

# Geographically Weighted Regression Modelling to Target Future Screening Interventions for Hepatitis C Virus Infections

## Tracking Regional Variation in Healthcare

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# Background

- Hepatitis C Virus (HCV) infections are a major cause for liver diseases
- A large proportion of these infections remains hidden to care due to its often asymptomatic nature
- Highly effective therapeutic options are becoming available but require prior diagnosis
- Preventive screenings are necessary to identify current hidden infections
- Screenings targeted at behavioural risk groups only have not proven to be very effective

# Background

## Risk factors:

- Injecting drug use (*Alter et al. 1998, Cornberg et al. 2011 u.a.*)
  - Blood transfusions before 1992 (*CDC 1998*)
  - Immigration from endemic countries (*Cornberg et al. 2011*)
  - Low socio-economic status (*Vermeiren et al. 2012*)
  - High-risk sexual behaviour (*CDC 1998*)
- ⇒ Future screening interventions based on demographic and socio-economic population characteristics potentially more feasible
- ⇒ Geographic Information Systems (GIS) allow modelling relationships between HCV and population characteristics

# Objectives

1. Determination of local clusters for prioritization of future screening interventions
2. Determination of demographic and socio-economic population characteristics associated with HCV prevalence
3. Assessment of local variation of the association between HCV prevalence and demographic as well as socio-economic determinants

# Data sources

## HCV data

- HCV positive persons between 2002 – 2008 (n = 781) based on 4 – digits postcode in South – Limburg, the Netherlands
- HCV positivity: positive immunoblot or polymerase chain reaction test

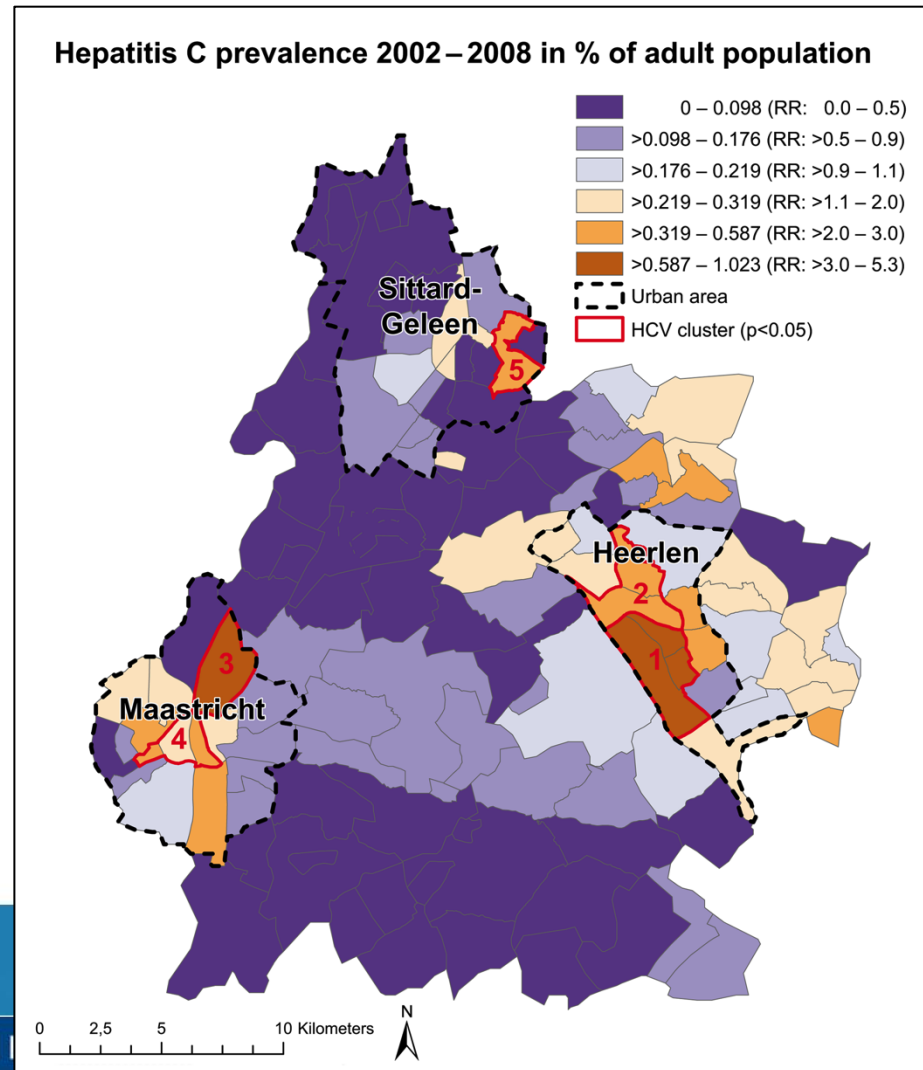
## Explanatory variables:

