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## Characteristics of suicide hotspots on the Belgian railway network

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In 2004, railway suicide accounted for 5.3% of all suicides in Belgium. In 2008, Infrabel (Manager of the Belgian Railway Infrastructure) introduced a railway suicide prevention programme, including identification of suicide hotspots, i.e., areas of the railway network with an elevated incidence of suicide. The study presents an analysis of 43 suicide hotspots based on Infrabel data collected during field visits and semi-structured interviews conducted in mental health facilities in the vicinity of the hotspots. Three major characteristics of the hotspots were accessibility, anonymity, and vicinity of a mental health institution. The interviews identified several risk and protective factors for railway suicide, including the training of staff, introduction of a suicide prevention policy, and the role of the media. In conclusion, a comprehensive railway suicide prevention programme should continuously safeguard and monitor hotspots, and should be embedded in a comprehensive suicide prevention programme in the community.

**Keywords:** railway suicide; suicide hotspots; suicide prevention

### Introduction

Railway suicide accounts for 1–12% of all suicides internationally, and despite its statistical rarity, it is a highly lethal method with up to 94% of attempts leading to death (Kryszyska & De Leo, 2008; Ladwig, Ruf, Baumert & Erazo, 2009). In 2004, railway suicide accounted for 5.3% of all suicides in Belgium, a Western European country with relatively high suicide rate (19.1/100,000 in 2004) (Andriessen & Kryszyska, 2012). In 2008, Infrabel (Manager of the Belgian Railway Infrastructure) introduced a comprehensive railway suicide prevention programme, including identification of railway suicide 'hotspots,' i.e., areas of the railway network with an elevated incidence of suicide (Infrabel, 2012). These high-risk locations became the targets of interventions aiming at improving safety on the Belgian railway network, mostly by limiting access to the infrastructure, e.g., by setting up fences, and locking up service entrances.

Limiting access to lethal suicide means and high-risk locations is an effective evidence-based suicide prevention strategy (Mann et al., 2005; Pirkis et al., 2013; Sarchiapone, Mandelli, Iosue, Andrisano, & Roy, 2011). This approach has been also recommended in the context of railway suicides (e.g., Erazo, Baumert, & Ladwig, 2004; Ladwig et al., 2009; RESTRAIL Project, 2013), although to-date there is limited evidence regarding its application and effectiveness on the railway networks (Cox et al., 2013; Law et al., 2009).

A detailed analysis of the epidemiology of fatal and non-fatal suicidal behaviour on the Belgian railway network over the period of 1998–2009, including a description of methodology to identify suicide hotspots, has been presented in an earlier publication (Andriessen & Kryszyska, 2012). The aim of the current report is to present a more detailed description of the characteristics of railway suicide hotspots in Belgium. In this way, we hope to contribute to the knowledge regarding the possible strategies for preventing suicide on railway networks.

### Material and method

The data regarding the incidence of fatal and non-fatal suicidal behaviour on the railway network in Belgium were provided by the Suicide Prevention Unit of Infrabel. The procedure to identify railway suicide hotspots included (a) identification of all railway suicide cases (fatal suicidal behaviour only) from 2003 to 2009, (b) classification of cases by municipality, (c) identification of municipalities in which at least five suicide deaths occurred over the study period, and in which, independent from the size of the municipality, in total occurred at least one-third of all railway suicide cases over the specified 5-year period. In addition, a specific place on the railway network was labelled as a hotspot when at least two suicides were recorded in a 2-km section in the 5-year period.

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The characteristics of the hotspots were identified during field visits conducted by members of the Infrabel Suicide Prevention Unit, technical staff, and other relevant officials in 2009–2012 and assessed using a checklist and photographic equipment. The checklist contained items related to the accessibility of the location, characteristics of its environment (especially a mental health facility within a radius of 2 km), and features of the local railway infrastructure, i.e., the platforms, the lighting systems, the level crossings, fences and unofficial pedestrian tracks, and vegetation. Additionally, data regarding the type of trains involved in 114 subsequent cases of suicide and attempted suicide in 2011 was analysed on the basis of reports prepared by the Infrabel staff as a part of official procedure following a suicide incident on the railway network.

Nineteen semi-structured interviews with management and staff of mental health facilities were conducted in 2009–2012 in order to gather additional information and insights regarding factors that might influence the choice of a suicide location, particularly a hotspot, on a railway network. These interviews were conducted in psychiatric institutions with ( $n = 17$ ) or without ( $n = 2$ ) recorded cases of railway suicide. The semi-structured interviews included questions concerning the incidence of suicide and railway suicide among the patients, the hospital suicide prevention policies and protocols, and the possible risk and protective factors for railway suicide in the vicinity of the hospital. Common themes were identified in the interview reports.

## Results

During the period 2003–2009, there were 664 suicides and 557 suicide attempts on the Belgian railway network. Following the procedure described in the Method section, over the study period, 43 railway suicide hotspots were identified. The number of suicides at the individual hotspots ranged from 2 to 12 ( $M = 3.6$ ). Table 1 presents the characteristics of the identified hotspots.

