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Temporal and spatial patterns of suicides in Stockholm's subway stations

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ABSTRACT

This paper investigates the potential temporal and spatial variations of suicides in subway stations in Stockholm, Sweden. The study also assesses whether the variation in suicide rates is related to the station environments by controlling for each station's location and a number of contextual factors using regression models and geographical information systems (GIS). Data on accidents are used as references for the analysis of suicides. Findings show that suicides tend to occur during the day and in the spring. They are concentrated in the main transportation hubs but, interestingly, during off-peak hours. However, the highest rates of suicides per passenger are found in Stockholm's subway stations located in the Southern outskirts. More than half of the variation in suicide rates is associated with stations that have walls between the two sides of the platform but still allow some visibility from passers-by. The surrounding environment and socioeconomic context show little effect on suicide rates, but stations embedded in areas with high drug-related crime rates tend to show higher suicide rates.

1. Introduction

Suicides are rare events. In Sweden, the number of suicides has declined by almost 50 percent since 1980 (2237 suicides). In 2008, 1467 suicides were recorded in Sweden (Karolinska Institutets Folkhälsoakademi, 2010). Yet suicide is one of the main public health issues in Sweden (Rådbo et al., 2005). With around 9 million inhabitants, Sweden registered a yearly average of 1500 official suicides over the past 30 years (Socialstyrelsen, 2006). In 2008, suicides in transportation environments (including trains and other objects in motion) accounted for about 5 to 10 percent of all suicides in Sweden; the main cause is poisoning, at 30 percent (Karolinska Institutets Folkhälsoakademi, 2010: 30). In Stockholm county, 284 suicides were recorded in 2008 – 17 percent of Sweden's total. The most common method was hanging or suffocation, followed by jumps from a height or in front of a moving object (Fig. 1). Although the figures for suicides committed in transportation environments might be perceived as small, suicide in public places, such as subway stations and rail lines, has a stronger impact on society as a whole than more private means of suicide do. Train suicides lead to high costs as a result of driver and bystander trauma, as well as service delays (O'Donnell and Farmer, 1994). Suicides in transportation environments are often covered by the media, which might influence subsequent suicide cases (Sonneck et al., 1994) or produce 'an uncomfortable image' of transportation locations by many travellers who use them on a daily basis.

Railway suicides in Sweden tend to happen during the daytime in more densely populated areas like Stockholm, with a weak increase during the warmer half of the year (Rådbo et al., 2005). Those findings provide an interesting starting point. However, railway stations differ from subway stations in terms of size and design. Railway stations are open, large structures found anywhere in the country, whereas subway stations are generally underground structures concentrated in large cities. Moreover, although Rådbo et al. checked for time variations of suicide events, they did not investigate the effect of differences in the railway environment on suicide rates.

Here, we postulate that the time and the station's environment can affect decisions to commit suicide. The objective of this article is to identify potential temporal and spatial patterns of suicide events in subway stations. The study also assesses whether the environments of these stations and their contexts can help explain variations in suicide rates. Investigation of the temporal and environmental aspects of suicides might ultimately help to prevent them. This study makes a direct contribution to suicide prevention by presenting specific patterns over time and space and identifying the environmental aspects of subway stations that may influence

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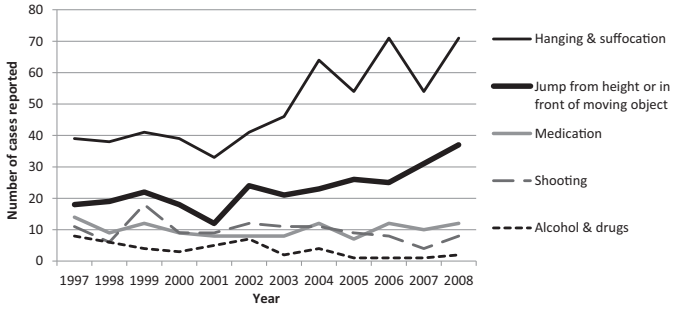

Fig. 1. Number of cases for certain methods of suicide (ages 15–24) in Stockholm county from 1997 to 2008. Source: Karolinska Institutets Folkhälsoakademi (2010).

the choice of location for suicide. These results may help transport, police, health, and security authorities to improve safety in public places, such as subway stations, and decrease the societal and psychological costs resulting from suicide in railway environments.

