



Maastricht University

*Leading
in Learning!*

Emergency Medical Services Research @Maastricht University

1st International Workshop on Planning of Emergency Services:
Theory and Practice, Amsterdam, 25-27 June 2014

Thomas Krafft
Alexandra Ziemann

Who are we and where do we come from?

- **Background**

- Health geography +
managing director private EMS +
health systems research/public health =
EMS research focusing on applied geographic methods

- **GEOMED Research Group**

- university-based / spin-off
- Researchers (EMS, hospital care, social sciences, public health, geography), specialists in Geographic Information Systems and IT
- EMS partners in Germany, Europe, USA and India

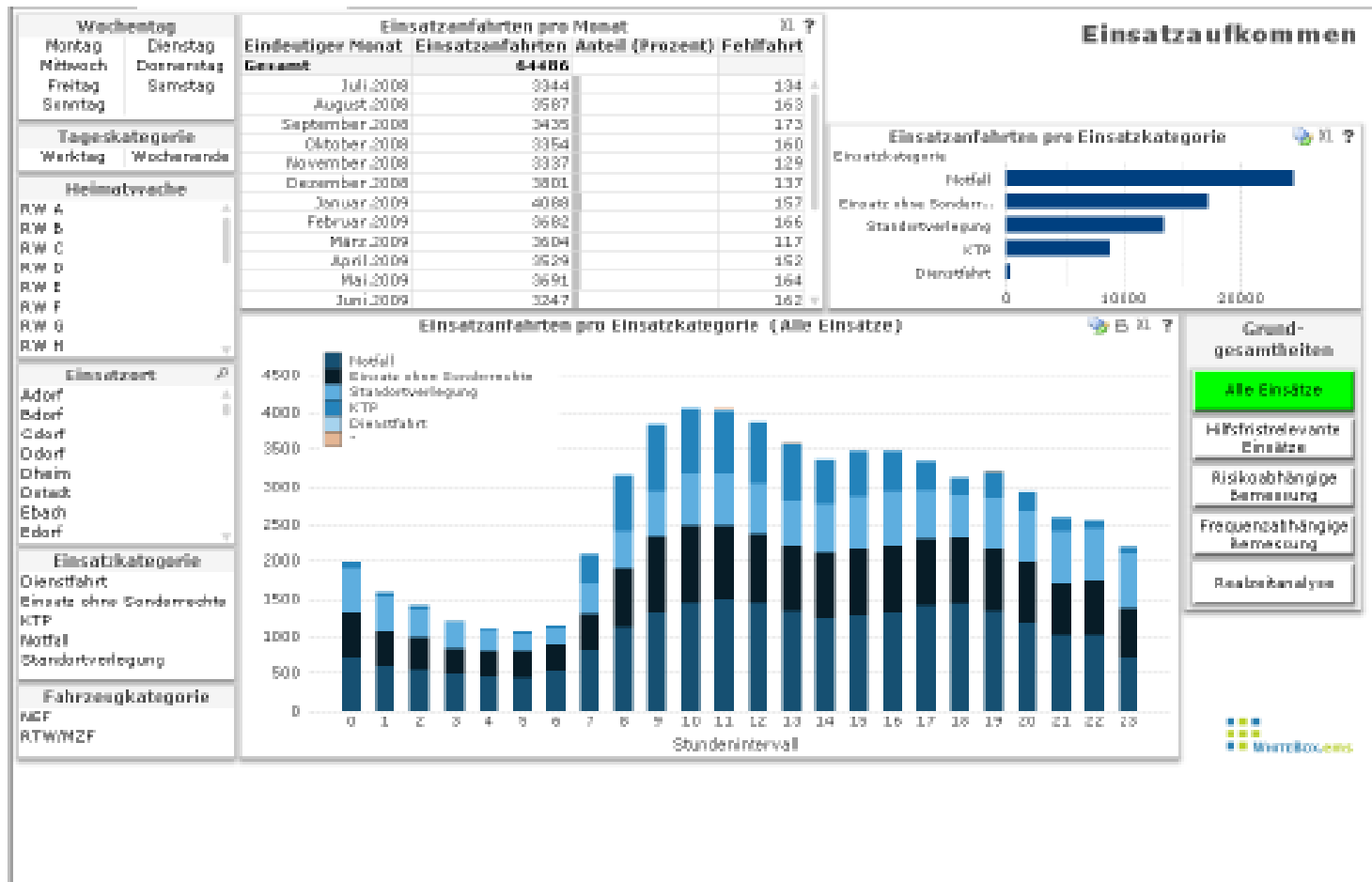
- **European Emergency Data Research Network & EMS Forum**

- EMS systems in 19 EU countries
- EU Commission co-funded projects

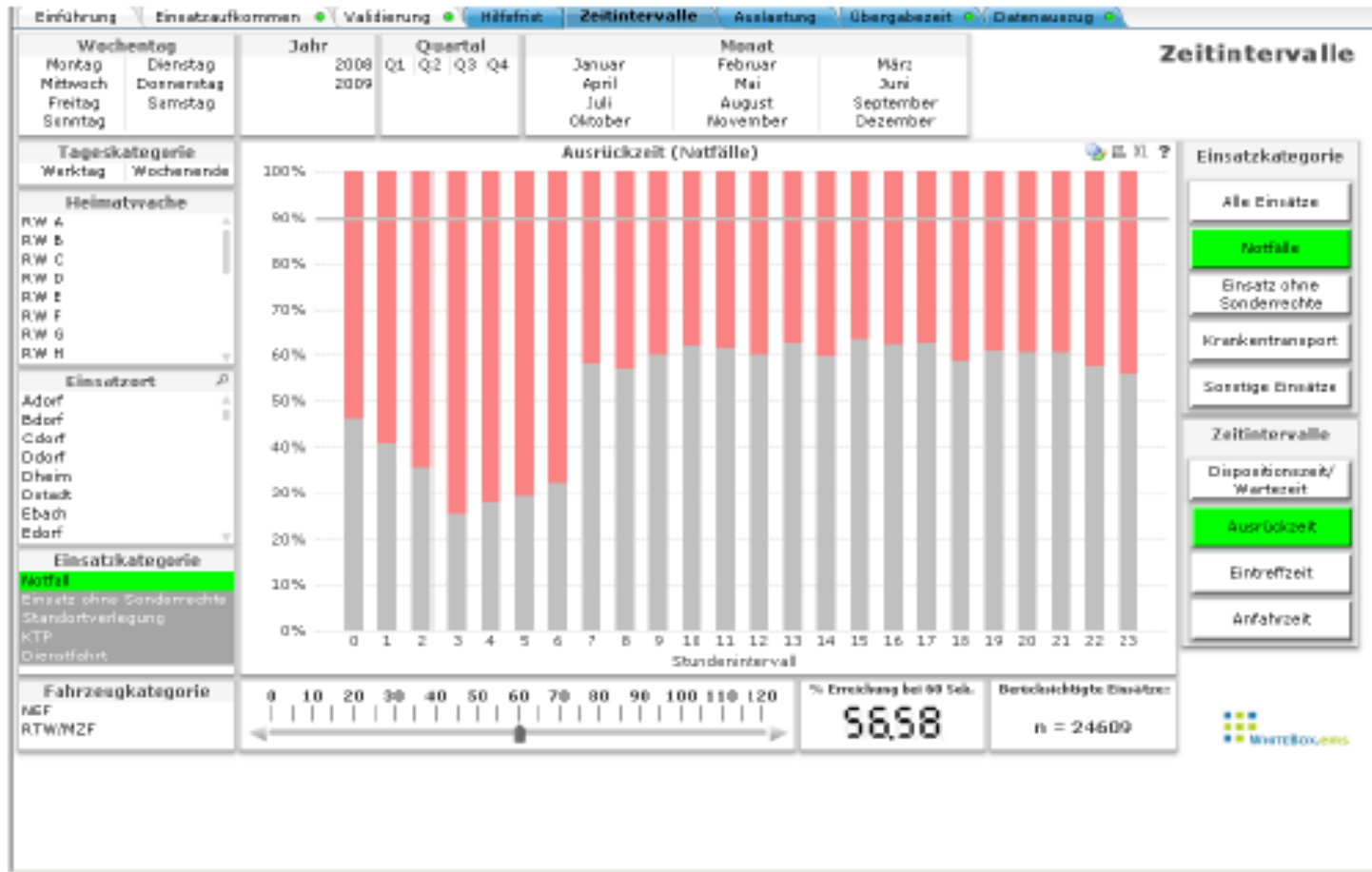
What do we do in EMS research?

