

# THE TRANSMISSION DYNAMICS OF SEXUALLY TRANSMITTED AND BLOODBORNE INFECTIONS WITHIN SOCIAL NETWORKS

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# Themes

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- Social networks and social epidemiology
- Why social networks are important
- Data collection
- Examples
  - ▣ Networks that form around geographic places
  - ▣ Exploratory analysis

# Social networks and Social epidemiology

- Social epidemiology is the study of the social determinants of a health outcome
- Provides a more detailed examination of health determinants than is possible with traditional risk factor epidemiology
- Social networks are one type of social determinant that can be included within social epidemiology

# Social epidemiology

□ Outcome – HIV Incidence (example)

□ Predictors:

## ***Pathogen characteristics***

- Virulence factors

Risk factor  
epidemiology

## ***Individual characteristics***

- Host genetics
- demographics
- Socioeconomic variables
- Drug use
- Sexual practices

Social  
epidemiology

## ***Social factors***

- Social networks
- Neighbourhoods

## ***Structural factors***

- Policy environment
- Legal structure
- war

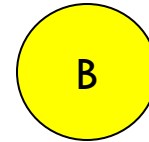
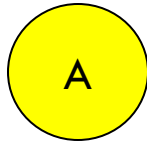
# Social networks

- A group of objects (individuals) and the relationships that connect them – relational data
- Specifically examines the ties and connections (relationships) that occur between individuals
- Can require specialized data collection and/or analysis techniques

# Are social networks important?

Why are social networks important for disease transmission?

## - *Theoretical example*



Both people (A and B) inject heroin

Both people inject about once per week

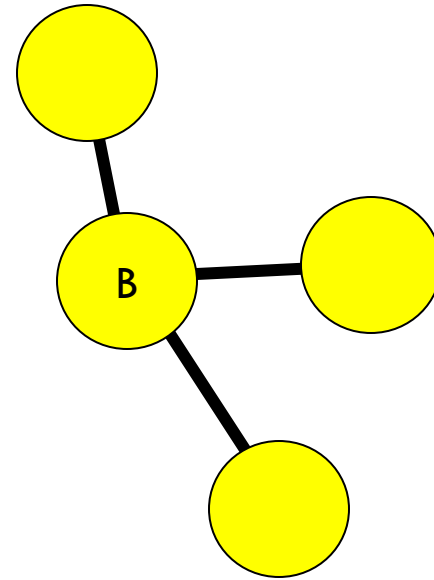
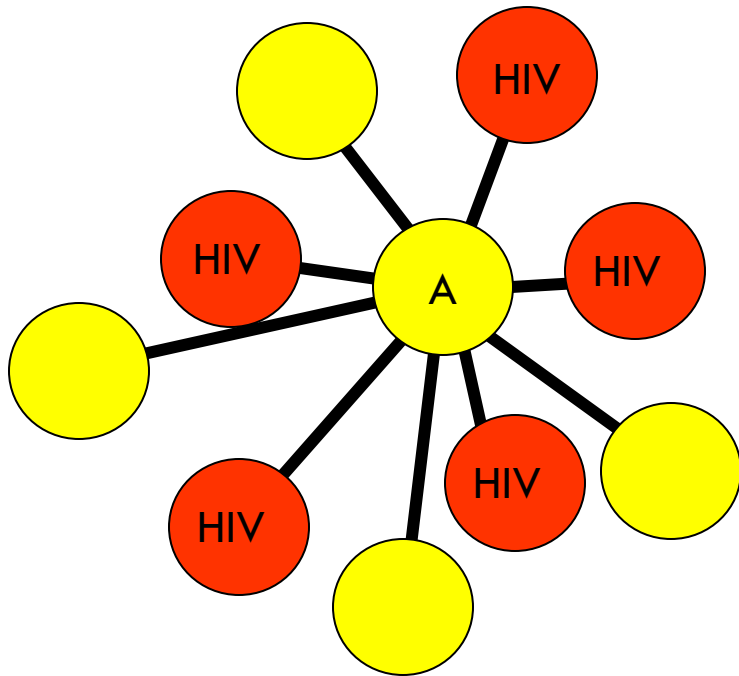
Both people share needles with other IDU about half of the time

A becomes infected with HIV within one month of initiating injection

B never becomes infected

Why?