In this study, fatal accidents are used as reference for the analysis of suicides at subway stations. Because accidents may have different causes than suicides, they should show a different profile in terms of temporal and spatial patterns. Also, one of the difficulties in working with secondary sources for suicide data, such as the ones used in this study, is untangling 'suicide' events from 'accident' events. Although transportation agencies differentiate between accidents and suicides, no clear-cut distinction can be established in some cases. In Stockholm county, about 19–25 percent (for man and for women, respectively) of the cases were unsure reports of suicide, which is high compared to the national average of 20 percent (Karolinska Institutets Folkhälsoakademi, 2010). For this reason, this study reports and analyses data on suicides in parallel to data on accidents. Accidents in transportation environments are expected to differ from suicides in both geography and in temporal patterns because they are caused by other factors. Therefore, accidents are not further analysed; they function here as a 'background' or 'benchmark' for the data on suicides.

The study combines different types of geographical information systems (GIS) to geographically map event and socioeconomic data. GIS is also used for buffer and distance analyses regarding the spatial location of events and psychiatric care centres. Statistical software is used to visualise time variations and analyse relationships between suicide rates and the environmental variables. This unique analysis combines both temporal and spatial data to uncover the environmental patterns of suicides in Stockholm's subway stations.

This article first discusses the existing literature on the temporal aspects of suicides in stations and transportation settings. It then focuses on the spatial and contextual aspects of the environment where suicides take place. Section 3 presents the framing of the case study, with data description and methods. The results are presented in Section 4, focusing first on the temporal analysis, followed by the spatial analysis and modelling. The results are discussed in Section 5, and final conclusions are presented in Section 6.

2. Theory and hypotheses of the study

Many international studies show an overrepresentation of specific population groups committing suicides. Men are overrepresented; more specifically, younger men between 20 and 40 years old. Swedish studies also show that young men are much more likely to commit suicide than women (Sonneck et al., 1994; Rådbo et al., 2005). In Germany, Ladwig and Baumert (2004) found that most suicides were committed by people between the ages of 20 and 29 and that the median age of the men was lower than that of the women. For people under the age of 49, most suicides were related to the subway, as compared to other methods (Ladwig and Baumert, 2004). Schmidtke (1994) also found that nearly half of the recorded railway suicide events in Germany occurred among men between 20 and 39 years old; for women, no such significant difference was found. Similarly, they found that railway suicides in Germany were more common among younger age groups. In the southern hemisphere, results are similar; in Australia, De Leo and Krysinska (2008) found that railway suicides peak among young men, with men between the ages of 15 and 24 making up nearly 30 percent of all cases. A peak among younger males and females was also observed in a study on the London Underground system; in 40 percent of the cases, the person was between 15 and 34 years old (O'Donnell and Farmer, 1994). Men with alcohol and drug consumption problems also dominate suicide statistics (Krysinska and De Leo, 2008). Although this study does not focus on the characteristics of those who commit suicide, it is important to note that there are features of an individual, such as age and gender, which are particularly relevant to explain general patterns of suicides.

2.1. Temporal factors affecting suicides in transit stations

2.1.1. Daily variations

Researchers have shown contrasting findings regarding the timing of suicide. Previous studies in Germany, Australia, and the Netherlands suggest that most suicides are committed during the afternoon hours (Erazo et al., 2004; Ladwig and Baumert, 2004; Houwelingen and Beersma, 2001; Emmerson and Cantor, 1993) as certain events may build up during the day and culminate in suicide in the afternoon, especially around sunset (De Leo and Krysinska, 2008; Houwelingen and Beersma, 2001; Schmidtke, 1994). Furthermore, during the darker hours, a person is less easily detected and may have a better chance of success when committing suicide. In a later study, Erazo et al. (2005) argue that the highest rate of occurrence is at night, whereas Schmidtke (1994), also studying a German case, found the lowest numbers during the night.

Contrary to previous evidence, O'Donnell and Farmer (1994) suggest in their study on the London underground that suicide peaks occur outside rush hours at mid-day between 11:00 and 16:00. Rush hours may be avoided by people aiming to commit suicide because of the unwanted crowds, attention, and possible intervention during these hours. These findings are contested by Houwelingen and Beersma (2001), who found a peak around the rush hours in late afternoon in the Netherlands, but still most events happen during the day.

2.1.2. Weekly variations

Most studies indicate that weekends (Saturday and Sunday) have fewer suicides as compared to weekdays (De Leo and Krysinska, 2008; Erazo et al., 2004). Several studies in Germany found that most suicides occur at the beginning of the week (Monday to Wednesday) (Erazo et al., 2004; Ladwig and Baumert, 2004; Schmidtke, 1994; Emmerson and Cantor, 1993). It is thought to be a threshold for depressed individuals because it is the start of a new week in which they will, again, see themselves 'failing'. Yet De Leo and Krysinska (2008) showed that in Australia, most acts of suicide at railways happen on Thursdays and Fridays. They also found a strong relationship between suicides and drug and alcohol use, which may relate suicides to unstructured activities (leisure time, for example) outside ones' routine.