

Switzerland - Bus-Exposure Matrix

Irina Guseva Canu

Report generated on: April 15, 2025

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Identification

SURVEY ID NUMBER

10.16909-dataset-51

TITLE

Bus-Exposure Matrix

SUBTITLE

A tool for assessing the physico-chemical exposure of bus drivers

ABBREVIATION OR ACRONYM

BEM

TRANSLATED TITLE

Matrice de bus-exposition

COUNTRY

Name	Country code
Switzerland	CHE

ABSTRACT

Swiss bus drivers suffer from musculoskeletal disorders, fatigue, and stress, and have an excess of mortality from lung cancer and suicide. However, their occupational exposure is poorly documented.

We created a bus-exposure matrix (BEM) to determine exposures (mean and standard deviation) to equivalent noise, peak noise, whole-body vibration (WBV), floor vibration, high-frequency and low-frequency electric fields, low-frequency magnetic fields, air exchange rate and the ratio between internal and external air particles in PM10 and ultrafine particles for 710 bus models used in Switzerland since 1980. For this, we made a bus inventory, identified ten bus-models representative of the Swiss fleet evolution, and conducted static and dynamic exposure measurement campaigns between November 2021 and May 2023. The measured values were then extended to the entire fleet using Integrated Nested Laplace Approximation (INLA) models. The choice of predictors, technical bus characteristics from the bus inventory, included in the model was based on directed acyclic graphs.

The BEM is an original tool to assess retrospective exposure to physico-chemical hazards that will enable further research in occupational health of bus drivers.

KIND OF DATA

Observation data/ratings [obs]

UNIT OF ANALYSIS

Bus model

Version

VERSION DESCRIPTION

version 2.1

The BEM contains the exposures (mean and standard deviation) to whole-body vibration, floor vibration, equivalent noise, peak noise, high- and low-frequency electric fields, low-frequency magnetic fields, air exchange rate, and outdoor/indoor particulate pollution ratios for PM10 and ultrafine particles for 710 bus models (Brand and model).

VERSION DATE

2025-04-07

VERSION NOTES

The exposure values were updated and new bus models were added.

Scope

NOTES

bus drivers' exposure to physico-chemical hazards

KEYWORDS

Keyword
Bus
Occupation exposure
Noise
Vibration
Electric fields
Magnetic fields
Air particles

Coverage

GEOGRAPHIC COVERAGE

National coverage

UNIVERSE

Bus drivers

Producers and sponsors

PRIMARY INVESTIGATORS

Name	Affiliation
Irina Guseva Canu	Unisanté, University Center for Primary Care and Public Health, Lausanne, Switzerland

PRODUCERS

Name	Abbreviation	Affiliation	Role
Viviane Remy	REV	Unisanté, University Center for Primary Care and Public Health, Lausanne, Switzerland	Researcher, co-author
David Vernez	DVE	Unisanté, University Center for Primary Care and Public Health, Lausanne, Switzerland	co-author
Thomas Charreau	TCR	Unisanté, University Center for Primary Care and Public Health, Lausanne, Switzerland	Data manager
Giles Innocent	GIN	Biomathematics and Statistics Scotland, The King's Buildings, Edinburgh, Scotland	Co-author, assistance in modeling

FUNDING AGENCY/SPONSOR

Name	Abbreviation	Role
Federal Office of Transport	FOT	Financing
Federal Office of Environment	FOEN	Financing

OTHER IDENTIFICATIONS/ACKNOWLEDGMENTS

Name	Affiliation	Role
Blaise Dupertuis	Unisanté, University Center for Primary Care and Public Health, Lausanne, Switzerland	Maintenance and preparation of measuring equipment
Deyan Poffet	Unisanté, University Center for Primary Care and Public Health, Lausanne, Switzerland	Support for the first measurement campaigns
Laurie Dorange-Pattoret	Unisanté, University Center for Primary Care and Public Health, Lausanne, Switzerland	Support for the first measurement campaigns

Data collection

DATES OF DATA COLLECTION

Start	End
2021/11/17	2023/05/30

DATA COLLECTION MODE

Other [oth]

SUPERVISION

Giles Innocent (data modeling)

David Vernez (measurement protocol)

Irina Guseva Canu

DATA COLLECTION NOTES

The measurement campaigns took place in French-speaking Switzerland between November 17, 2021, and May 30, 2023. A total of ten bus models were measured.

Exposure values were modeled between June 2023 and April 2025

DATA COLLECTORS

Name	Abbreviation	Affiliation
Viviane Remy	REV	Unisanté, University Center for Primary Care and Public Health, Lausanne, Switzerland

Data Processing

DATA EDITING

We collected the measured data and then calculated average exposure values for the various physico-chemical hazards for urban and regional roads where applicable.

Then, for each physicochemical exposure, we created mathematical models to extend these exposure values to the entire Swiss bus fleet. We used INLA to model the data. The modeled values were then checked to ensure that they were feasible (no negative concentrations) and consistent with existing literature.

Data analysis and modeling with the free software R, version 4.2.3

Access policy

CONTACTS

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ACCESS CONDITIONS

The dataset is available on request for research purpose only.

To get access to data, the following procedure must be followed:

- Create an account (Login → Register)
- Go to the Data Catalog and click on the study of interest (<https://doi.org/10.16909/dataset/51>)
- Once on the study page, click on the tab Data Access
- Fill in the application form and submit

Important: Before submitting a request, please check whether the data is at all useful for your project. The codebooks with the corresponding information are filed under Documentation and do not require registration.

CITATION REQUIREMENTS

Remy, V.F.M., Innocent G., Vernez, D., and Guseva Canu, I. Bus-Exposure Matrix. Center for Primary Care and Public Health (Unisanté), University of Lausanne, Switzerland. Version 1.0 of the licensed dataset (03/2024), provided by the Unisanté Research Data Repository. DOI:10.16909/DATASET/51

ACCESS AUTHORITY

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LOCATION OF DATA COLLECTION

Unisanté Data repository

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Metadata production

DDI DOCUMENT ID

10.16909-dataset-51

Data Dictionary