- **EMS performance and cost-effectiveness analyses**

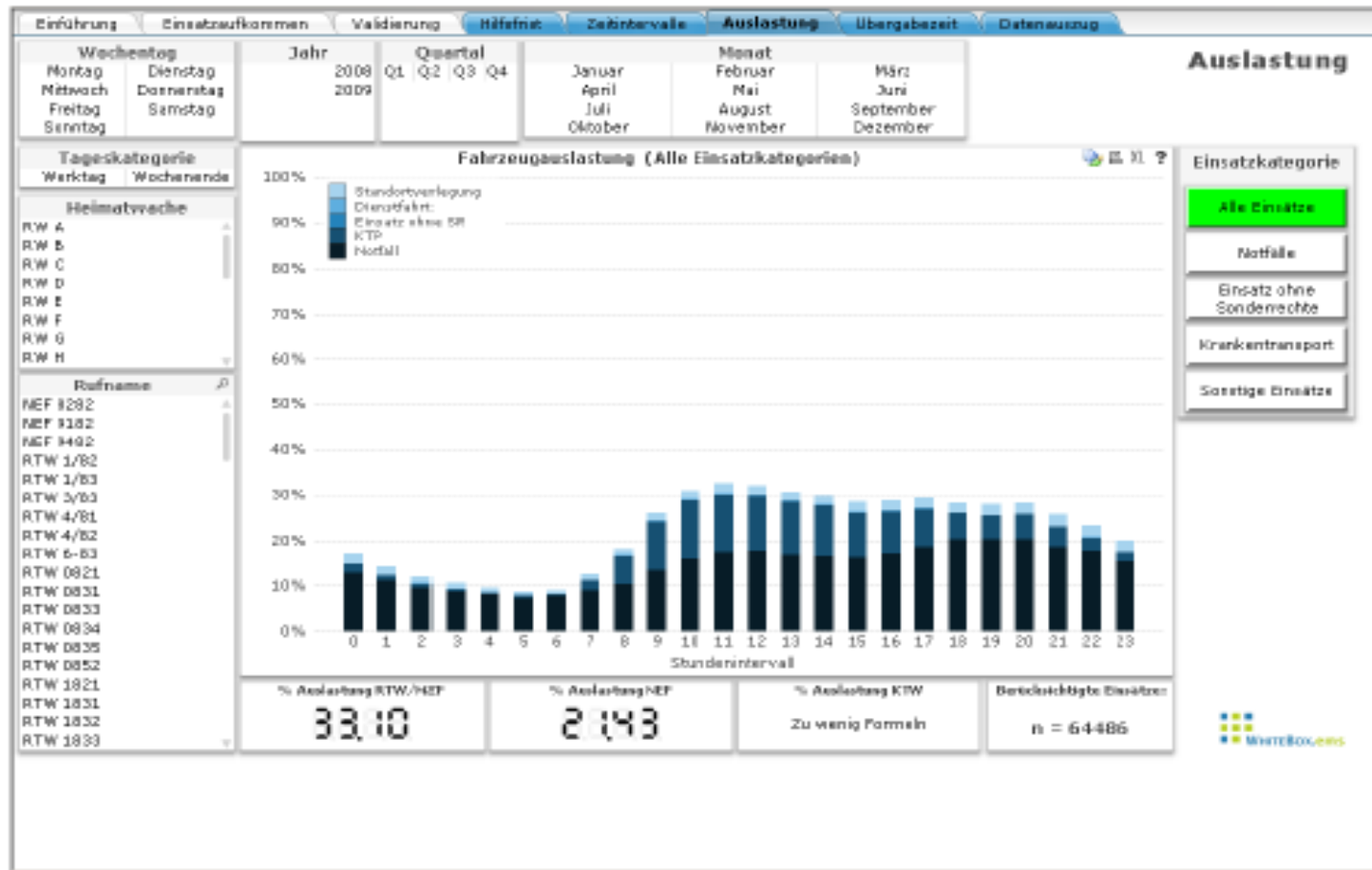
EMS structure and demand



Time intervals (response time...)



Unit hour utilisation



What do we do in EMS research?

- **EMS performance and cost-effectiveness analyses**
- **Resource planning**

Resource planning based on historical demand

Realzeitanalyse für RTW

Dienstag

Stunde	0	1	2	3	4	5	6	7	8	9	10
0	3.85%	11.54%	42.31%	65.38%	84.62%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
1	7.69%	26.92%	42.31%	69.23%	96.15%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%
2	11.54%	23.08%	46.15%	84.62%	88.46%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
3	19.23%	34.62%	61.54%	80.77%	88.46%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
4	19.23%	38.46%	73.08%	88.46%	92.31%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%
5	11.54%	30.77%	50.00%	76.92%	92.31%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
6	53.85%	69.23%	80.77%	84.62%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
7	34.62%	61.54%	84.62%	92.31%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
8	19.23%	57.69%	65.38%	84.62%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
9	19.23%	46.15%	65.38%	84.62%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
10	19.23%	46.15%	65.38%	84.62%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
11	19.23%	46.15%	65.38%	84.62%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
12	19.23%	46.15%	65.38%	84.62%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
13	19.23%	46.15%	65.38%	84.62%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
14	19.23%	46.15%	65.38%	84.62%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
15	19.23%	46.15%	65.38%	84.62%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
16	26.92%	57.69%	80.77%	92.31%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
17	19.23%	42.31%	80.77%	88.46%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
18	19.23%	50.00%	73.08%	88.46%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
19	34.62%	53.85%	73.08%	88.46%	92.31%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%
20	23.08%	46.15%	69.23%	88.46%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
21	26.92%	38.46%	80.77%	92.31%	96.15%	96.15%	100.00%	100.00%	100.00%	100.00%	100.00%
22	3.85%	7.69%	15.38%	57.69%	73.08%	92.31%	92.31%	100.00%	100.00%	100.00%	100.00%
23	3.85%	11.54%	38.46%	65.38%	80.77%	92.31%	100.00%	100.00%	100.00%	100.00%	100.00%

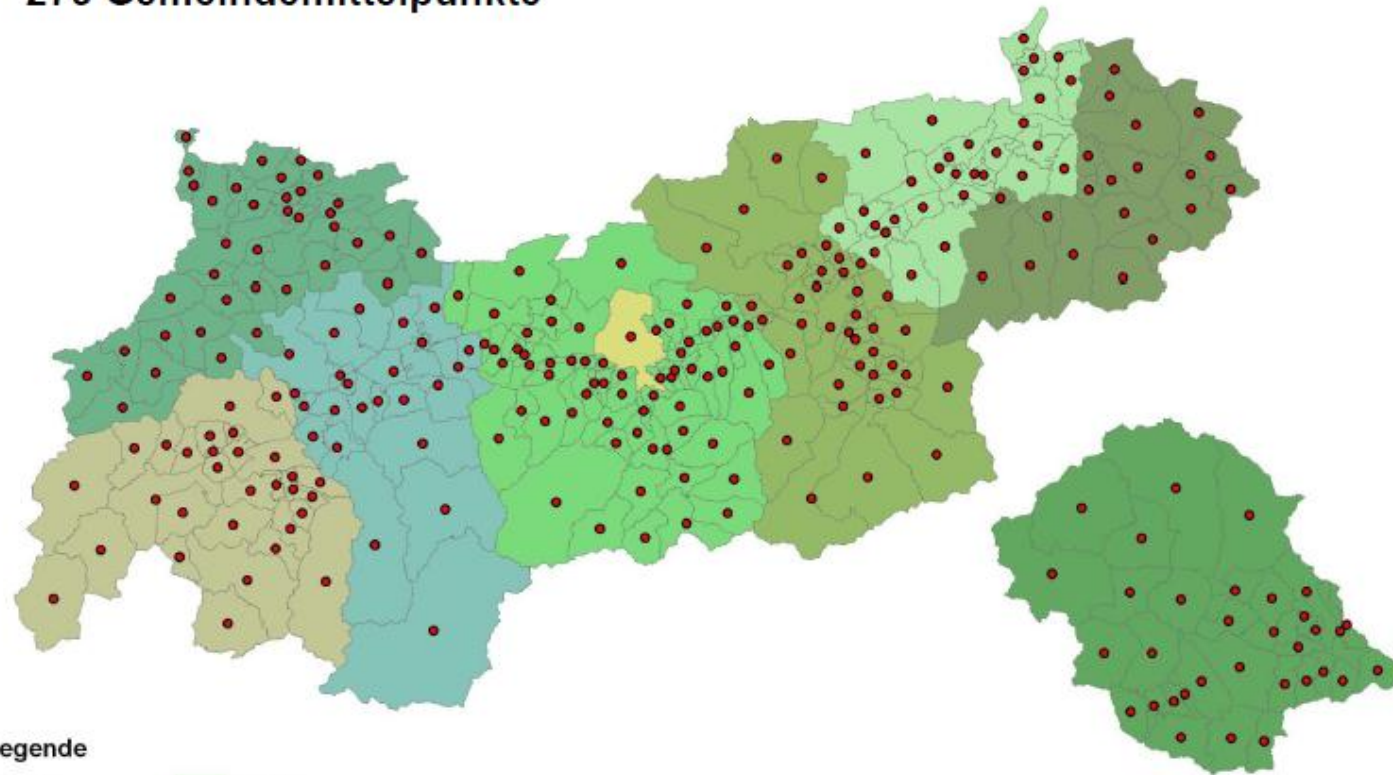
In 92,31% of the analysed intervals between 4-5 hrs on Tuesdays max. 4 BLS units were engaged = 4 Unit Hours

