cycling has many advantages, e.g., ecological and health benefits (Int Panis et al. 2011; de Geus et al. 2012). However, vulnerability in traffic is one of the disadvantages.

In recent years, many efforts were made to prevent injuries amongst cyclists and creating a safer infrastructure. It is shown that purpose-built bicycle facilities reduce crashes and injuries amongst cyclists (Reynolds et al. 2009). At the same time, the use of public transportation is being promoted because of its many advantages: excellent passenger safety, environmental benefits and relief of traffic congestion. In many cities across the world, trams have been added to the streets onto existing road infrastructure, resulting in tram tracks embedded into the public road. However, integrated tram tracks can cause problems for other road participants, including cyclists (Cameron et al. 2001; Deunk et al. 2014; Maempel et al. 2018). In these tram tracks, bicycle wheels can get stuck easily, causing a cyclist to fall. This mechanism of trauma is a frequent recurring phenomenon and has been accounted for up to 46% of cyclist injuries (Cameron et al. 2001). Despite this high number, only a handful of studies mention this type of accidents. Vandenbulcke et al. (2014) already found the presence of on-road tram tracks and (tracks) crossings to be related with an increased risk of accident (Vandenbulcke et al. 2014). Only one published study in the UK, performed by Maempel et al. (2018), regarding patient characteristics and type of sustained injuries, was found (Maempel et al. 2018). A better understanding of these accidents might facilitate targeted interventions to prevent or reduce the incidence of these injuries.

Patients and methods

We conducted a one-year, multicenter, prospective, observational study after approval of the ethics committee in all participating hospitals. The study population consisted of all patients who suffered a tram track related cycling injury in Ghent and were treated in one of the four Ghent emergency departments between January 1, 2018 and December 31, 2018. All hospitals are located in or close to the city center, and one hospital is a level-1 trauma center.

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Eligible patients received a questionnaire upon arrival in the emergency department. The informed consent form was signed by the patient or by their legal representative in case of inability to give informed consent. Patient demographics (age, gender) and information on circumstances (weather conditions, location, mechanism of injury) were collected, as well as report of helmet use and alcohol use and whether a police report was filed. Mechanism of injury was registered using a pre-defined set of categories. The second part of the questionnaire was completed by the responsible emergency physician. Via an open-ended question, the sustained injuries were listed. Admission to the hospital for more than 24 hours and loss of working days, as prescribed by the emergency physician, were recorded. Prescription of subsequent time off work was not registered. To estimate the number of missed cases, we performed a data search in the electronic files in one of the hospitals (Ghent University Hospital) with terms like 'tram' and 'cyclist'. The software packages in the other hospitals did not allow a similar data search.

Statistical analysis was done using Statistical Package for Social Sciences (SPSS). We performed a descriptive data analysis on patient demographics, environmental characteristics, helmet use, alcohol use, injury type, loss of working days and admission to the hospital. We performed a multiple logistic regression to identify the impact of the injury categories, demographics, weather conditions, police report filing and helmet use on number of days off work. The One Sample Chi^2 test was used to analyze dry versus wet weather conditions and to search for seasonal differences. A binomial test was used to identify a potential gender difference and to compare observed versus expected weather circumstances at the time of the accident. A p-value <0.05 was considered to be statistically significant.

Results

Upon presentation to the emergency department, 131 patients were included. We excluded a 10-month old baby who was a passenger in a child bike seat. To make an estimation of the missed cases, a data search in the electronic files in one of the hospitals was performed. Upon reviewing the electronic files, another 31 cases were identified on top of the 14 primarily detected cases. This results in a 68.9% rate of cases that were not included (31.1% pick-up rate) in this hospital. It is not documented whether these patients refused inclusion in this study or were missed. Of these 31 cases, 23 patients were available by phone, which resulted in 19 additional informed consents, totaling 33 patients (73.3% pick-up rate) in this hospital. In total, 149 cyclists who suffered injuries in relation to tram tracks, were included.