# Are social networks important?



Person A interacts with more drug users. Many are infected with HIV. This type of detailed information is not usually collected in traditional studies. Social networks reveal social structure or social context.

# Data collection

## □ Rapid assessments

- How many people do you know that have had more than one sex partner?
- What proportion of your friends do you think would have unprotected sex with a new sex partner?
- What proportion of your friends do you think have a steady sex partner but would also have sexual relations with other people?





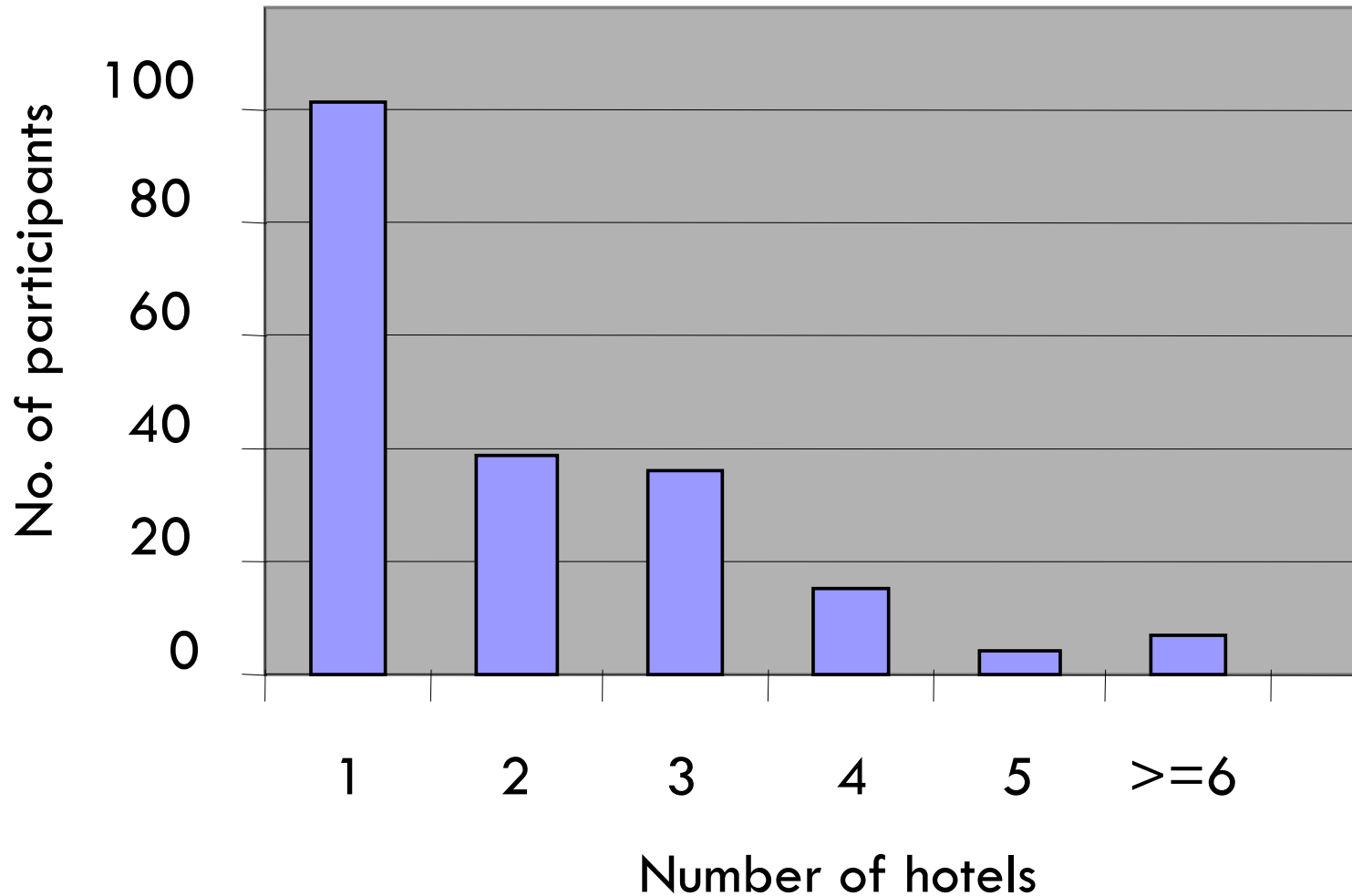
# The importance of place

- Networks that form around geographic places (e.g. neighbourhoods, specific buildings)