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- **Resource planning**
- **Location-allocation modelling**

Location – Allocation

279 Gemeindemittelpunkte



Legende

Bezirk

Imst

Innsbruck

Innsbruck-Land

Kitzbühel

Kufstein

Landeck

Lienz

Reutte

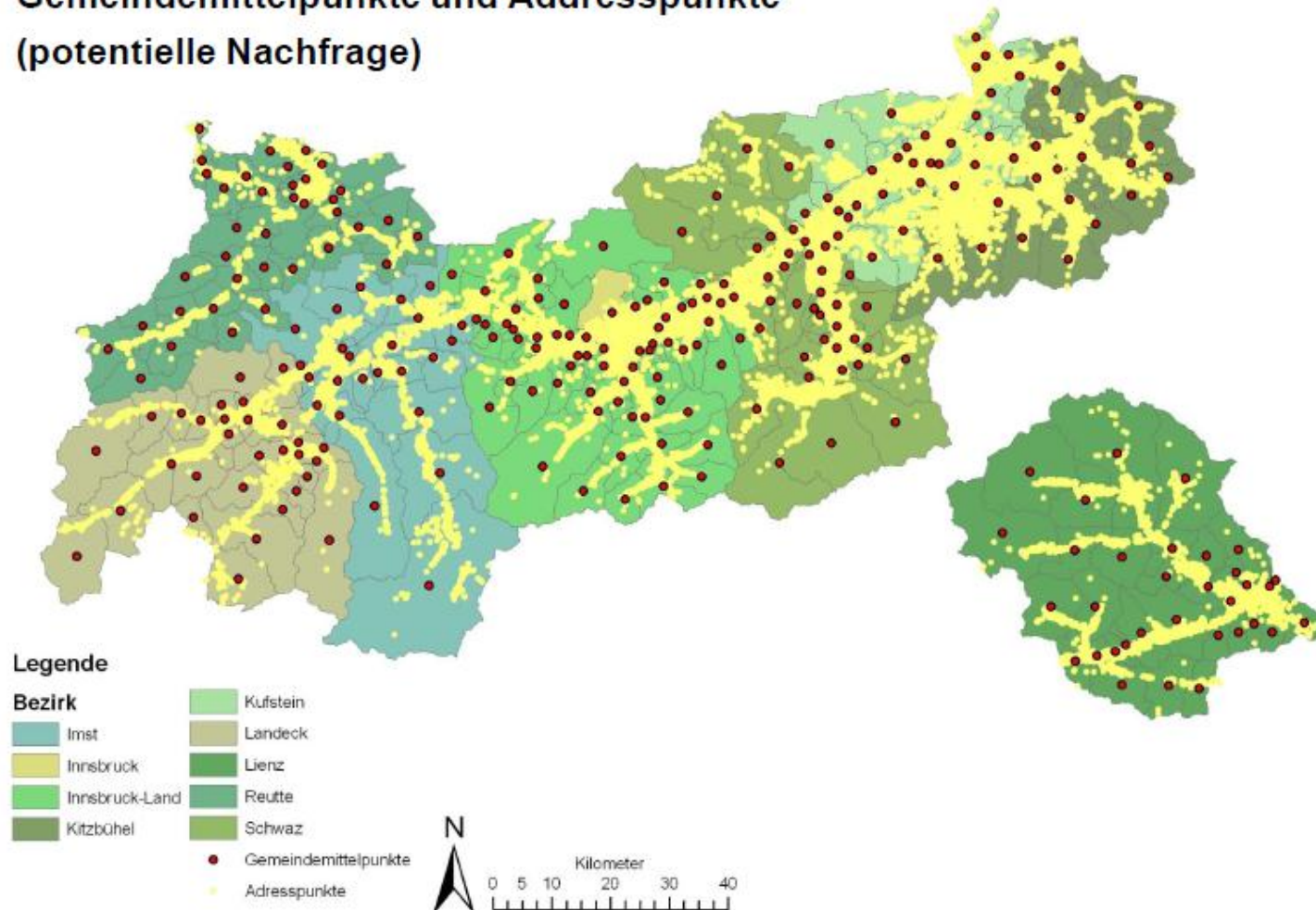
Schwaz

• Gemeindemittelpunkte



Location – Allocation

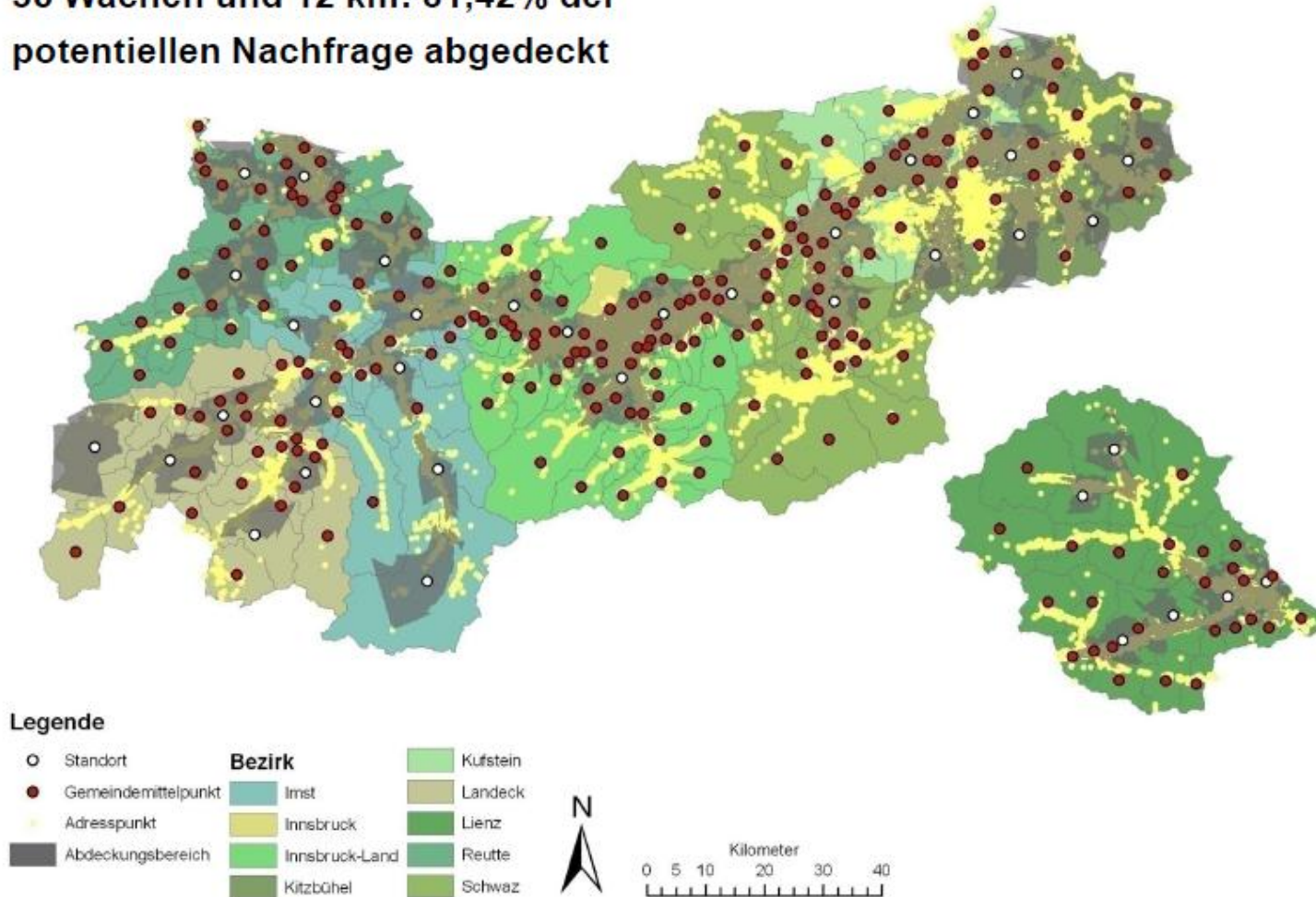
Gemeindemittelpunkte und Adresspunkte
(potentielle Nachfrage)



