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Insights on train-pedestrian collisions on Finnish railways – What do we know based on in-depth accident data?

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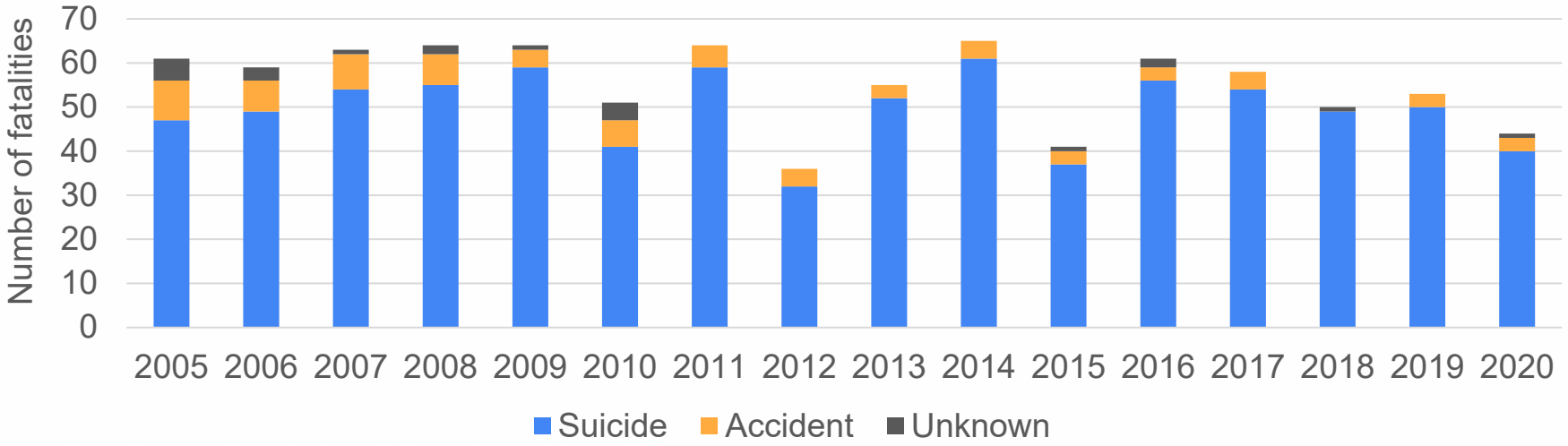
Train-pedestrian collisions in Finland

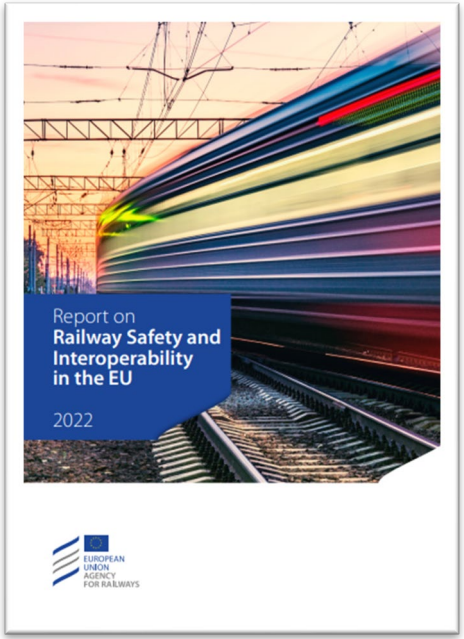
- Most common accident type among all fatal railway accidents occurring on Finnish railways (~ 90%)



Train-pedestrian collisions in Europe

- This same trend is also visible in European statistics

- Railway **suicides** represent around **75% of all fatalities** on railways
- Railway suicides **together with fatalities of unauthorised persons** on railway premises, constitute **90% of all fatalities** occurring within the railway system
- **2,204 railway suicides and 411 trespasser fatalities** were recorded on railways **in the EU-27 in 2020**



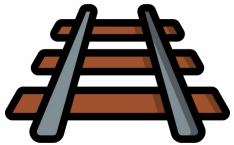
Source: *European Union Agency for Railways, 2022.*

Challenge

- Data on train-pedestrian collisions is scattered across several databases

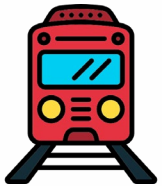
Finnish Police

Police reports (including interviews of family and potential eyewitnesses)



Finnish main rail operator (VR Group Ltd.)