Female patients (97, 65.1%) presented with tram tracks related cycling injuries more frequently than male patients (52, 34.9%) ($p = 0.001$), with no significant difference in encountered type of injury. Median age was 31 years (mean 34.2 years, range 11-74 years) with the most frequent age group being 20-30 years old (31.5%) (Table 1). Two mechanisms of injury accounted for the vast majority of patients presenting with tram tracks related cycling injuries. The most frequent mechanism of injury was the bicycle wheel getting caught in the tram track (78 patients, 52.3%), while 63 patients (42.3%) reported to have lost their balance or slipped when crossing the rails. Twenty-nine patients (19.5%) reported to have slipped on the tram tracks. Seventy-three (57.5%) injured patients occurred in dry weather circumstances and 54 (42.5%) in wet conditions. There was no significant difference in the absolute number of accidents in wet conditions compared to dry weather conditions ($p = 0.092$). When compared to the expected percentage of accidents in wet weather conditions (7.1%) (Deboosere 2018), a significant difference was found ($p < 0.001$). No correlation was found between weather circumstances and rates of fractures, lacerations, bruises or abrasions.

Table 1. Proportion of weather types and participating hospitals.

	Categories	Number	Percentage
Weather type	Sunny	36	28.3%
	Cloudy	37	29.1%
	Rainy	49	38.6%
	Snowy	4	3.1%
	Stormy	1	0.8%
Hospitals	1	33	22.1%
	2	77	51.7%
	3	19	12.8%
	4	20	13.4%

Only 15 patients (11.5%) wore a helmet at the time of the accident. Twenty patients (15.4%) admitted having drunk at least 1 unit of alcohol (ranging $1-10$ units of alcohol). We could not identify an impact of helmet use or alcohol abuse on injury severity or days off work. Only 7 patients out of 127 (5.5%) filed a police report. There was no significant correlation between filing a police report and suffered injuries, hospitalization rates or number of days off work.

All patients sustained at least one injury, including fractures (28.2%), lacerations (26.2%), bruises (53%), abrasions (32.9%) and luxations (3.4%). Fifty-four patients (36.2%) suffered multiple injuries. An overview of affected body regions is provided in Figure 1. Most frequently the upper limb was affected, accounting for over 44.5%, with the lower limb accounting for 30% of injuries. Twenty percent of all injuries affected the head. Forty-seven patients (31.6%) sustained a fracture or a dislocation. Over 63% of these were located in the upper limb, whilst only 17% in the lower limb. Radial head fractures were most frequently encountered (9), followed by finger fractures (5), clavicula fractures (4) and wrist fractures (4). Eight percent suffered facial fractures, consisting of nose fractures (2) and orbital fractures (2).

Fifty-six percent of all patients had an Injury Severity Score (ISS) of 1. Mean ISS was 1.95 (median 1) with a range of 1 to 10. Only 5 patients (3.4%) required admission and needed hospitalization for more than 24 h, all requiring orthopedic surgery. No patients suffered neurosurgical or visceral injuries, nor did any patient require monitoring on the intensive care unit; there were no fatalities.

The number of days off work prescribed by the emergency physician were registered. Fifty-seven (47.5%) patients

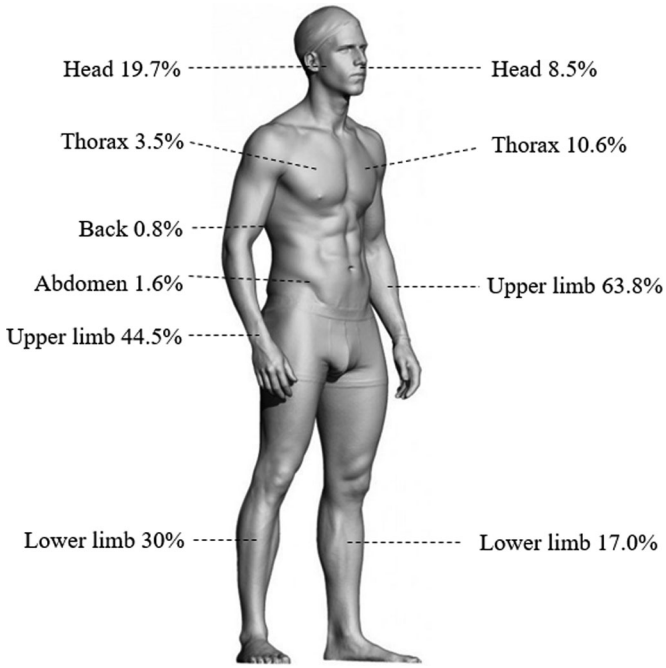

Figure 1. Percentages of injuries per body part. Left: overview of all injuries combined (n = 214). Right: overview of fractures and/or luxations (n = 47).