GEMED Research Forschungsgesellschaft mbH 2007

Location – Allocation

36 Wachen und 12 km: 81,42% der potentiellen Nachfrage abgedeckt



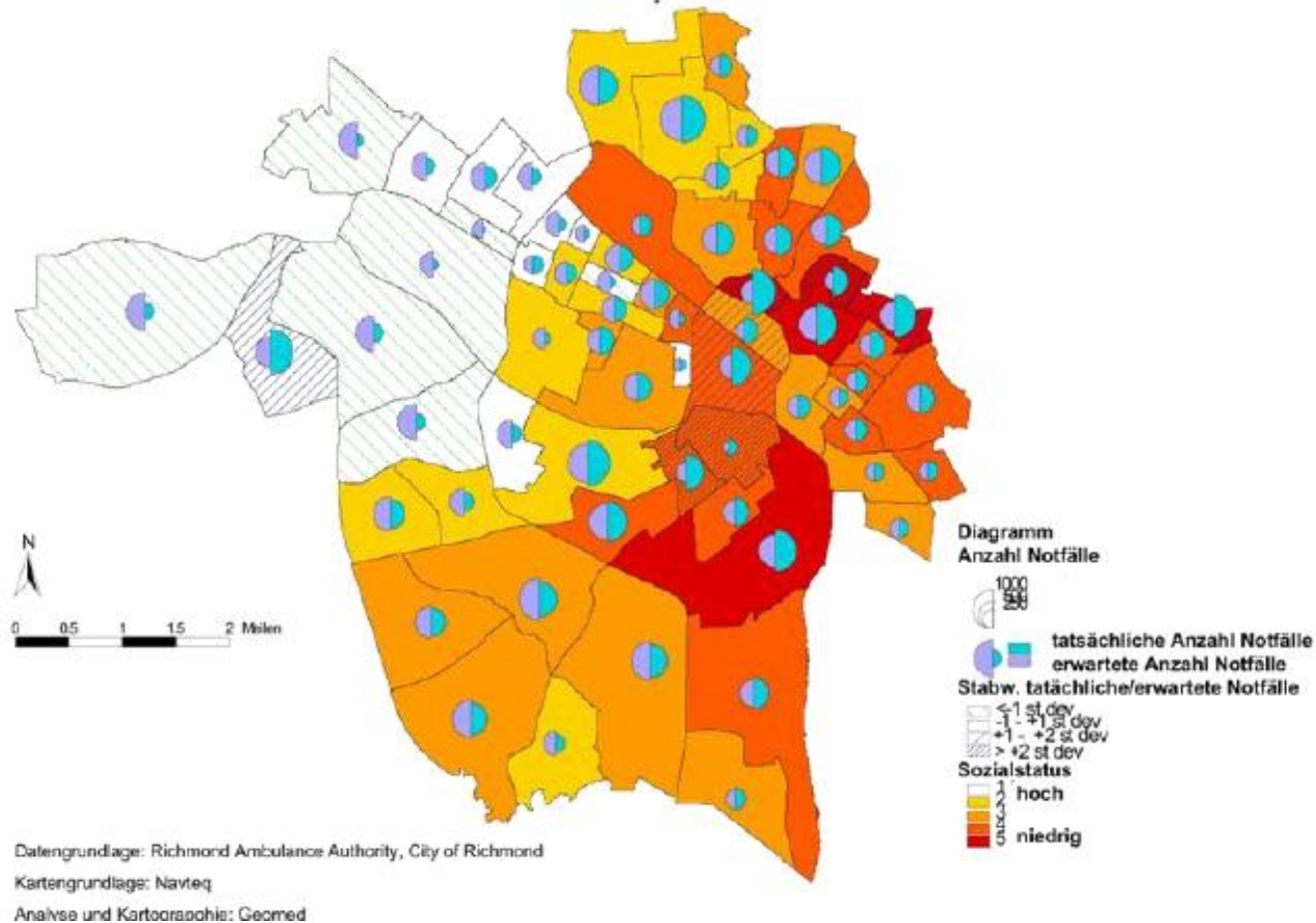
GEMED Research Forschungsgesellschaft mbH 2007

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- **Demand forecasting and social area analysis**

Social Area Analysis

Korrelation Notfallaufkommen und Sozialstatus in Richmond/Virginia (USA)



GEOMED Forschungsgruppe, Universität Bonn

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- **Development of (dynamic) steering algorithms**

Demand forecast – dynamic steering

GEOMED Research Forschungsgesellschaft mbH 2009



The screenshot shows a software interface for dynamic steering. The main window displays a map of Birmingham with numerous vehicle locations marked by icons and labels (e.g., KR16, OLS, DR45, R0070, etc.). Two red arrows point to specific vehicles on the map. A 'VMS Suggestions' dialog box is open in the foreground, displaying a table of suggested vehicle moves.

Vehicle ID	From Static PID	To Static PID
LDL8	ALD	SBP56
OLS	SUT1	SBF51
DM34	WAL	SBP26

Below the table, there is a text input field for a reason, a 'Reject' button, and a timer showing '0:00:52'. At the bottom of the dialog are 'Accept' and 'Reject' buttons.