Location and time, event from engine driver perspective, type of train



Finnish Transport Infrastructure Agency (IM)

Location and time

Rescue Department

Location (coordinates), time & severity

Statistics Finland

Death certificates (including findings from autopsy and from police report)

Objectives

1) To compile information on train-pedestrian collisions to one database

2) To describe the frequency of fatalities, timing of collisions and characteristics of persons killed in train-pedestrian collisions

3) To investigate similarities and differences between accidents vs. suicides

National objective

Finnish Traffic Safety Strategy 2022–2026:

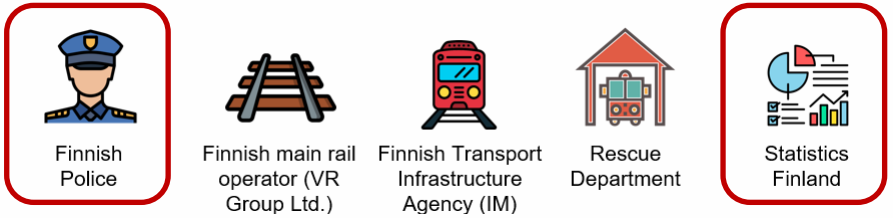
According to the zero vision of the Strategy, by 2050 **nobody shall die or be seriously injured in traffic**, regardless of the mode of transport (published by the Ministry of Transport and Communications)

One of the seven strategic guidelines: **Decision-making must be based on knowledge**

Traffic Safety Strategy 2022 - 2026

Data

- Data was obtained from five different sources
- Years covered: 2005–2020
- 889 train-pedestrian fatalities:
  - 795 suicides (90%)
  - 73 trespassing fatalities (8%)
  - 21 unclassified events (2%)



Official sources of information on the seriousness and intentionality of train-pedestrian collisions

Data – Variables

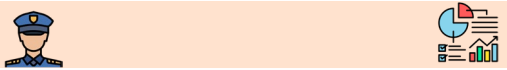
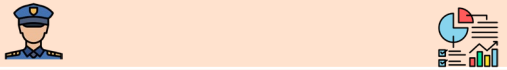
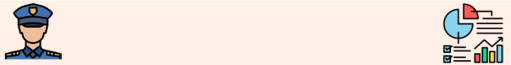

Finnish Police


Finnish main rail operator (VR Group Ltd.)


Finnish Transport Infrastructure Agency (IM)


Rescue Department


Statistics Finland

Variable	Source of information
Location and time	
Gender and age	
Intentionality	
Pre-crash behaviour	
Intoxication	
Mental health	
Information on self-destruction	
Information on suicide note or farewells	
Type of train	

Method – Modelling

- Multivariate logistic regression analyses were used to assess the **effect of various background variables** on
  i) whether a collision had been accidental or intentional, and
  ii) whether a track kilometre was associated with one or multiple train-pedestrian collisions
- **Why?** To identify most influential background factors associated to above comparisons

Results – In-depth analysis (1/2)

Common findings (accidents + suicides)

- Most victims were **male** (accidents 75%, suicides 71%)
- Most victims were in the **20–29 year age group** (accidents 26%, suicides 29%)
- Both suicides and accidents had a **relatively even distribution by month and weekday**; accidents occurred somewhat more frequently at the end of the week (from Friday to Sunday) compared to other weekdays
- Most victims (70%) were hit by a **passenger train**
- Out of all train–person fatalities, 25% occurred **at currently or formerly used railway stations or in their vicinity** (not more than 100 m away)

Results – In-depth analysis (2/2)

Accidents

- Most frequently during **rush hours,** in the **evening** or **after midnight**
- 64% of victims were **intoxicated**
- Accidents happened most frequently in situations where a person was **crossing the track** or was **lying/sitting on the tracks**

Suicides

- Most frequently in the **evening** (18–24)
- 41% were intoxicated
- Most victims **waited on the tracks** before the train arrived. Other behaviours included e.g. **running/jumping** in front of the train and walking in front of the train
- 26% suffered from **mental health problems** (+19% lately had problems)
- 32% had tried to commit suicide previously or had threatened to do so.
- 23% left a suicide note or farewells

Results – Modelling (1/2)

- Collision was **significantly more likely to be accidental** if it occurred on a weekend, if the victim was intoxicated, 65 years old or older or if travelling in a group
- Collision was **significantly more likely to be intentional** if the person had previous suicide attempts, mental health problem or if the event occurred in the evening (18–24)

Accidents
Weekend
Intoxication
65 years old or older
Travelling in a group

Suicides
Previous suicide attempts
Mental health problems
Evening (18–24)