Table 2. Impact of injuries on incapacity leave. Overview of multivariate logistic regression results. Hosmer and Lemeshow test = 0.946 and 0.075 respectively.

Dependent variable: incapacity leave	Independent variable	Odds Ratio (CI)	p-value
	Fracture	7.09 (1.96 – 25.65)	p = 0.003
	Laceration	1.75 (0.53 – 5.71)	p = 0.357
	Bruises	4.45 (1.37 – 14.43)	p = 0.013
	Abrasions	0.86 (0.37 – 2.00)	p = 0.729
	Luxation	10.52 (0.79 – 141.11)	p = 0.076
	Age	1.02 (0.99 – 1.04)	p = 0.286
	Gender	0.85 (0.37 – 1.97)	p = 0.705
	Helmet	1.56 (0.45 – 5.43)	p = 0.488
	Dry / wet	0.76 (0.34 – 1.72)	p = 0.514
	Police report	0.68 (0.10 – 4.48)	p = 0.692

were absent from work for at least 1 day (range 1-28). Bearing in mind that only the first part of incapacity leave is prescribed in the emergency department, mean number of days off work prescribed in the ED episode was 2.7. Within the group with days off work, the mean number of days is 5.7 (median 4 days). Mean time off work increased to 6.6 days for patients sustaining any fracture or dislocation. Patients with a fracture were prescribed days off work significantly more often, compared to patients without a fracture ($p = 0.02$) and are more likely to be absent from work for 7 days or more ($p < 0.001$). There was no significant correlation between days off work and age, gender, helmet use, filing a police report, admission to the hospital or weather type. Apart from fractures and bruises, no risk factors for incapacity days were identified (Table 2).

Most accidents were registered in autumn (September – November), accounting for 64 (43%) of all cases ($p < 0.001$). There was no significant seasonal difference in number of days off work.

In our study most accidents occurred on a relatively small part of the tram rail system (Figure 2). Out of 114 registered locations, 84 (73.7%) accidents occurred in the city center.

Discussion

For decades, cycling has been a very popular means of transportation in Flanders, and this is very much the case in Ghent. Despite the obvious health benefits, cycling accidents seem to happen frequently, and official data appear to underestimate true incidence rates.

According to official police data, only 154 cyclists were involved into an accident in the Ghent city center during 9 months in 2018 (Mobiliteitsbedrijf 2019). A recent study performed by de Geus et al. shows only 7% of bicycle crashes resulted in a police report in adults, whilst Vanparijs et al. found 12% of bicycle crashes in adolescents in Flanders resulted in a police report (de Geus et al. 2012; Vanparijs et al. 2016). These low police report rates are in keeping with our study with only 7 patients out of 127 (5.5%) filing a report. However, a recent study registering all types of bicycle accident in all 4 Ghent's emergency departments registered 526 patients in the 10-month period from June to March 2020 (De Wilde and Walgers 2019). Police report rates appear not to generate reliable numbers and this might have implications on political strategies.

To our knowledge, the total number of daily cyclists in the Ghent region or Ghent city center is unknown. In our study in 2018, 149 cyclists presented to one of four Ghent hospitals with injuries after a fall in tram tracks. Considering 526 bicycle accidents were registered over a 10-month period in the same emergency departments two years later (De Wilde and Walgers 2019), estimatedly in almost a quarter of bicycle accidents, tram tracks may have been involved. However, these 149 registrations might only be the tip of the iceberg. True incidence rates of these accidents might be a multifold because of several reasons. Firstly, the spontaneous pick-up rate was only 31.1% in one of the hospitals; secondly, not every cyclist with tram track related minor injuries will seek medical advice, or might be seen by another type of physician (generalist, orthopedic surgeon …). This data suggest that this study is not apt for determining true incident rates for tram tracks related cycling injuries, but it does show that tram tracks are a frequent cause of trauma in cyclists.