- Data from statistics Netherlands based on 4 – digits postalcodes
- Statistics Netherlands offers a wide variety of demographic and socio-economic variables

# Geographically Weighted Regression Modelling

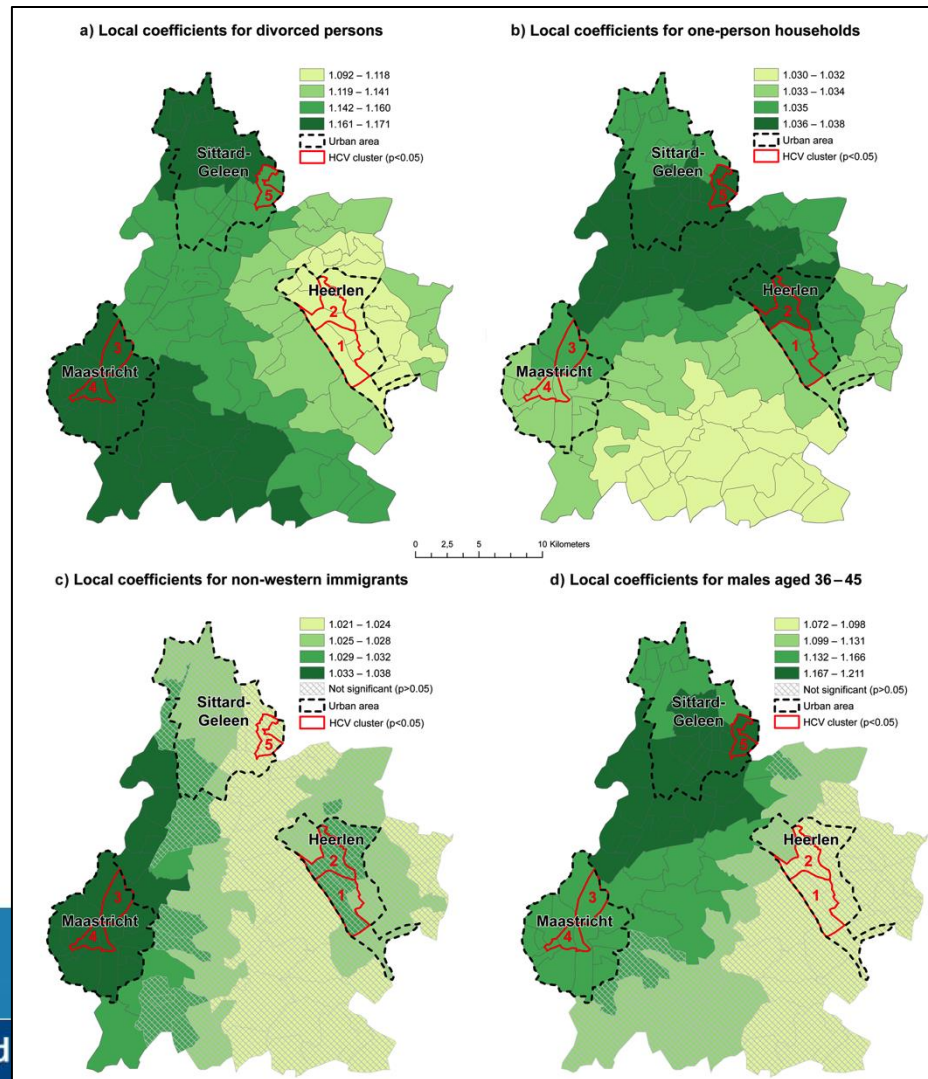
- Traditional regression models estimate strength of relationship averaged over whole study area
  - Epidemiological outcomes often autocorrelated
  - Socio-economic and demographic variables display usually regional variation
  - It is unlikely that one coefficient reflects the „true“ underlying relationship between epidemiological outcome and explanatory variables
- ⇒ Public health interventions for HCV need to address the spatially varying associations between epidemiological outcome and population characteristics