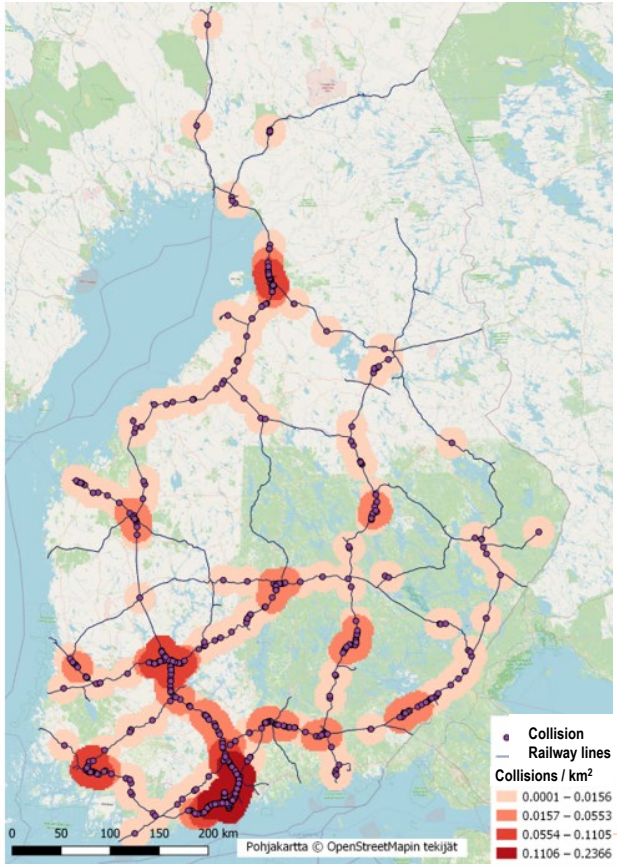
Results – Modelling (2/2)

- The results showed that a track kilometre was **significantly more likely to be associated with multiple train-pedestrian collisions** if it is located....

Multiple collisions
Urban area
Station area
Level crossing
Bridge within 100 metres
High average number of daily trains

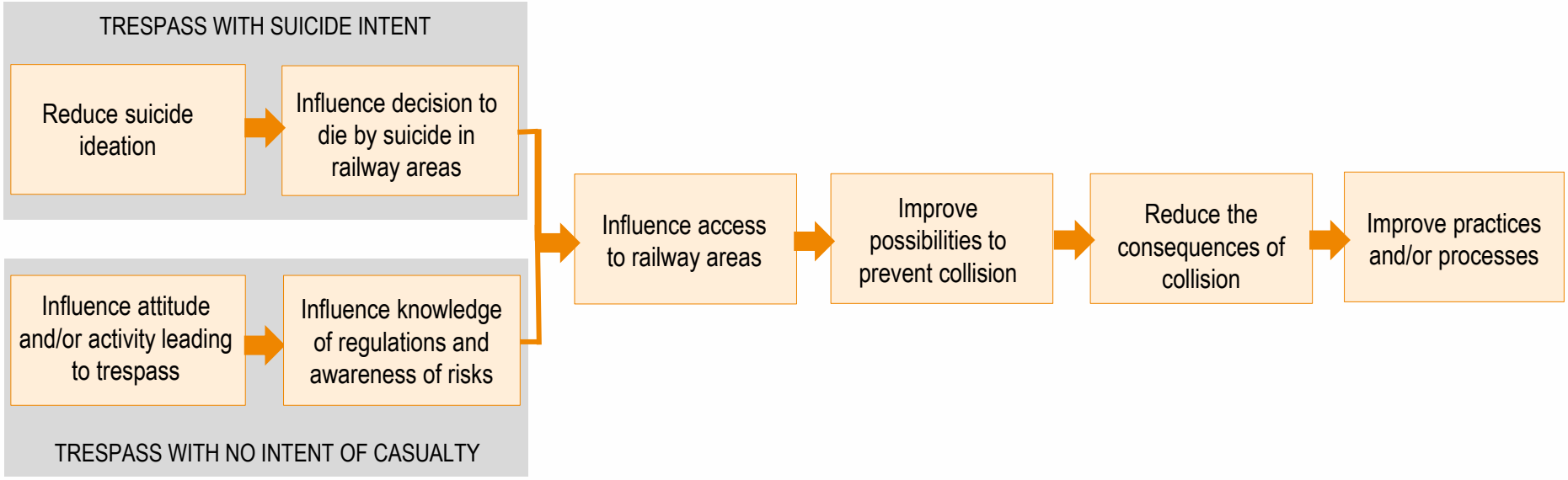
Discussion

- The results can be used when planning preventative efforts
- Prevention of train-pedestrian collisions is challenging due to the substantial length of the railway network (5,926 km of railway lines)
- Some measures have already been applied in Finland for the prevention of train-pedestrian collisions, and some are being considered

