The use of GIS in the analysis of fatal fall and burn injuries in older adults

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Fatal injuries in South Africa

- Homicide is a significant cause of death (2007)
- Emphasized by recent reports by the Centre for the Study of Violence and Reconciliation (CSVR)
- Annual SAPS crime statistics judged in terms of proprtions of violent deaths
- Road traffic crashes a major cause of death
- Other injuries pales somewhat into insignificance

Fatal injuries in South Africa

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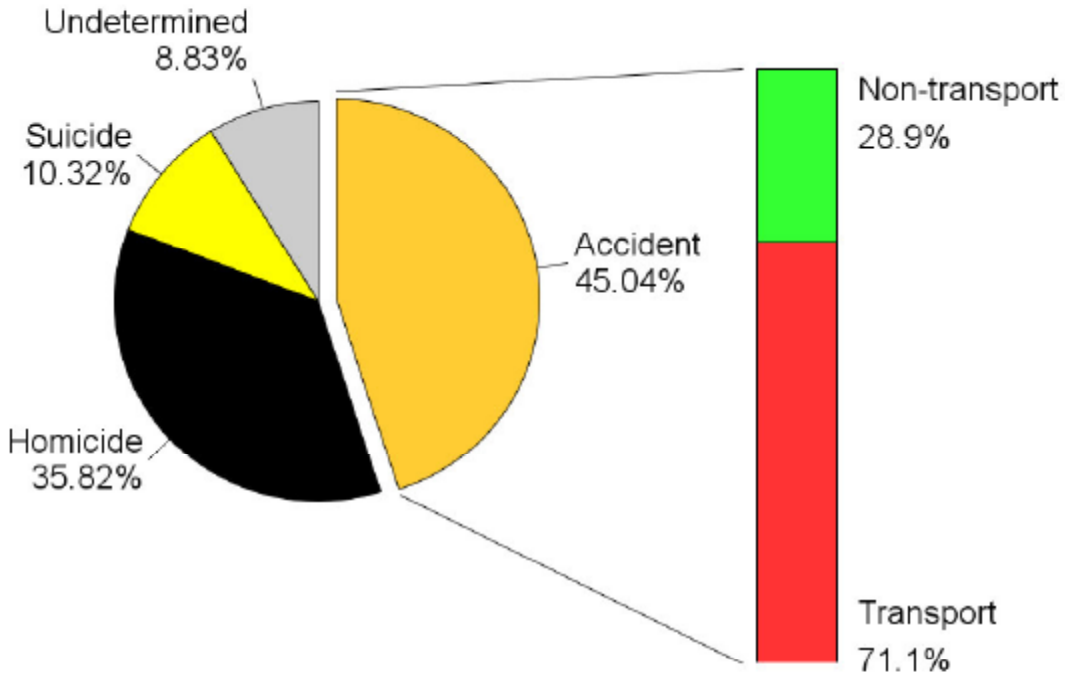


Source: NIMSS, 2008

Manner of death by age

The average age of the victims was 33.2 (± 16.3 years). The leading manner of death(s) amongst the:

- **0-14** age group was other unintentional (36%) followed by transport (33.8%);
- **15-24** age group was violence (48.3%);
- **25-34** age group was violence (43.6%) followed by transport (30.7%);
- **35-44** age group was violence (36.4%) followed by transport (35.3%);
- **45-54** age group was transport (36.2%);
- **55-64** age group was transport (37.4%); and
- **65+** age group was transport (33%).