All identified hotspots were easily accessible via platforms, level crossings, service entrances, and/or parallel streets or roads, and 30 hotspots (69.8%) provided anonymity to the suicidal person. The visibility of 24 hotspots (55.8%) for the train driver was limited due to excessive vegetation and/or a turn on the railway track. Seventeen hotspots (39.5%) were located in the vicinity of a mental health facility. In addition, three of the hotspots (hotspots 20, 26 and 39) were plagued by problems, such as vandalism or graffiti. The number of hotspots characteristics does not seem to be related to the number of suicides at the location. For example, the hotspot with the highest number of suicides ( $n = 12$ ) had three characteristics (high accessibility, anonymity and presence of a mental health facility), while three locations featuring all five identified risk factors had six suicides (Hotspot 8), four suicides (Hotspot 5), and two suicides (Hotspot 19).

However, the presence of a mental health facility could be related to a higher incidence of suicides: the average numbers of suicides at the hotspots with a mental health facility ( $n = 17$ ) and without mental health facility ( $n = 26$ ) were 4.1 and 3.2, respectively.

According to the management and staff of mental health facilities, introduction of procedures and guidelines regarding identification and treatment of suicidal patients, and relevant staff training, might contribute to a lower number of railway suicides among the patients. On the other hand, vicinity and ease of access to the railway, especially in case of open psychiatric institutions, as well as provision of treatment to patients with high and acute suicide risk, seemed to be linked with higher incidence of railway suicide. Uncoordinated response to a suicide of a patient may also increase the risk of suicide, and imitation effect ('copycat suicides') among patients may contribute to the emergence of a suicide hotspot near a mental health facility. In some cases, mass media can play a role in creating a suicide hotspot by giving excessive publicity to cases of suicide on the railway and/or providing information about the location and details of the method.

The management and the staff of some of the mental health institutions suggested that the type of a train (implying the train speed) may be a factor influencing the choice of location for a railway suicide. In order to check this assumption, an additional analysis of suicide and attempted suicide cases on the Belgian network in 2011 was conducted. The analysis showed that all types of trains, i.e., regional trains ( $n = 44$ ), fast intercity trains ( $n = 41$ ), rush hour trains ( $n = 6$ ) and international high speed train ( $n = 2$ ), were involved in the reported cases. There were also 15 cases of suicide involving a freight train, 5 cases with an empty service train, and 1 case with a mobile work train.

## Discussion and conclusion

The current study provided detailed information regarding the characteristics of suicide hotspots on the Belgian railway network. In general, these high-risk locations were easily accessible, provided anonymity to persons contemplating suicide and were located in the vicinity of mental health institutions. In many cases, the visibility of the place was limited due to excessive vegetation and/or presence of a turn. The presence of a mental health institution in the vicinity of a train suicide hotspot has been reported in earlier studies, including studies in Germany (Erazo et al., 2004), the Netherlands (van Houwelingen, Kerkhof, & Beersma, 2010), and Australia (De Leo & Krysinska, 2008). Lack of information regarding the mental health history of individuals who died by suicide on the railway network in Belgium does not allow drawing direct conclusions regarding the choice of suicide method and location of suicide of patients of the mental health institutions.

Table 1. Characteristics of hotspots identified at the Belgian railway network, 2003–2009.