- Winnipeg Injection Drug Use study - Nov 2003 to Aug 2004
- Word of mouth advertising with self-report of injection in last 6 months - 435 IDU
- Collected information on hotels used for injection in previous six months

# The importance of place

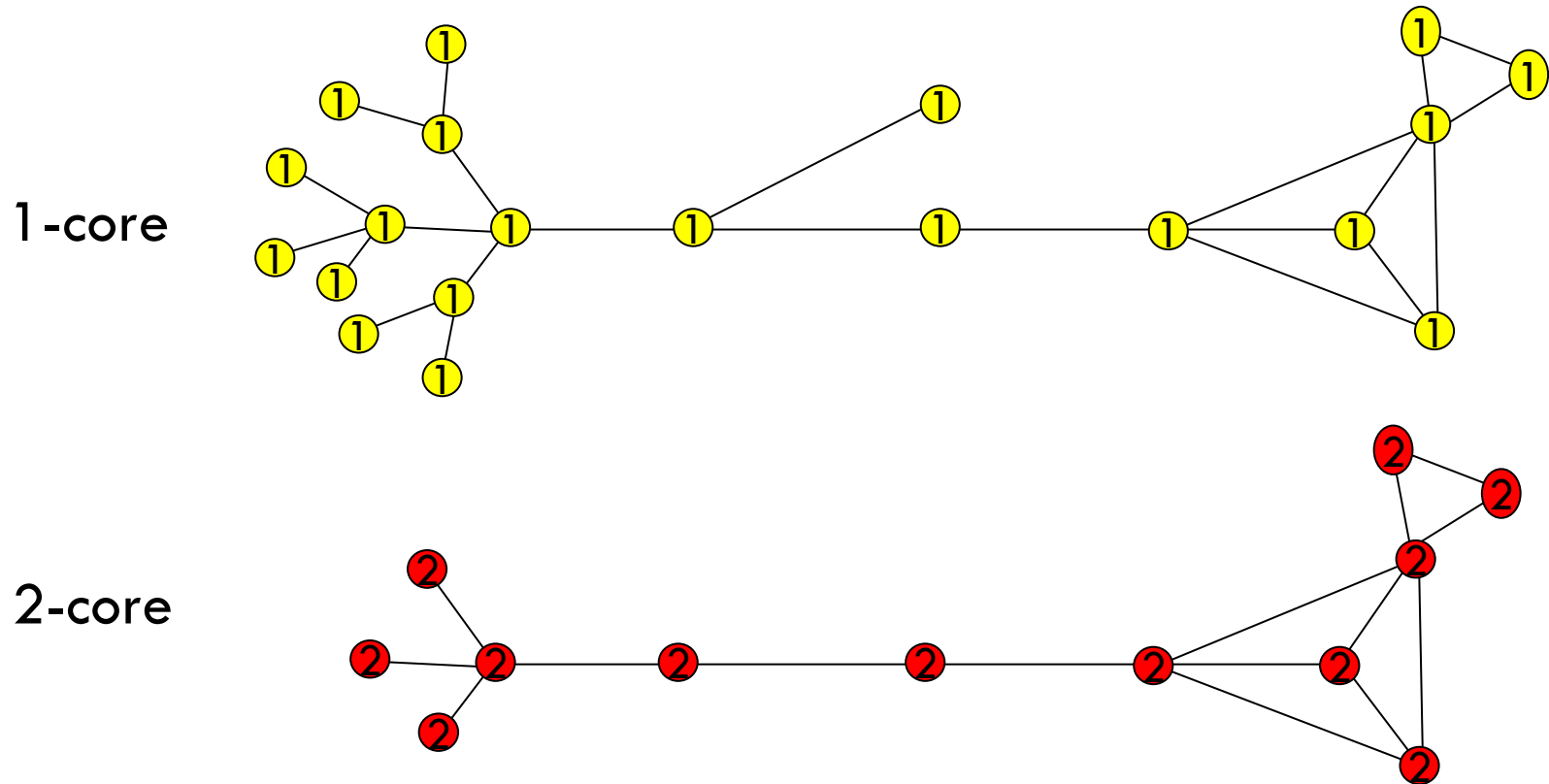
- Individual level - analyzed to determine if:
  - Infection associated with a study participant injecting at a hotel
  - Infection associated with number of hotels a person injects (most IDU inject at only one hotel, but some inject at many hotels)
  - Infection associated with specific hotels
- No clear association between infection and injection at a hotel
- Used a network approach to visualize the network of hotels and IDU