Source: NIMSS, 2008

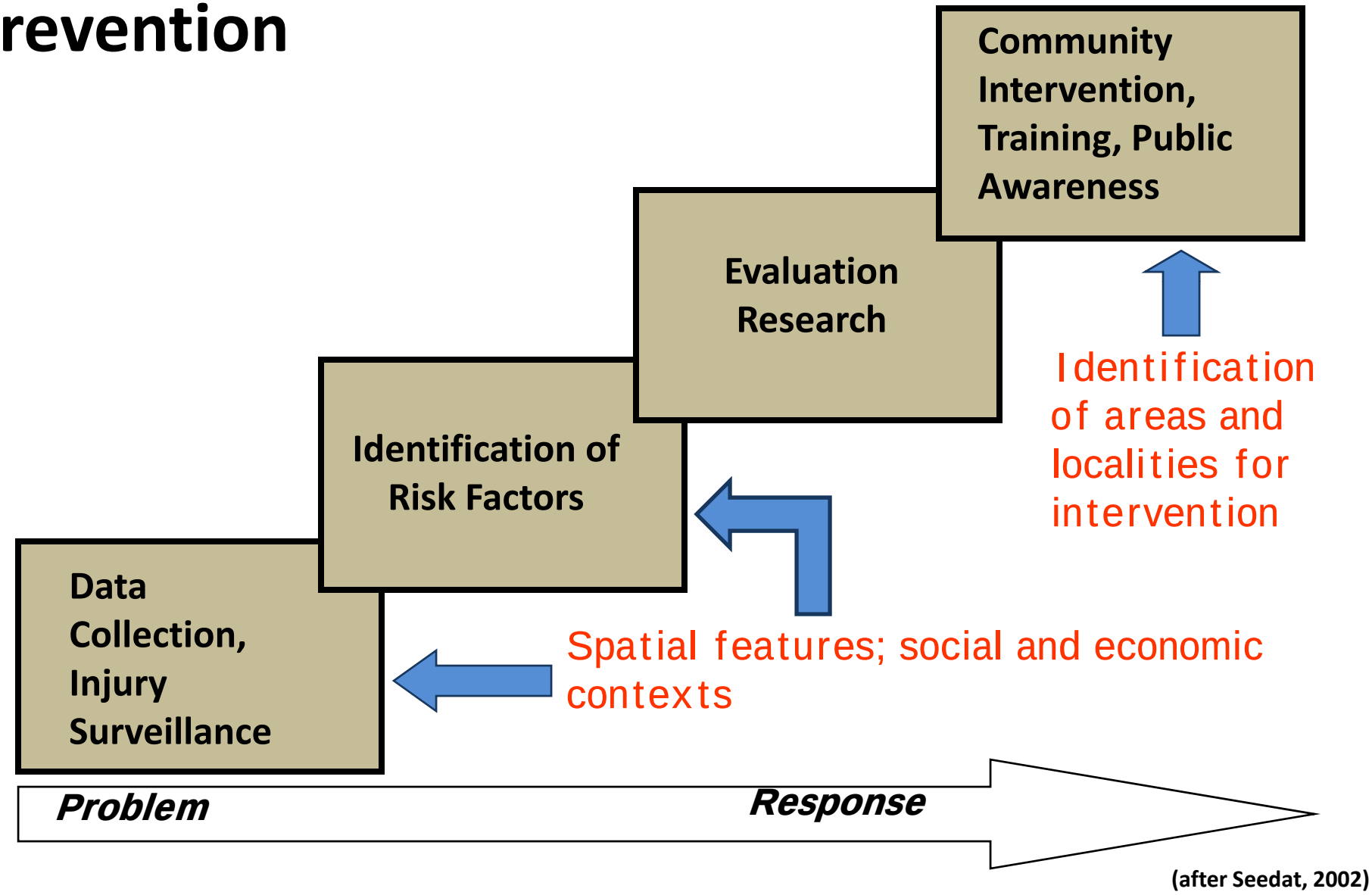
Aim of the project

To establish a Geographical Information System (GIS) database for fatal injuries on victims 50 years and older, from geographical elements recorded by the National Injury Mortality Surveillance System (NIMSS) in South Africa.

Objectives of the project

- Extract geographical elements from NIMSS data
- Edit geographical element names to match those in place-name databases available from Statistics South Africa (Stats SA)
- Assign Stats SA place-names to NIMSS cases
- Aggregate the available NIMSS data - for burns and falls - to individual geographical or mapping units
- Link the aggregated injury data to geographical units to create a basic GIS database on injury in older adults
- Create sample outputs on the geographical distribution of injury

Spatial analysis in injury research – the Public Health Approach to Injury Prevention

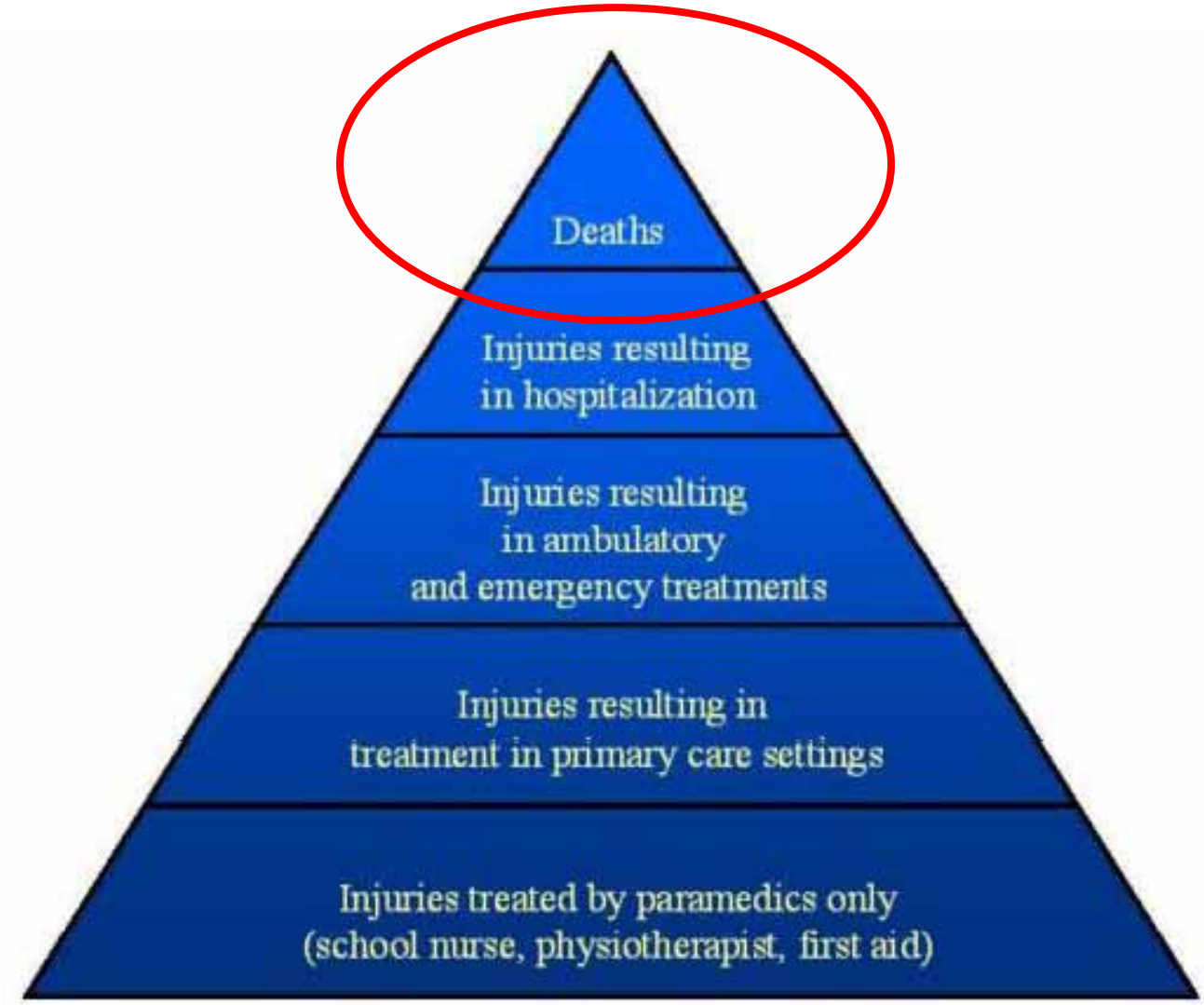


(after Seedat, 2002)