West Midlands Ambulance Service NHS Trust

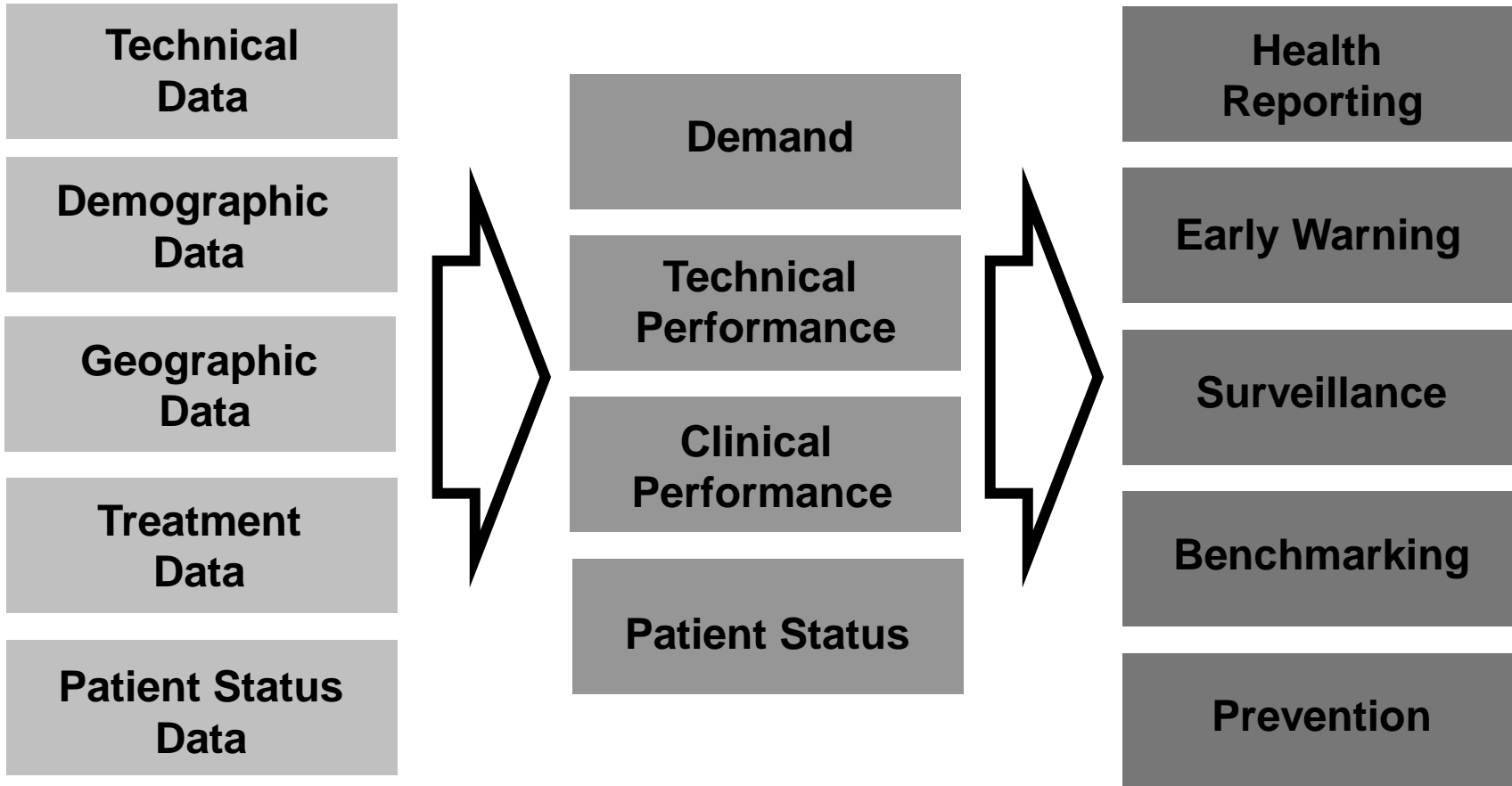
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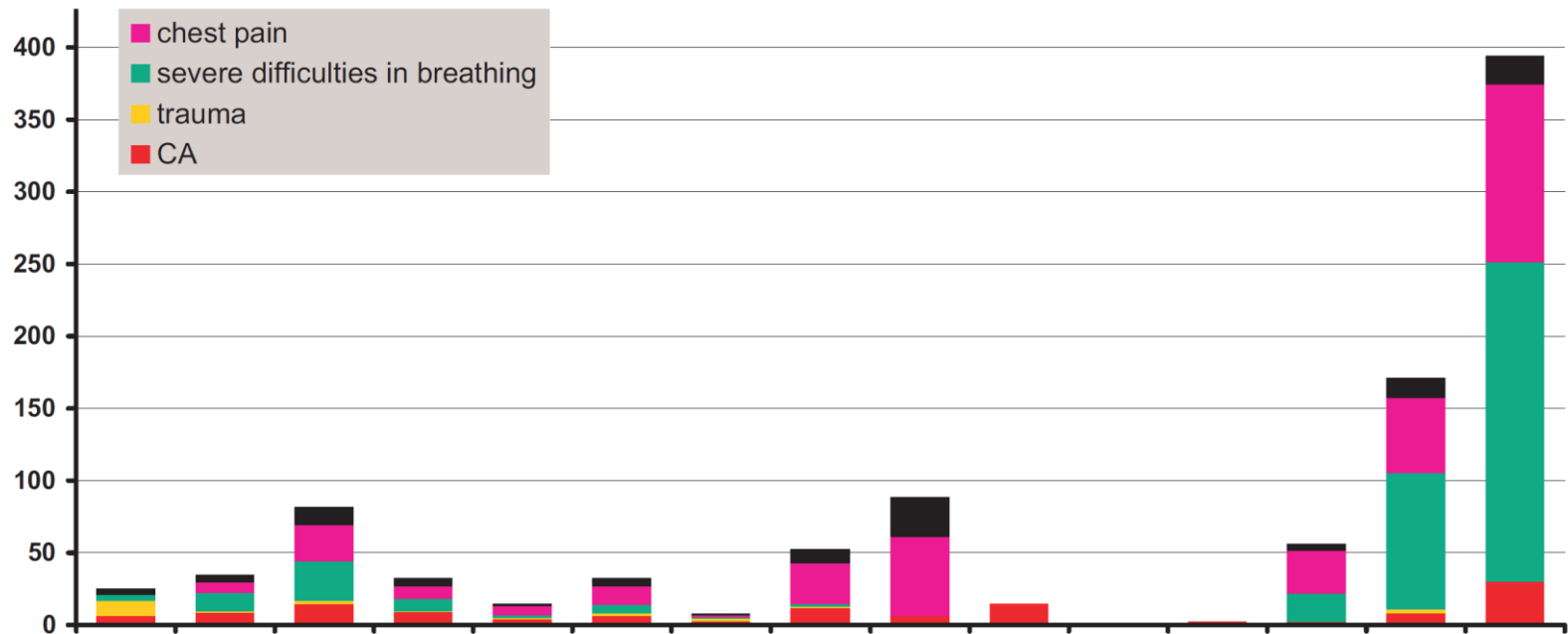
**Routine Data
Emergency Care**

Analysis

**Public Health
Applications**



Chronic disease monitoring



	AUT	B	D	DK	E	F	FIN	I	N	P	P	SLO	SWE	UK	USA
	Kufstein	Leuven	Bonn	Copenh.	Canta.	Garches	Vantaa	Genova	Oslo	Azores	INEM	Slovenia	Gothenb.	WMAS	Richm.
CA	6	9	15	9	4	6	3	12	7	15	?	2	2	8	30
trauma	11	1	2	1	1	2	2	1	?	?	?	?	?	3	?
severe breath. difficulties	4	13	27	9	2	6	1	2	?	?	?	?	20	94	222
chest pain	?	8	25	9	6	13	2	28	55	?	?	?	30	52	123
stroke	4	6	12	6	2	6	1	10	27	?	?	?	5	14	20

Syndromic surveillance

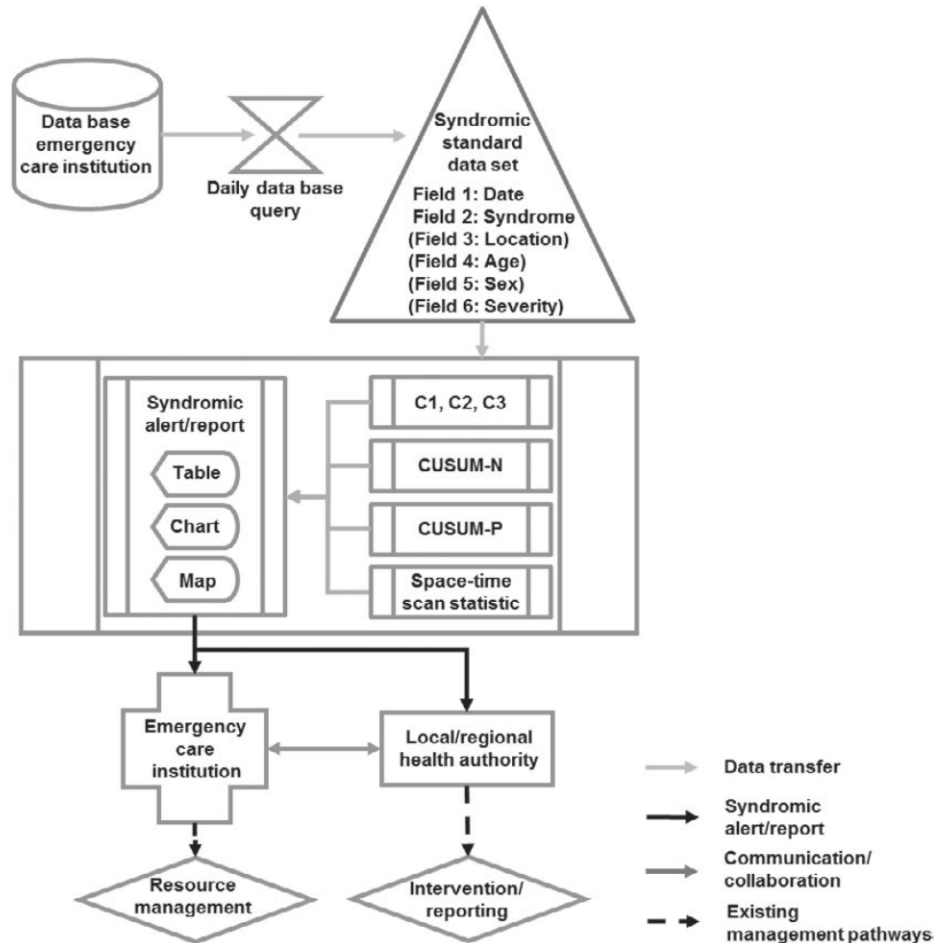
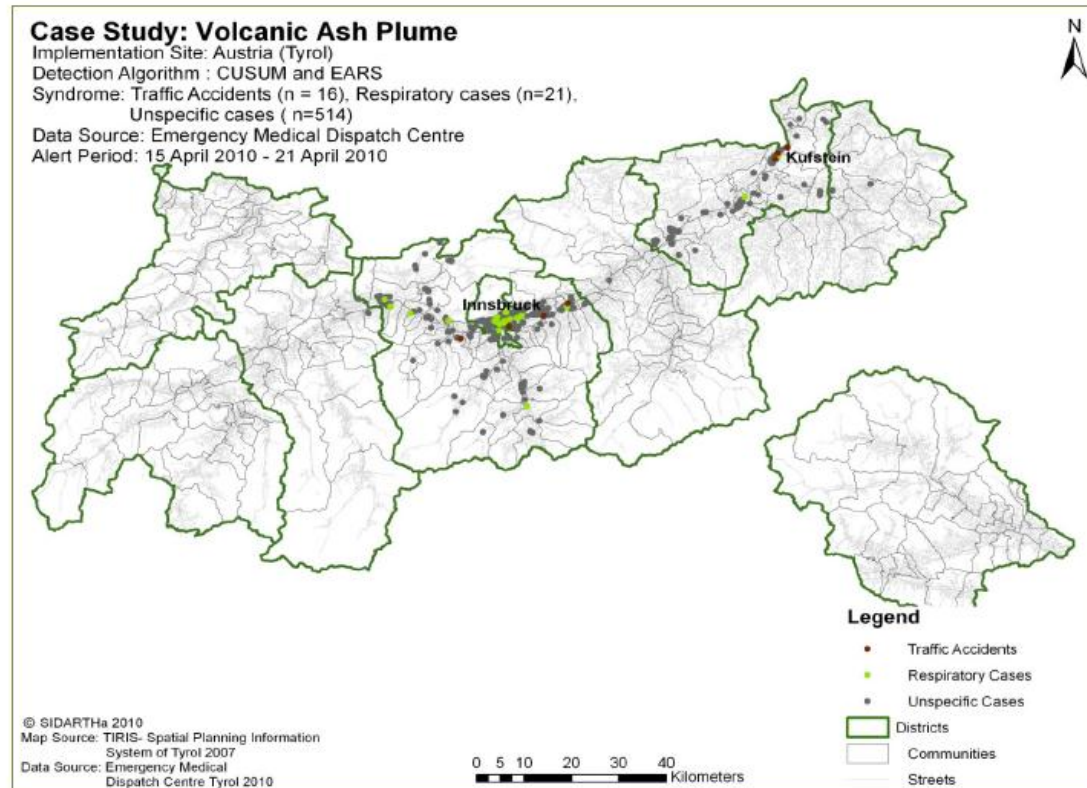