# Results: Spatial Distribution of HCV Prevalence



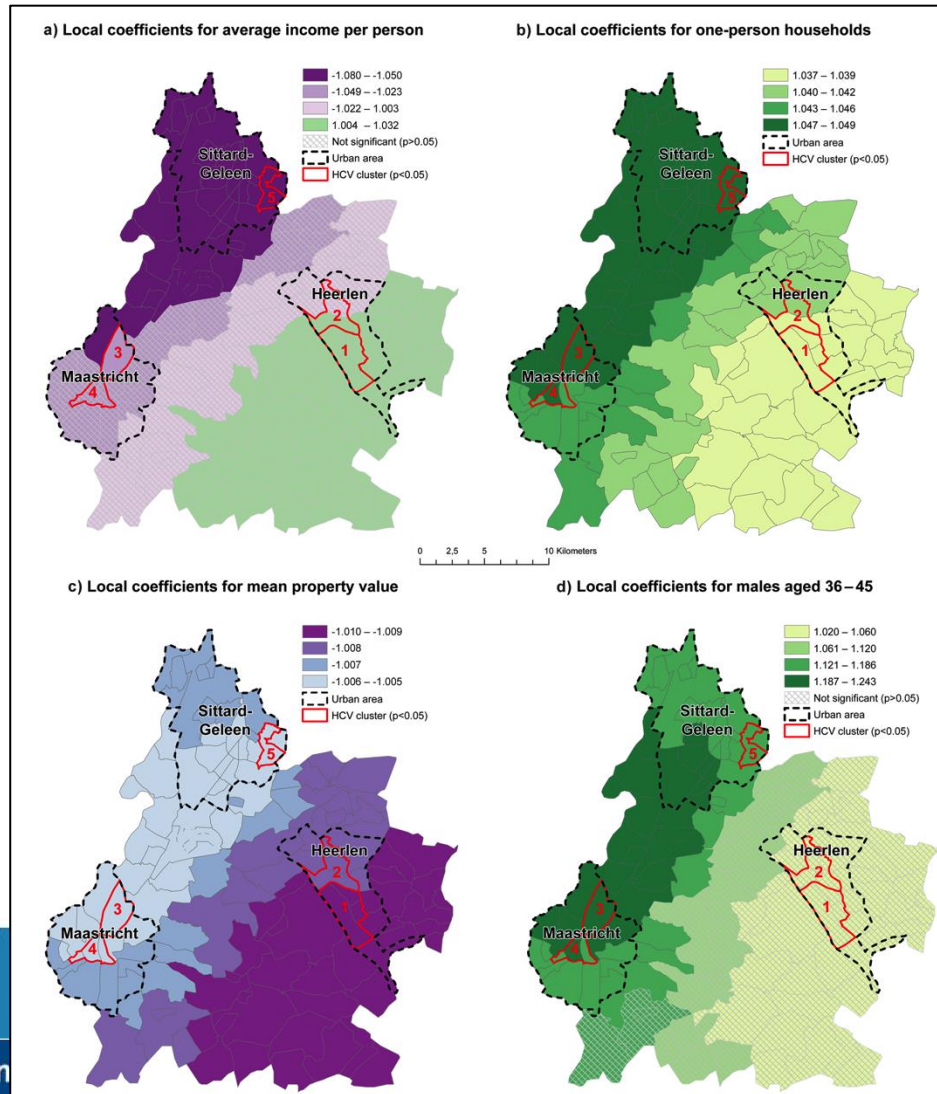


# Results: GWR model 1





# Results: GWR model 2



# Limitations

- Identified risk factors reflect only risk factors for diagnosed HCV infections
- Risk factors might differ for the total number of infections
- The identified ecological risk factors do not necessarily reflect individual risk factors
- Educational variables were not available for this study
- Low number of administrative areas (n = 126)

# Conclusions

- Future screening interventions need to take into account the spatially varying association between risk factors and HCV
  - A one-size-fits-all approach is not appropriate even in small geographic regions
- ⇒ Geographically weighted regression modelling is a useful tool to capture spatially varying relationships
- ⇒ Health care planning should address the spatially varying relationship between epidemiological outcomes and population characteristics

**Thank you for your attention!**

Questions?

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