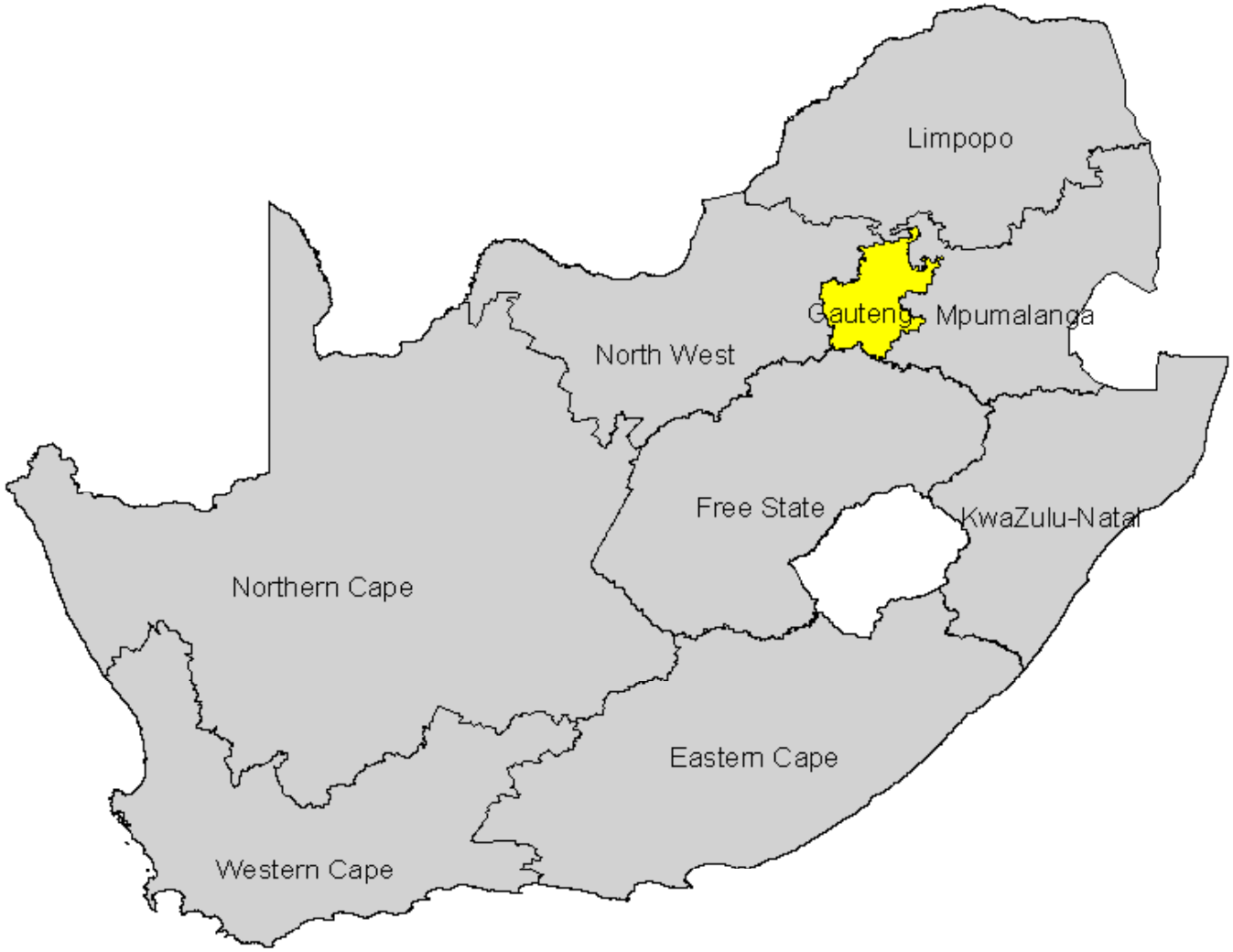
National Injury Mortality Surveillance System (NIMSS) - South Africa

- NIMSS is the only 'who, what, where, when and how' fatal injury surveillance system
- The first NIMSS report included 14897 injuries for 1999, at 10 mortuaries across five provinces
- Second NIMSS: 2000, 18876 injuries, 15 mortuaries, five provinces
- Third NIMSS: 2001, 25361 injuries, 32 mortuaries, six provinces
- Current NIMSS is the ninth report: 33513 injuries in 2007: 39 mortuaries, seven provinces
- Data for 2001 & 2002 was available and was used for this study