Fig. 1. Concept of an automated emergency data-based SyS system.

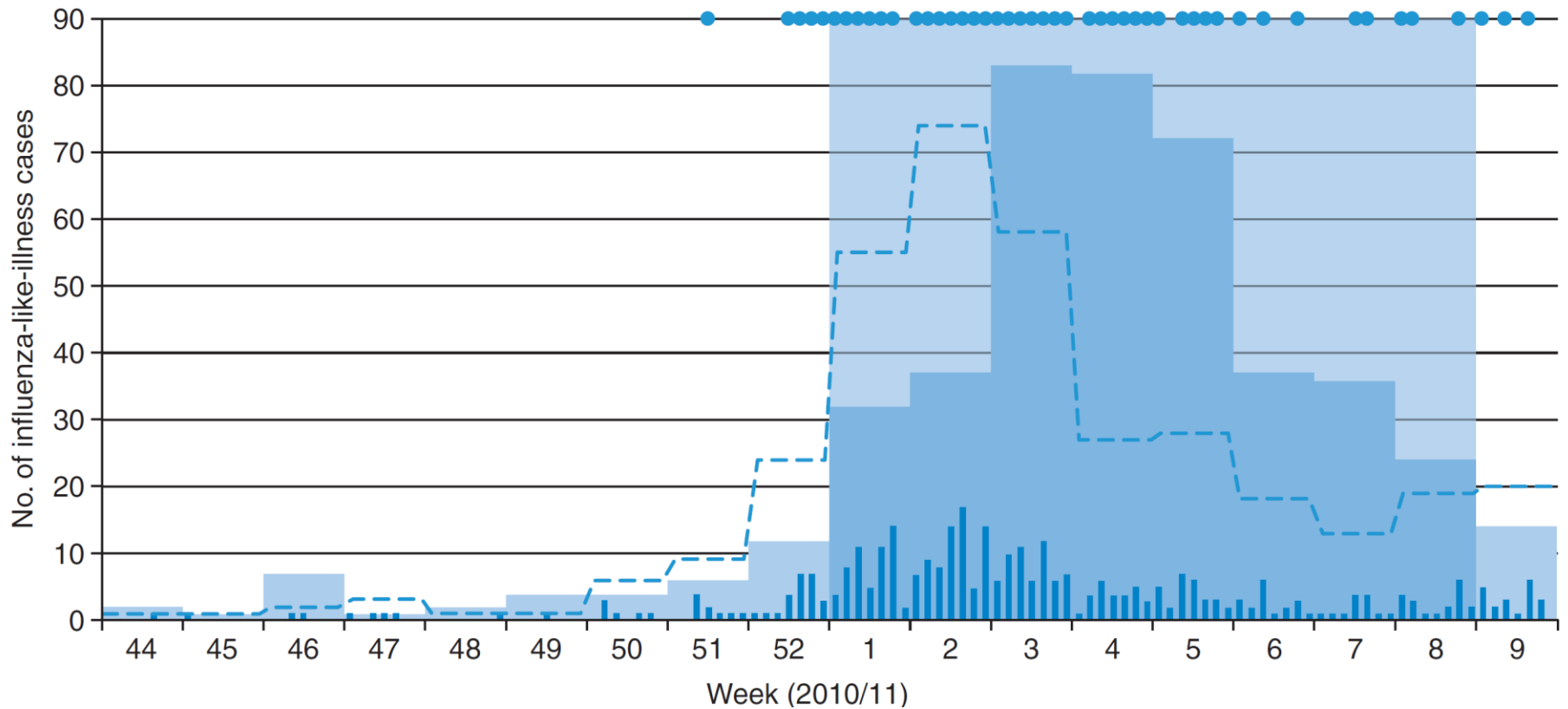
Timely information on health impact of unexpected events

During the period two temporal signals regarding respiratory syndrome and one temporal and spatial-temporal cluster was identified for traffic accidents.

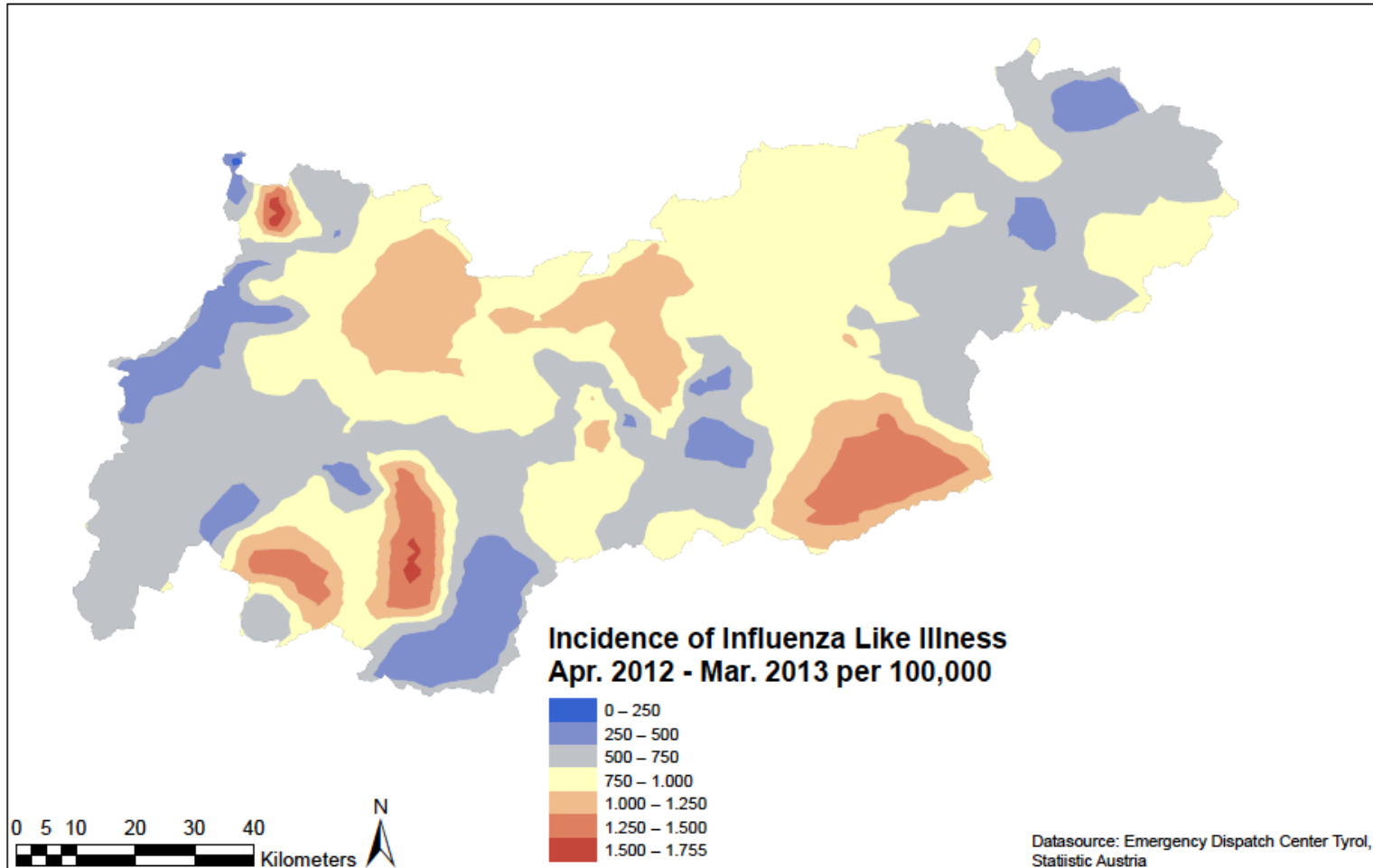
It is unlikely that these signals are attributed to the volcanic ash cloud.