These tram tracks related cycling accidents appeared to be more common in females (65.1%, $p < 0.001$), with the majority occurring in individuals aged 20-30 years (31.5%). Results on gender preponderance in cycling accidents have been contradicting, with many theories around these differences (Duijm et al. 2011; de Geus et al. 2012). It is unclear whether females have a lower threshold to go to the Emergency Department compared to males. With a mean age of 34.2 years, accidents seem to happen in a rather young population compared to the mean age of Ghent inhabitants (39.4 years) (Demografische gegevens 2018). Possible explanations for this young population might be an overestimation of Ghent's population true mean age because many of Ghent's students are not official inhabitants, as well

as older people might be less likely to ride a bicycle. Teschke et al. (2016), in a smaller study of 87 patients, reported a similar age and gender distribution (Teschke et al. 2016), while Maempel et al. (2018) found it to be more frequent in males (Maempel et al. 2018).

A recent meta-analysis showed mandatory bicycle helmet legislation for all cyclists reduces head injury among all cyclists by 20% with a reduction in serious injury by 55% (Hoye 2018). Despite helmet use not being mandatory in Belgium, an increase in helmet use has been noted in recent years in the Brussels Capital Region with up to 55% of cyclists wearing a helmet (Pro Velo vzw jaarverslag 2017). However, in Flanders, there is no tradition of wearing helmets, as demonstrated in our study with only 15 (11.5%) patients wearing a helmet. There was no significant difference in encountered injuries, hospitalization rates or number of incapacity days when wearing a helmet, albeit no neurotrauma was reported in this cohort. However, the lack of people suffering more serious trauma and the limited number of people wearing a helmet in this study might be insufficient to demonstrate such a difference.

The majority of fractures and dislocations sustained by cyclists were of the upper limb (63.8%). This is in keeping with multiple previous reports (Cameron et al. 2001; Maempel et al. 2018). Twenty-four patients (19.7%) suffered a head injury, four of whom suffered facial fractures, consisting of nose fractures (2) and orbita fractures (2). In two studies, head injury rates of 4.0 up to 32.4% were reported (Cameron et al. 2001; Maempel et al. 2018).

The number of days off work prescribed by the emergency physician were registered. Locally, it is common practice for emergency physicians to prescribe a maximum of 5-7 days, while the remainder of days, if necessary, will be prescribed by the orthopedist in fracture clinics or by the general practitioner. Time off work was not affected by age, gender, helmet use, weather, hospitalization and whether or not filing a police report. Time off work increased to 6.6 days for patients sustaining any fracture or dislocation as a result to their accident. Patients with a fracture are significantly more frequently being prescribed days off work than patients without a fracture ($p = 0.02$) and are more likely to be absent from work 7 days or more ($p < 0.001$). This number will be an underestimation of the real number of days off work since we have no data on total work incapacity days. Furthermore, in a few patients, a substantial time off work was registered. One case was prescribed seven months of medical leave due to a shoulder fracture. These injuries result in major costs to the patient and the public health system, but they may also have an important economic impact on the employer. A study performed by Aertsens et al. (2010) estimated the average total cost of minor bicycle accidents at 841 euro per accident. Minor bicycle accidents were defined as bicycle accidents not involving death or heavily injured persons, implying that possible hospital visits last less than 24 hours. Considering our study also includes hospitalized patients, indicating more serious injury, the average cost of tram tracks related cycling injuries might be considerably higher.

Most accidents appeared to happen in autumn. In Flanders, it rains just 7.1% of the time, while up to 42.5% of the accidents happened in wet weather conditions (Deboosere 2018). This finding shows accidents do happen more frequently in rainy conditions ($p < 0.001$). However, this doesn't explain the seasonal peak in autumn, as 2018 had more rainy days in winter and spring (Klimatologische Overzichten van 2018). A possible explanation for this seasonal peak might be that many students with little knowledge on local traffic infrastructure start in September. Besides, these students often don't have a local general practitioner and might visit the emergency departments instead, making up for more inclusions in our study at the start of the academic year.

On-road tram tracks are known to be related with an increased risk of accident (Vandenbulcke et al. 2014). Studies conducted in Amsterdam have shown that identifying accident "hotspots" and separating trams from other vehicles and bicycles in these areas, may lead to a significant reduction in accidents (Danish Transportation Council 1995). We identified a few of these "hotspots" in Ghent (Figure 2), mainly located in the city center. Local policy makers should focus on these hotspots in an attempt to lower the number of tram tracks related cycling injuries.