The Injury Pyramid



South African provinces

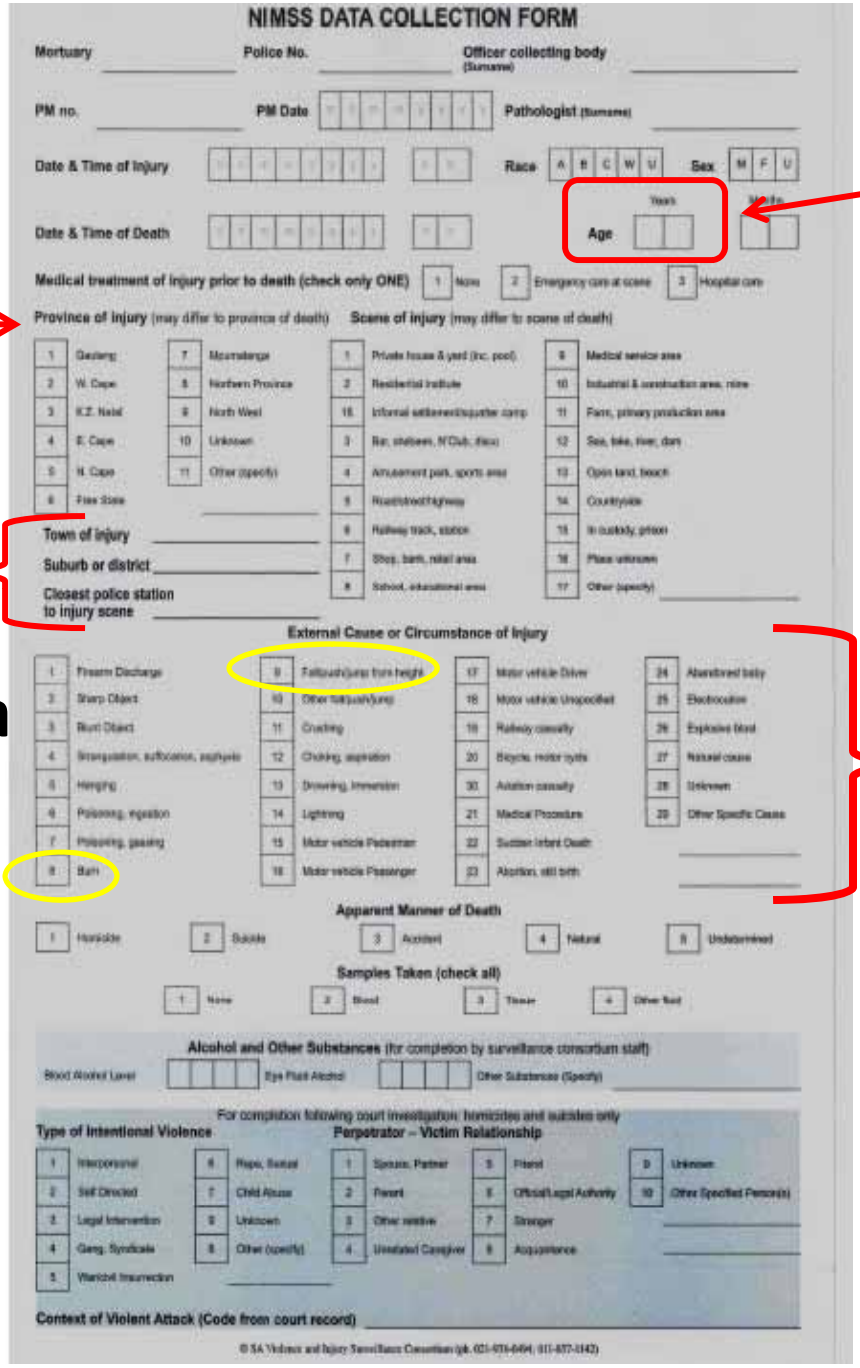


NIMSS Data for Gauteng

- NIMSS data collection form lists 29 options for **External Cause or Circumstance of Injury**
- Based on the International Classification of Diseases **(ICD-10)**
- The smallest spatial unit recorded on the NIMSS Data Collection Form is a **Suburb or District**

Province

Town, suburb, district, police area



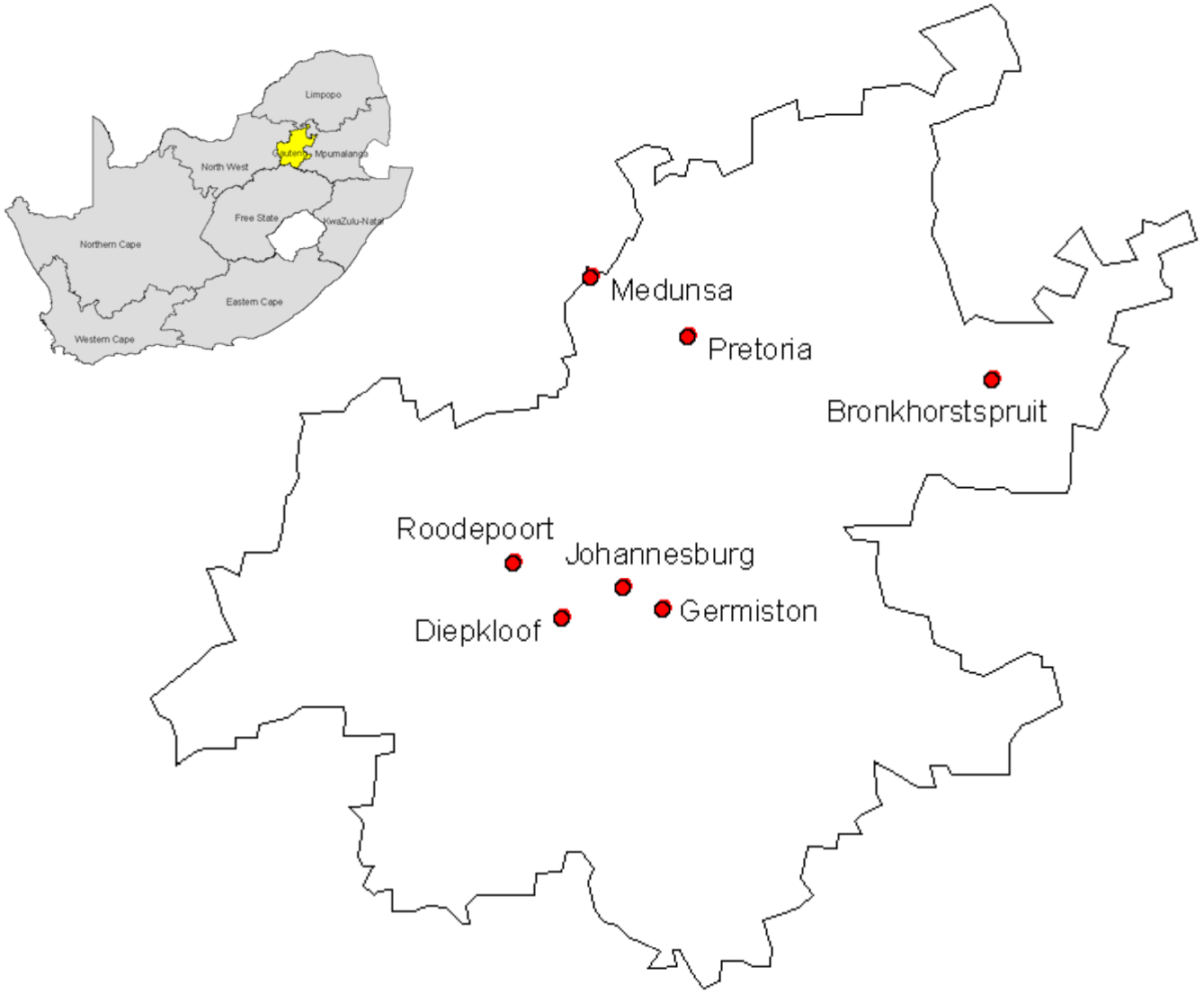
Age

External Cause of Injury

8 - Burns;