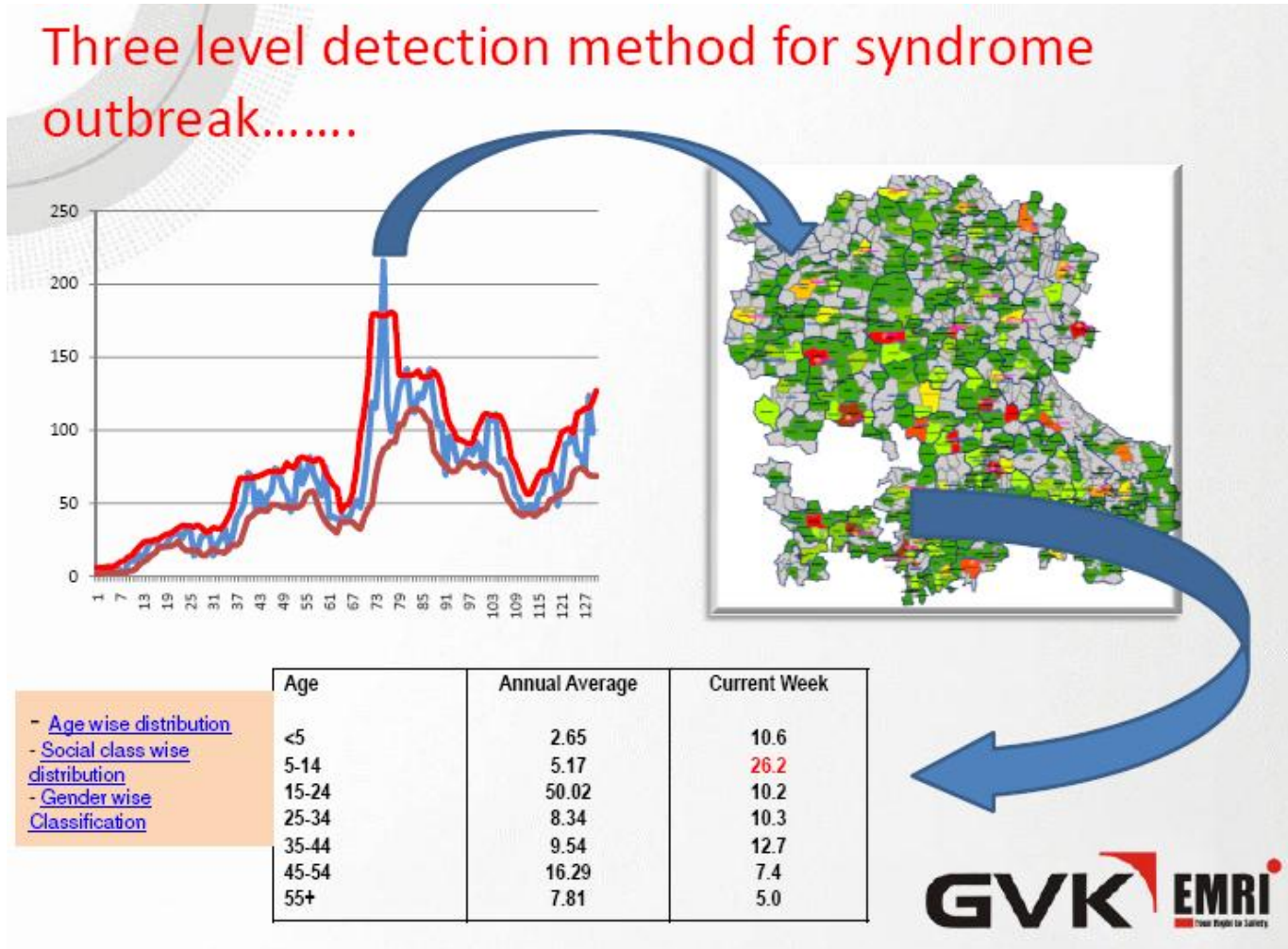
Cost-effective surveillance of seasonal events



Cost-effective surveillance of seasonal events



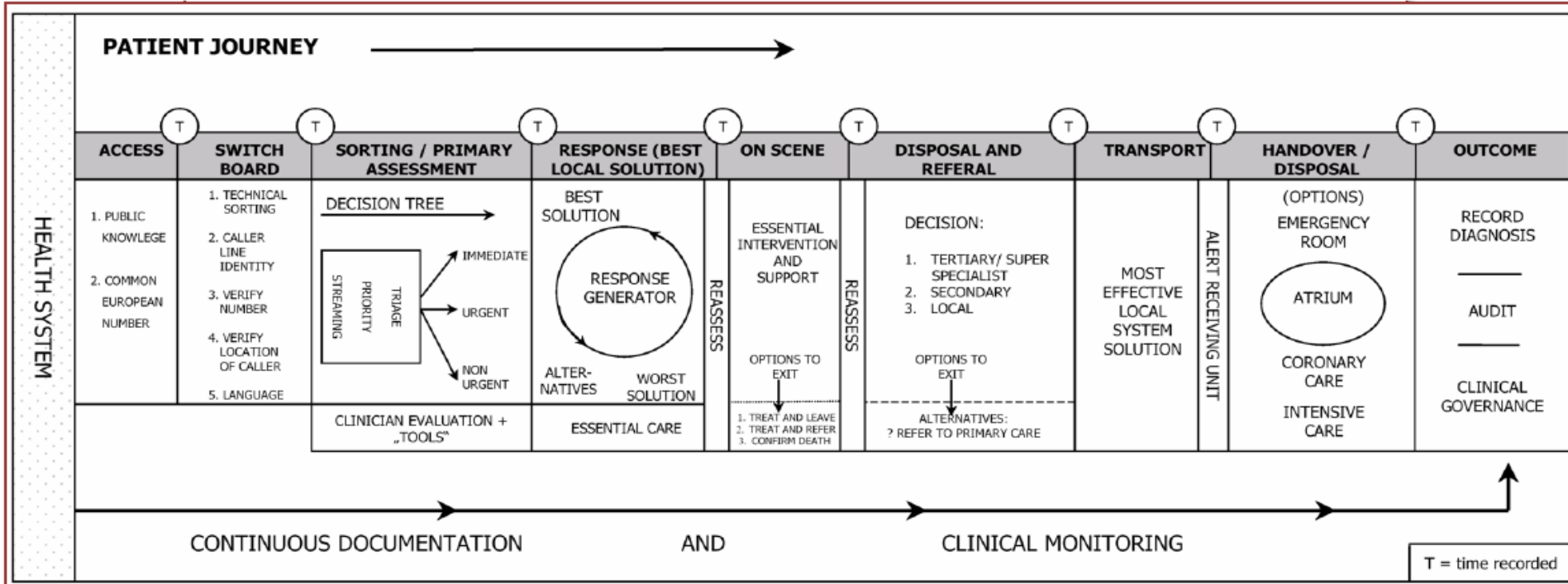
Syndromic surveillance in India



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- **Routine emergency data analysis for health reporting, early warning and surveillance**
- **Benchmarking**