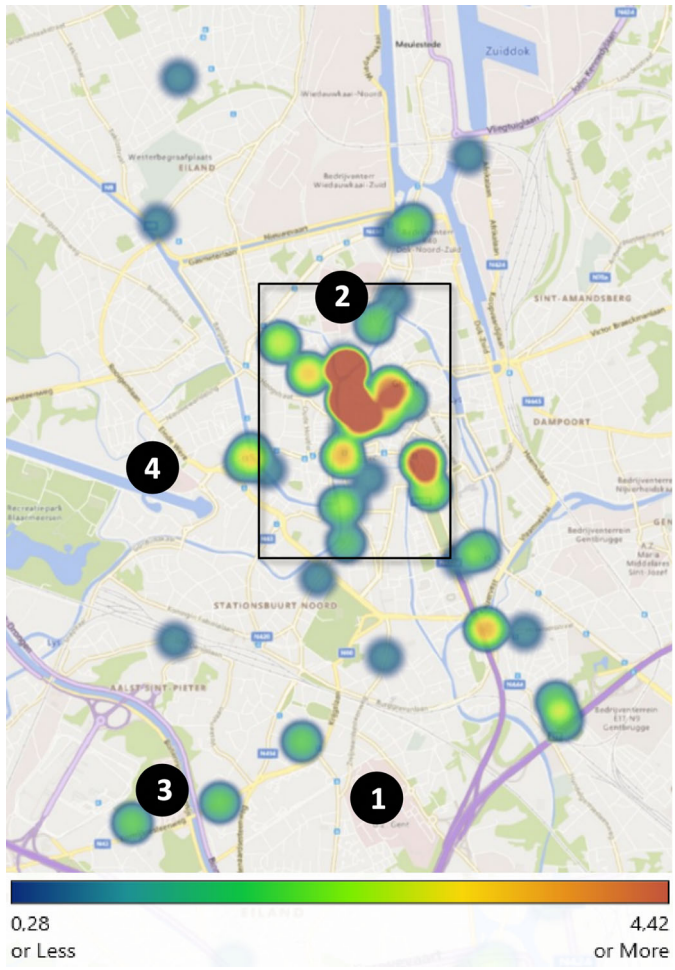

Figure 2. Heat map of Ghent with 114 known accident locations. The legend is shown below. The small box indicates the city center with 84 (73.7%) accidents. The black circles indicate the hospital locations with their corresponding numbers of Table 1.

More generally, roads in city centers crowded with cars, pedestrians, cyclists and on-road tram tracks (crossings) are probably the most dangerous for cyclists. Awareness of the potential danger of these on-road tram tracks is essential for policy makers. I.C. Cameron et al. (2001) found the number of tram tracks related cycling injuries in Sheffield fell sharply after a period of local media attention to this particular problem (Cameron et al. 2001). K. Teschke et al. (2016) found route design measures, including dedicated rail ways and cycle tracks (physically separated bike lanes), to be the best strategy to prevent the majority of track-involved injuries (Teschke et al. 2012, 2016). If this cannot be realized, another possible intervention might be the placement of rubber linings within the tram gutter, making it difficult for bicycle wheels to get trapped in them. However, these rubber linings are still in a testing phase and show disappointing results with important concerns for public safety (pedestrians tripping over these linings, derailing of trams, wearing of the rubber linings) and feasibility in turns or tram track switches (De Lijn 2019).

Our data suggests tram tracks related injuries occur most frequently in the city center in young female adults, and most frequently in autumn and significantly more in wet weather circumstances. To achieve the highest reduction in tram tracks related cycling accidents, policy makers should focus on route infrastructure (dedicated tram tracks) on one hand, and on awareness strategies with the focus on young adults on the other hand, especially near the start of the academic year.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, PL, upon reasonable request.

References

Aertsens J, de Geus B, Vandenbulcke G, Degraeuwe B, Broekx S, De Nocker L, Liekens I, Mayeres I, Meeusen R, Thomas I, et al. 2010. Commuting by bike in Belgium, the costs of minor accidents. Accid Anal Prev. 42(6):2149–2157. doi:10.1016/j.aap.2010.07.008

Cameron IC, Harris NJ, Kehoe NJ. 2001. Tram-related injuries in Sheffield. Injury. 32(4):275–277. doi:10.1016/s0020-1383(00)00196-0

Danish Transportation Council. 1995. *Light rail impact on bicycle safety: case study.* Danish Transportation Council 1995.

de Geus B, Vandenbulcke G, Int Panis L, Thomas I, Degraeuwe B, Cumps E, Aertsens J, Torfs R, Meeusen R. 2012. A prospective cohort study on minor accidents involving commuter cyclists in Belgium. Accid Anal Prev. 45:683–693. doi:10.1016/j.aap.2011.09.045

De Lijn K. 2019. In Persoonlijke communicatie, klantenreactie nr. 72019107392.