9 - Falls

NIMSS Mortuaries in Gauteng – 2001/2

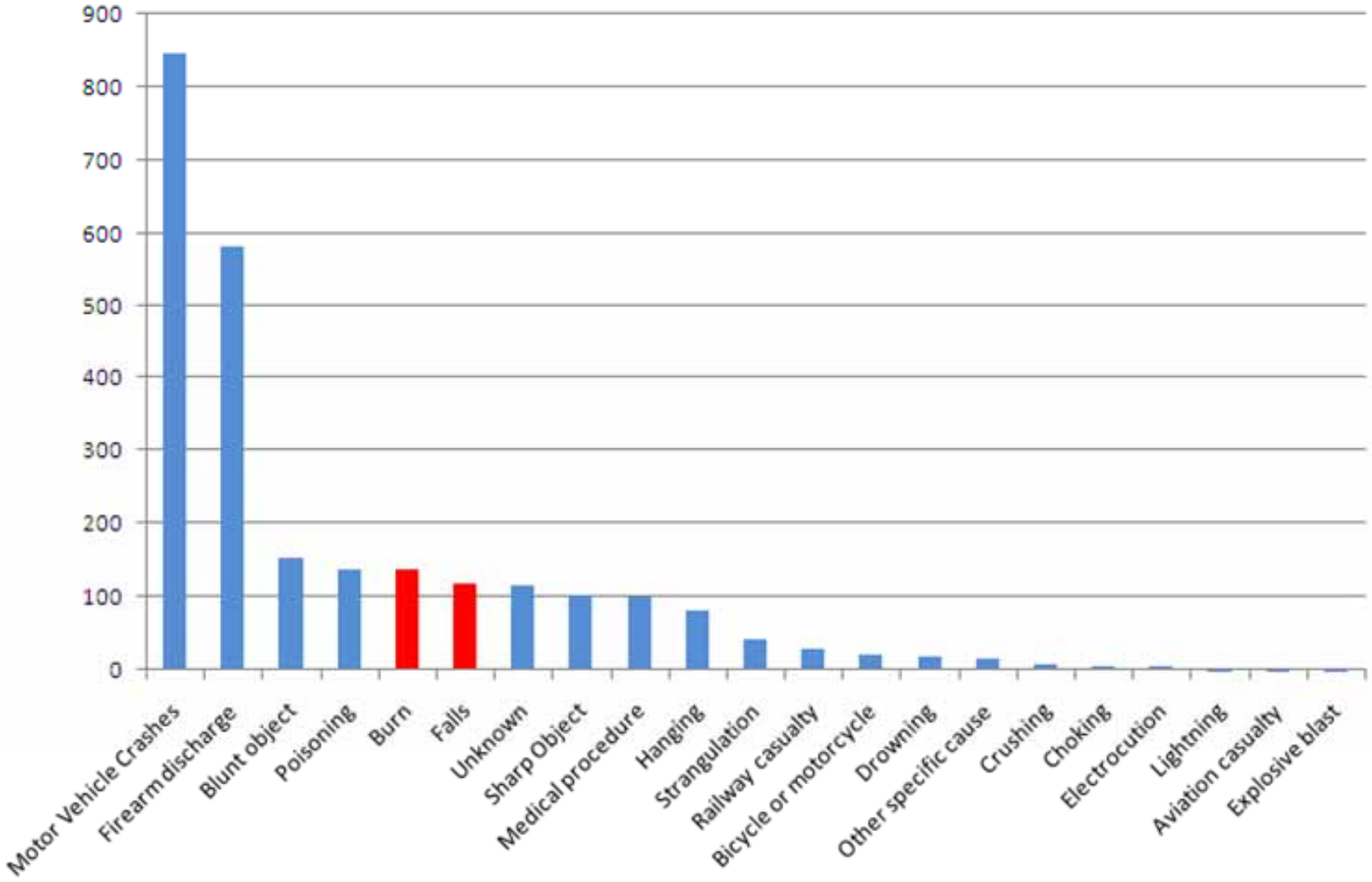


NIMSS Data for Gauteng (All): 2001/2

Apparent Manner of Death	Frequency	Percentage
Homicide	9300	38.0%
Suicide	2542	10.4%
Accident	8664	35.4%
Natural	2031	8.3%
Undetermined	1955	8.0%
Total:	**24492**	**100.0%**

External causes of non-natural deaths (Gauteng)

Persons 50 years & older (n=2511)



Race & Gender of burn and fall victims (>=50 years) – 2001/2 (Gauteng)

Race/ Gender	*Unknown*	*Asian*	*Black*	*Coloured*	*White*	**Total**
Female	0	0	55	1	46	**102**
Male	0	1	93	5	38	**137**
Unknown	1	0	0	0	2	**3**
Total	**1**	**1**	**148**	**6**	**86**	***242***

- There was a distinct gender and racial profile amongst victims
- Fifty seven percent (57%) were men
- Greatest number recorded were Black/African men (38.4%), followed by Black/African women (22.6%)