Benchmarking



Benchmarking

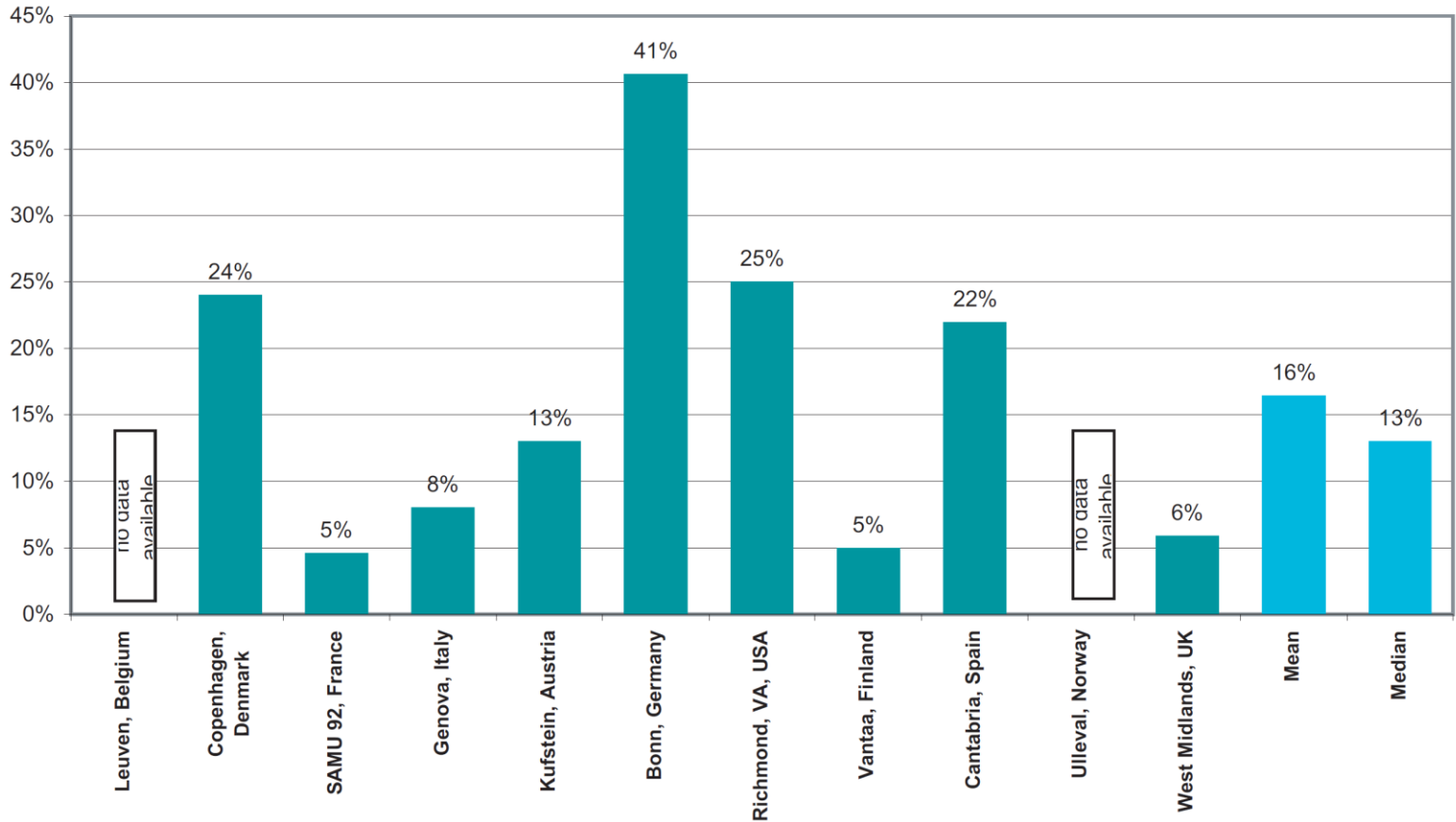


Figure 16: Percentage of Successful Resuscitations

Benchmarking

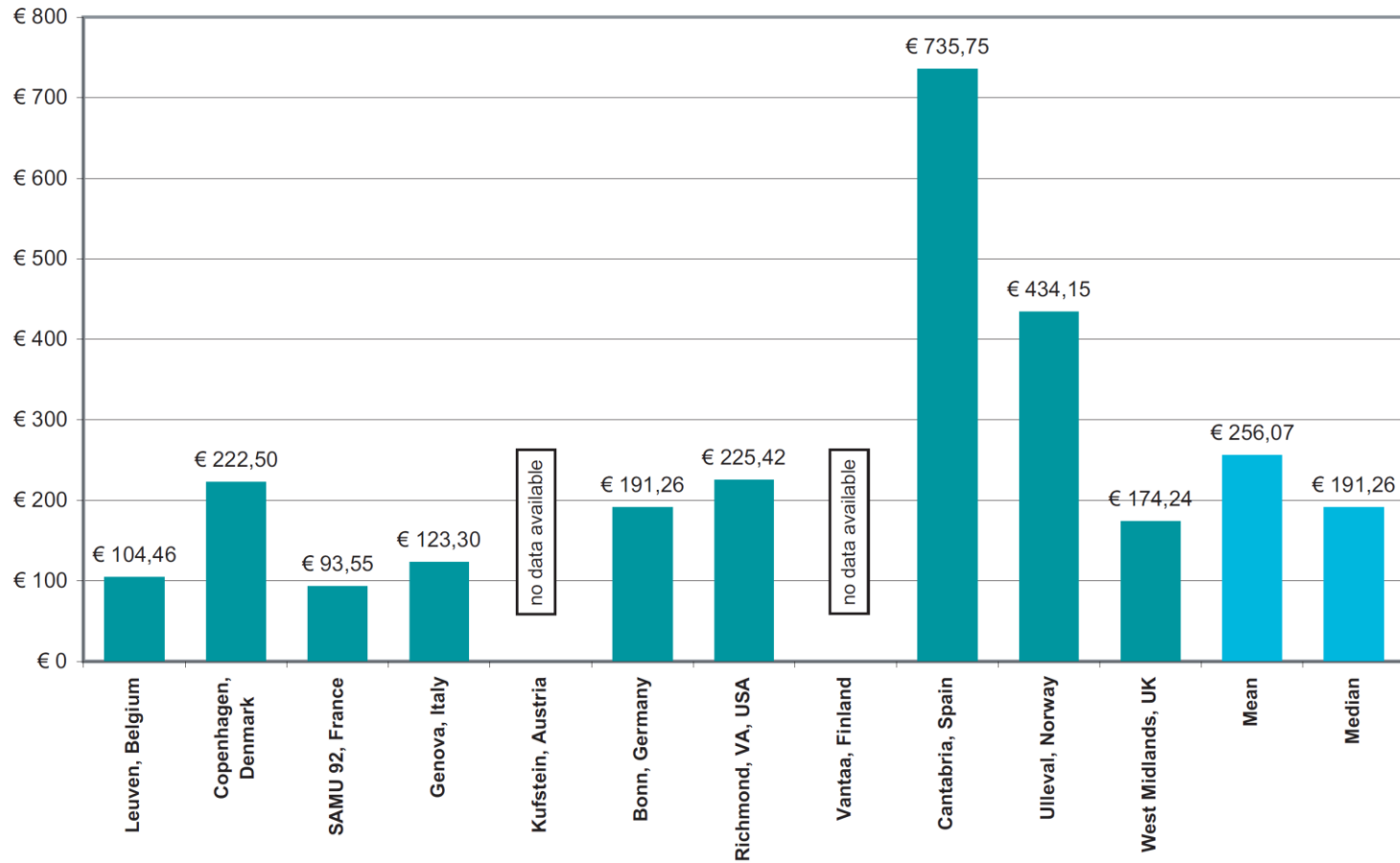


Figure 18: Cost per Transport

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- **Scientific advice in legislative procedures**

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- **Scientific advice in legislative procedures**
- **Scientific advice in bid procedures**
- **Teaching & training**

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