Hotspot	Suicide (N)	Accessibility	Accessibility via	Anonymity	Excessive vegetation	Turn	Vicinity of a mental health facility
Hotspot 15	12	Yes	Platforms, temporary service entrance, parallel street	Yes	No	No	Yes
Hotspot 7	6	Yes	Level crossings, platforms	Yes	No	No	Yes
Hotspot 8	6	Yes	Level crossings, parallel road, parking	Yes	Yes	Yes	Yes
Hotspot 14	6	Yes	Old railway courtyard	Yes	No	No	No
Hotspot 23	5	Yes	Platforms	No	No	Yes	Yes
Hotspot 31	5	Yes	Level crossing, platforms	Yes	No	Yes	Yes
Hotspot 35	5	Yes	Level crossings	No	No	No	No
Hotspot 38	5	Yes	Platforms, service entrance	No	No	No	No
Hotspot 40	5	Yes	Platforms	No	No	Slight	Yes
Hotspot 1	4	Yes	Service stairs	Yes	Slightly	Slight	No
Hotspot 2	4	Yes	Level crossing, shortcut along the railway track	Yes	Slightly	No	No
Hotspot 5	4	Yes	Station	Yes	Yes	Yes	Yes
Hotspot 9	4	Yes	Platforms, service entrances	Yes	No	No	No
Hotspot 17	4	Yes	Level crossings	No	No	No	No
Hotspot 21	4	Yes	Platforms, parallel street	Yes	No	Yes	Yes
Hotspot 22	4	Yes	Level crossings, parallel street	No	No	Yes	No
Hotspot 24	4	Yes	Parallel street, service entrance	Yes	No	No	No
Hotspot 26	4	Yes	Platforms	Yes	Yes	Yes	No
Hotspot 34	4	Yes	Level crossing, parallel street	Yes	Yes	Yes	No
Hotspot 41	4	Yes	Level crossings	No	No	Slight	No
Hotspot 43	4	Yes	Platforms, service entrance, shortcut along the railway track	Yes	No	Slight	Yes
Hotspot 10	3	Yes	Platforms	No	No	No	No
Hotspot 11	3	Yes	Level crossings	Yes	No	Slight	No
Hotspot 12	3	Yes	Level crossing, park, parking	Yes	No	Yes	Yes
Hotspot 18	3	Yes	Platforms	No	No	No	Yes
Hotspot 27	3	Yes	Service entrance	Yes	No	No	Yes
Hotspot 30	3	Yes	Level crossing, shortcut along the railway track	Yes	No	Slight	No
Hotspot 33	3	Yes	Level crossing, service entrance	Yes	Slightly	Slight	No
Hotspot 3	2	Yes	No fence between street and platform	Yes	Slightly	No	Yes
Hotspot 4	2	Yes	Station, service entrance	No	No	No	Yes
Hotspot 6	2	Yes	Parallel streets, service entrances	Yes	No	No	No
Hotspot 13	2	Yes	Level crossings, platform, closed platform	Yes	No	Yes	No
Hotspot 16	2	Yes	Closed level crossing	No	No	No	No
Hotspot 19	2	Yes	Shortcut along the railway track	Yes	Yes	Yes	Yes
Hotspot 20	2	Yes	Platforms	Yes	No	No	No
Hotspot 25	2	Yes	Platform, service entrance	Yes	Yes	No	No
Hotspot 28	2	Yes	Parallel street, via a railway ramp	Yes	No	Slight	Yes
Hotspot 29	2	Yes	Platforms	No	No	No	No
Hotspot 32	2	Yes	Level crossings	Yes	No	No	No
Hotspot 36	2	Yes	Closed level crossing	Yes	No	Slight	No
Hotspot 37	2	Yes	Level crossing, road	Yes	No	No	No
Hotspot 39	2	Yes	Platforms	Yes	No	No	Yes
Hotspot 42	2	Yes	Platforms	No	No	Slight	No

However, it has been confirmed during the interviews conducted in the mental health facilities that some of their patients died on the railway track.

The easy accessibility and the limited visibility of the track at the hotspot location have been earlier reported as risk factors (e.g., Erazo et al., 2004). Our study has not found indications that the number of hotspots characteristics is related to the number of suicides. This indicates the need to conduct further studies looking at the role of other

factors, including train traffic intensity and population density (e.g., van Houwelingen, Baumert, Kerkhof, Beersma, & Ladwig, 2013) and the socio-economic status of the area (e.g., Abbot et al., 2003). Also particular clusters of risk factors and/or interactions between a number of factors might be of crucial importance in determining the incidence and location of railway suicides (Ladwig, Kunrath, Lukaschek, & Baumert, 2012; van Houwelingen et al., 2010).

Interviews conducted in a number of mental health facilities provided additional information and insights regarding the risk and protective factors, which might influence the choice of the method and location of a suicide. The role of imitation effect among patients and the role of the mass media in creating and maintaining a 'hotspot reputation' of a location have been mentioned in earlier studies (Erazo et al., 2004; O'Donnell, Farmer, & Catal, 1996). The interviewees also stressed the role of training for the staff, including identification and treatment of suicidal patients, and the importance of a coordinated response in case of a patient suicide, in prevention of suicide and 'copycat suicide' among the patients.

The study found that the type of a train is not necessarily related to the incidence of a railway suicide (a suggestion of some of the interviewees). This observation seems to suggest that the association 'railway-train-suicide' is sufficient to attract vulnerable individuals to the railways, without paying attention to the type of the railway traffic. For example, generally, the information about the timetables and the availability of the freight trains is not known to the public. Suicide involving this type of train might thus be a coincidence or might result from a thorough preparation of the suicidal act (O'Donnell et al., 1996). However, this observation has to be treated with caution, as this preliminary analysis was not applied to the suicide cases at the identified railway hotspots.

In conclusion, the study has identified a number of characteristics of high suicide risk locations on the Belgian railway network. Some of the features of the hotspots, especially the vicinity of a mental health institution, have been reported earlier in the literature and indicate the need to closely collaborate with mental health services in prevention of railway suicide. Also, the ease of access, anonymity, and limited visibility of the hotspots call for preventive measures related to increased safety on the railway networks and good maintenance of the infrastructure. The suicide prevention measures applied by Infrabel at the hotspots in Belgium include limiting access to the railway infrastructure by setting up fences, closing some of the level crossings, locking up service entrances and unofficial pedestrian tracks, and breaking down old unused platforms repeatedly used as 'springboards' for suicide (Infrabel, 2012). Also, vegetation hindering the driver's view and providing hiding place is being removed to improve the railway track visibility for the train drivers. In addition, collaboration with media to avoid publicising the high-risk locations and railway suicide cases is recommended, as well as promotion of hotlines, crisis intervention and mental health services, and training of railway staff regarding suicide warning signs and basic intervention skills (Infrabel, 2012).

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