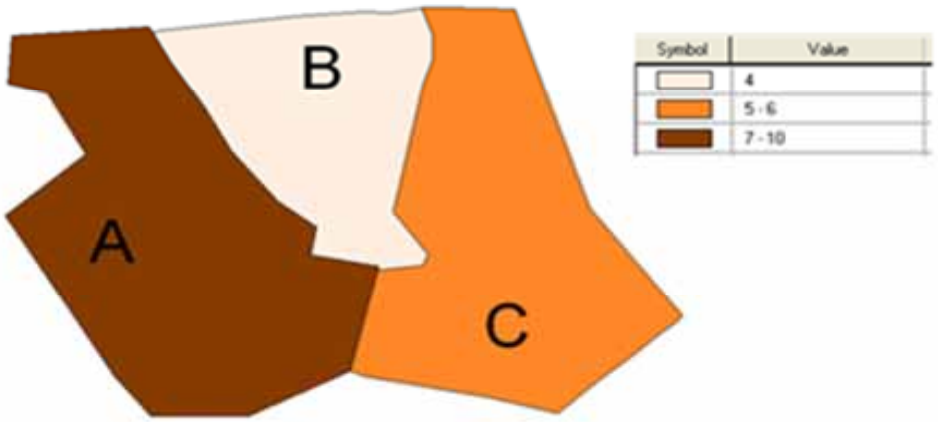
Age categories of burn and fall victims (>= 50 years) (2001/2)

Age group	Frequency
50-54	53
55-59	42
60-64	35
65-69	30
70-74	23
75-79	17
80-84	22
85-89	14
>= 90	6
Total	***242***

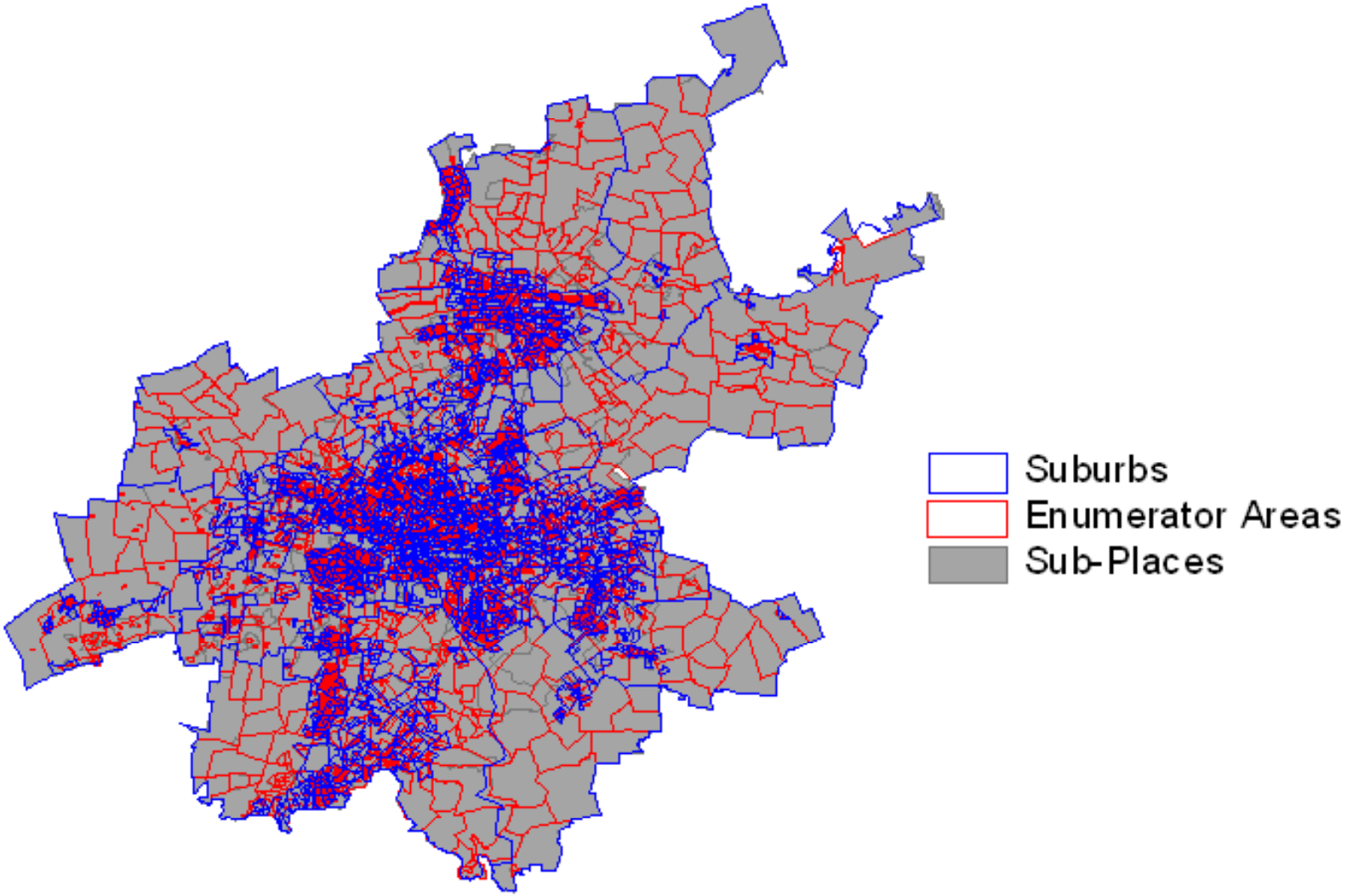
Example output (fictitious data)