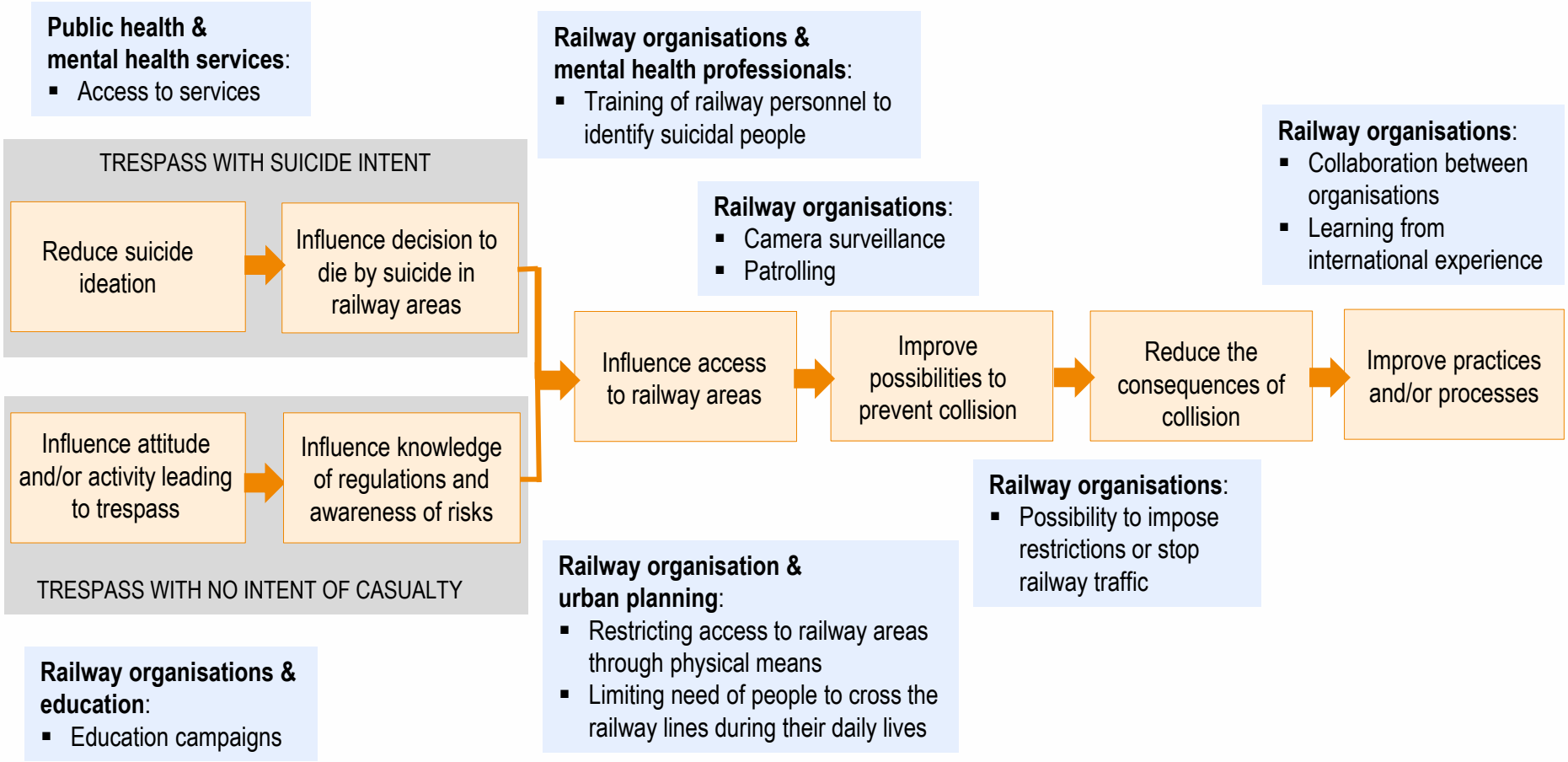


Source: *Silla & Mesimäki, 2022.*

Type of measures linked to different phases of process leading to train-pedestrian collision



The categories for types of measures were adapted from Silla, 2022; Gabree et al., 2014 and Burkhardt et al., 2012.


Public health & mental health services:
- Access to services
Railway organisations & mental health professionals:
- Training of railway personnel to identify suicidal people
Railway organisations:
- Collaboration between organisations
- Learning from international experience
TRESPASS WITH SUICIDE INTENT
Reduce suicide ideation
Influence decision to die by suicide in railway areas
Railway organisations:
- Camera surveillance
- Patrolling
Influence access to railway areas
Improve possibilities to prevent collision
Reduce the consequences of collision
Improve practices and/or processes
Influence attitude and/or activity leading to trespass
Influence knowledge of regulations and awareness of risks
TRESPASS WITH NO INTENT OF CASUALTY
Railway organisations:
- Possibility to impose restrictions or stop railway traffic
Railway organisation & urban planning:
- Restricting access to railway areas through physical means
- Limiting need of people to cross the railway lines during their daily lives
Railway organisations & education:
- Education campaigns

Conclusions – Key messages

- Detailed information is important
- Effective prevention of train-pedestrian collisions calls for a systems approach
- Cooperation and sharing of information also outside railway community is important

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