De Wilde A, Walgers N. 2019. Difference in severity of injuries sustained after bike-accidents with e-bike versus regular bike. Emergency Department of the Ghent University Hospital.

Deboosere F. 2018. Hoe vaak regent het in Vlaanderen? Deboosere, Frank. https://www.frankdeboosere.be/vragen/vraag177.php.

Demografische gegevens. 2018. Stadsbestuur Gent - Dienst Burgerzaken. https://stad.gent/sites/default/files/page/documents/demo2018.pdf.

Deunk J, Harmsen AM, Schonhuth CP, Bloemers FW. 2014. Injuries Due to Wedging of Bicycle Wheels in On-road Tram Tracks. Arch Trauma Res. 3(4):e23083. doi:10.5812/atr.23083

Duijm S, de Kraker J, Schalkwijk M, Boekwijt L, Zandvliet R. 2011. PROV 2011: Periodiek Regionaal Onderzoek Verkeersveiligheid. http://publicaties.minienm.nl/documenten/prov-2011-periodiek-regionaal-onderzoek-verkeersveiligheid.

Hoye A. 2018. Recommend or mandate? A systematic review and meta-analysis of the effects of mandatory bicycle helmet legislation. Accid Anal Prev. 120:239–249. doi:10.1016/j.aap.2018.08.001

Int Panis L, Meeusen R, Thomas I, De Geus B, Vandenbulcke-Passchaert G, Degraeuwe B, Torfs R, Aertsens J, Willems H, Frere J. 2011. Systematic analysis of Health risks and physical Activity associated with cycling PoliciES "SHAPES". Belgian Science Policy.

Klimatologische Overzichten van BK. 2018. https://www.meteo.be/nl/klimaat/klimatologisch-overzicht/2018/winter.

Maempel JF, Mackenzie SP, Stirling PHC, McCann C, Oliver CW, White TO. 2018. Tram system related cycling injuries. Arch Orthop Trauma Surg. 138(5):643–650. doi:10.1007/s00402-018-2890-4

Mobiliteitsbedrijf I. 2019. Evaluatie Circulatieplan Gent. https://stad.gent/sites/default/files/onepager/cta/Evaluatierapport%20Circulatieplan%20Gent%202019%20finaal.pdf.

Pro Velo vzw jaarverslag. 2017. Pro Velo vzw jaarverslag 2017 [press release].

Reynolds CC, Harris MA, Teschke K, Cripton PA, Winters M. 2009. The impact of transportation infrastructure on bicycling injuries and crashes: a review of the literature. Environ Health. 8:47. doi:10.1186/1476-069X-8-47

Teschke K, Dennis J, Reynolds CC, Winters M, Harris MA. 2016. Bicycling crashes on streetcar (tram) or train tracks: mixed methods to identify prevention measures. BMC Public Health. 16:617. doi:10.1186/s12889-016-3242-3

Teschke K, Harris MA, Reynolds CCO, Winters M, Babul S, Chipman M, Cusimano MD, Brubacher JR, Hunte G, Friedman SM, et al. 2012. Route infrastructure and the risk of injuries to bicyclists: a case-crossover study. Am J Public Health. 102(12):2336–2343. doi:10.2105/AJPH.2012.300762

Vandenbulcke G, Thomas I, Int Panis L. 2014. Predicting cycling accident risk in Brussels: a spatial case-control approach. Accid Anal Prev. 62:341–357. doi:10.1016/j.aap.2013.07.001

Vanparijs J, Int Panis L, Meeusen R, de Geus B. 2016. Characteristics of bicycle crashes in an adolescent population in Flanders (Belgium). Accid Anal Prev. 97:103–110. doi:10.1016/j.aap.2016.08.018

Vlaanderen T. 2018. Toerisme in Kerncijfers. https://www.toerismevlaanderen.be/sites/toerismevlaanderen.be/files/assets/publication/TVL_KERNCIJFERS_2018_NL_LR.pdf.