Output 1

Output 2



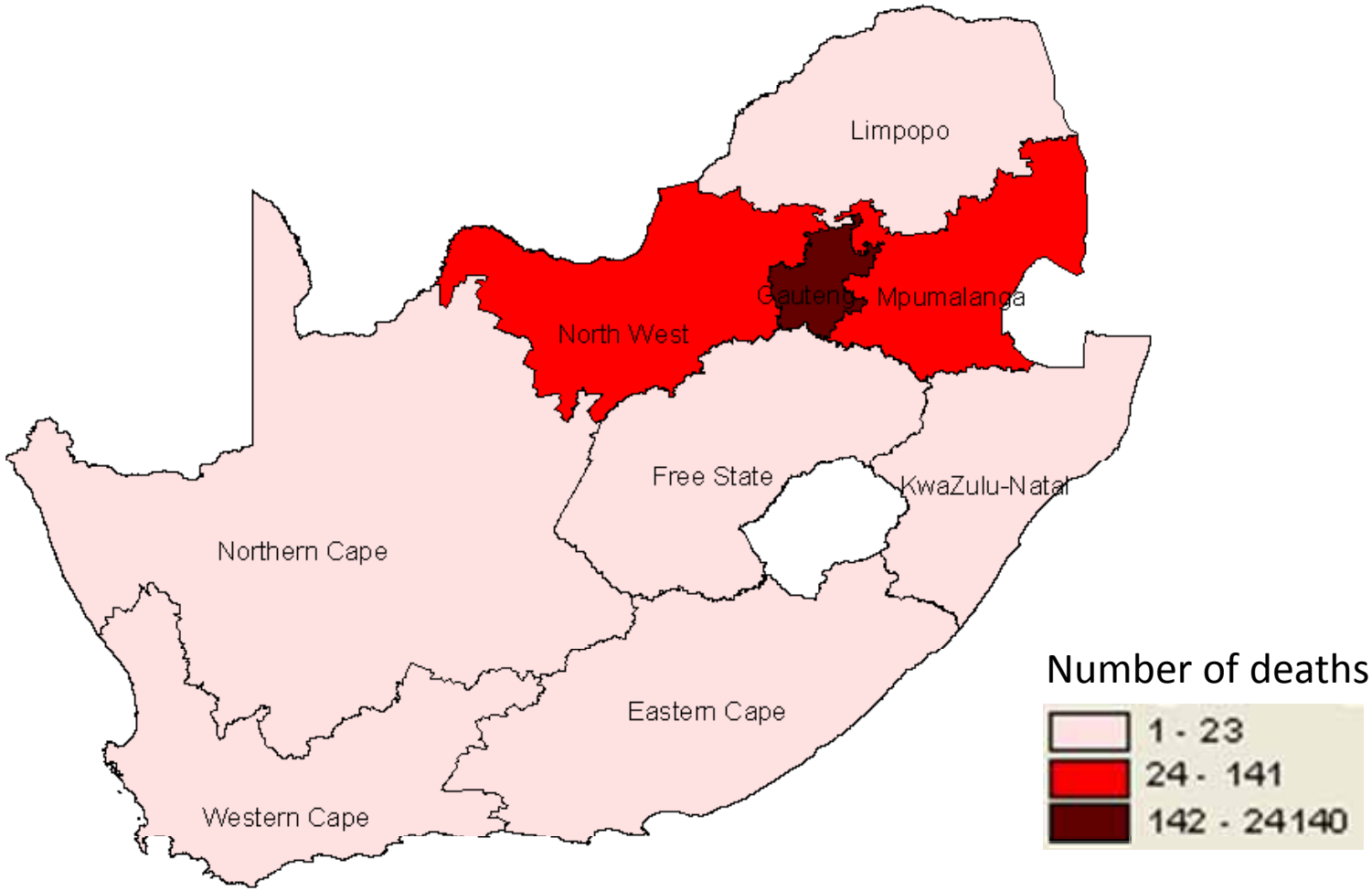
The web of mapping units - Gauteng



Potential of mapping units for spatial analysis of (fatal) injuries

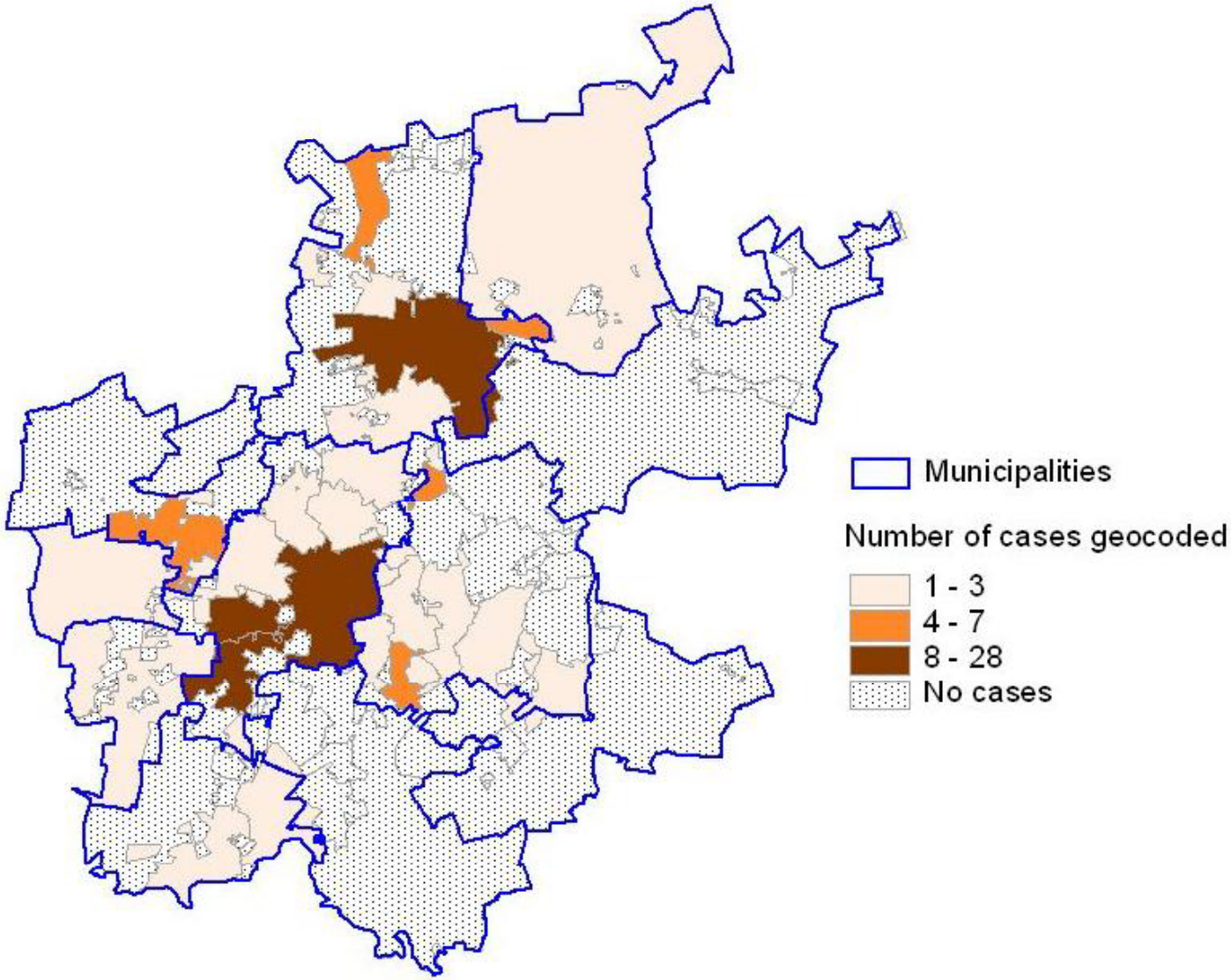
- **Suburbs** – no standing in terms of the population census; has cadastral and property marketing value
- **Enumeration areas (EAs)** – extensive population data, but only published for 1996 census; has numerical identifiers only
- **Subplaces** – output areas for the 2001 census, five provinces, generalized population data, aligned to Main Places of Census 2001
- **Datazone geography** – deprivation at local level; ranking of indices of deprivation

Province of injury: Gauteng Mortuaries (All cases: 2001/2)



98.6% of injuries originate in Gauteng

Deaths by falls and burns (>=50 years)



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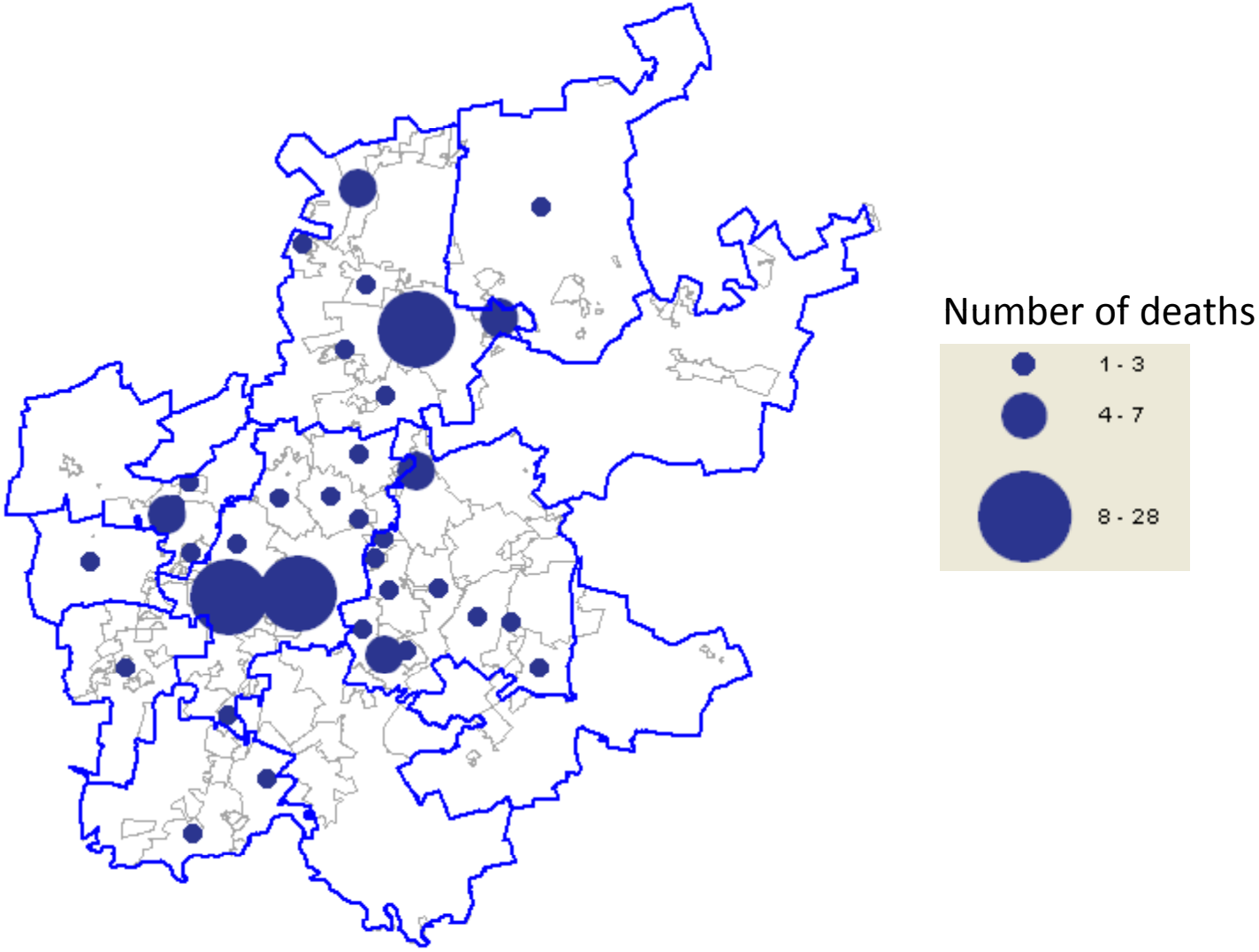

Towards ‘Small area analysis’ – spatial autocorrelation

Figure 2 Neighborhoods of residence for patients hospitalized from an assault injury between March 2001 and March 2006.

Source: N Bell, N Schuurman and S M Hameed (2008)

The way forward

- **Most recent data on fatal injuries** - access to longitudinal data from NIMSS for 2001-2007; search for a national picture ; with inter-city comparisons
- **Denominator data** – suitable population data at an appropriate spatial level will be sought; calculation of rates for comparison
- **Identification of socio-economic risks factors** – housing types, income, age, overall deprivation indices at small area levels; what are the links?
- **Does geography matter?** – are older adults living or working in some areas more at risk of a fatal injury through burns and falls than elsewhere?

Acknowledgements

- NIMSS data contribitors – pathologists and their staff at participating mortuaries
- MRC and NDoH for making the data available
- The PHASA conference organisers - conference bursary for fees and accommodation costs
- HSRC for funding the rest of my conference costs