# The importance of place

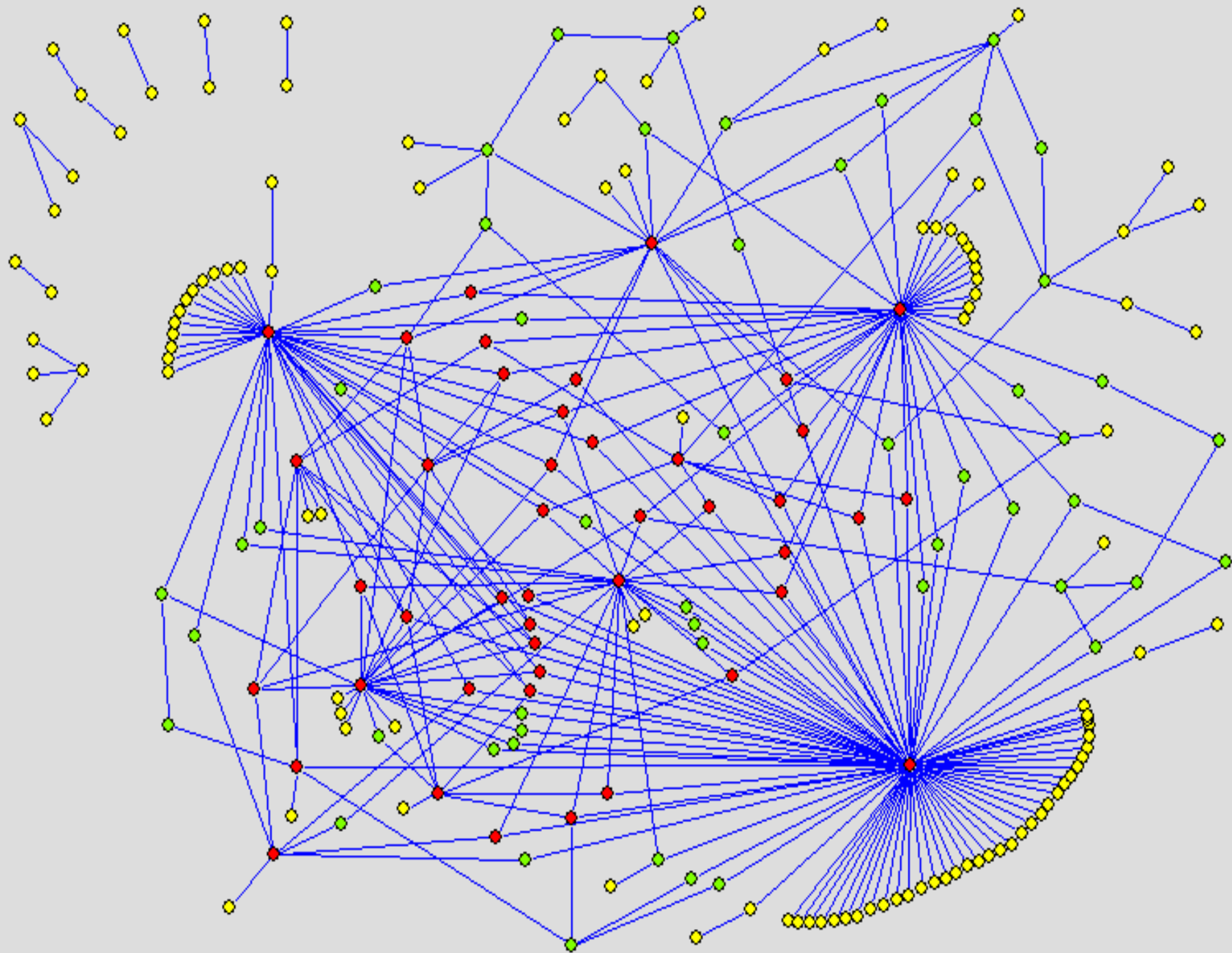




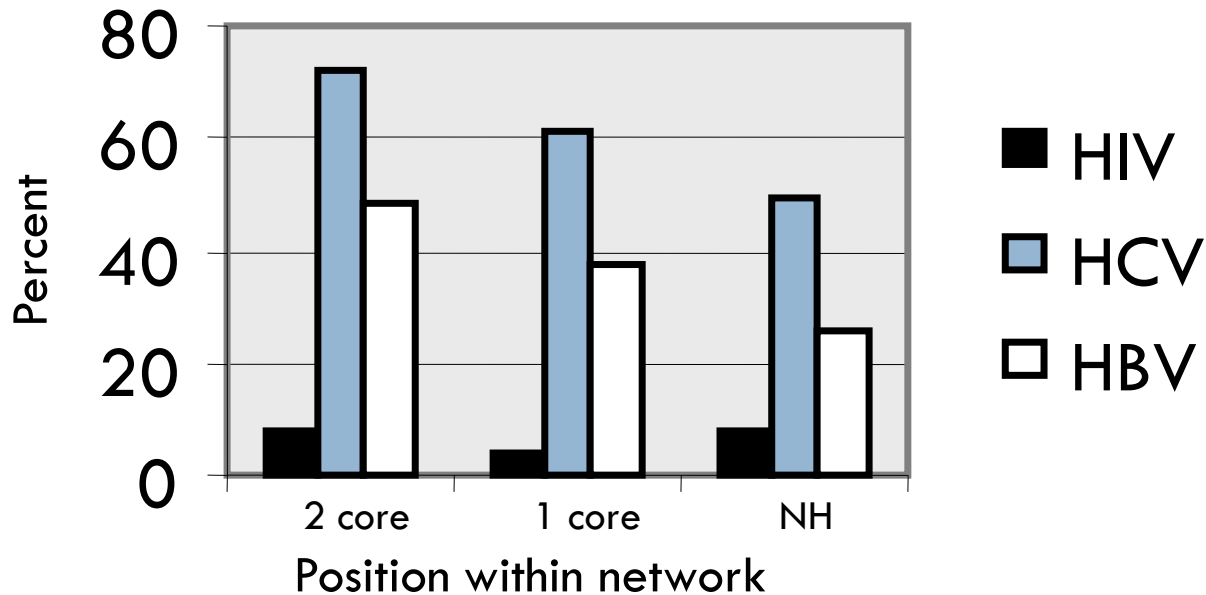
# $k$ -core analysis (subgroups within networks)



Example: a 2-core contains all individuals with 2 or more partners and that are connected to other people with 2 or more partners.



# The importance of place



What is different about people in the 2-core?

More likely to sell drugs

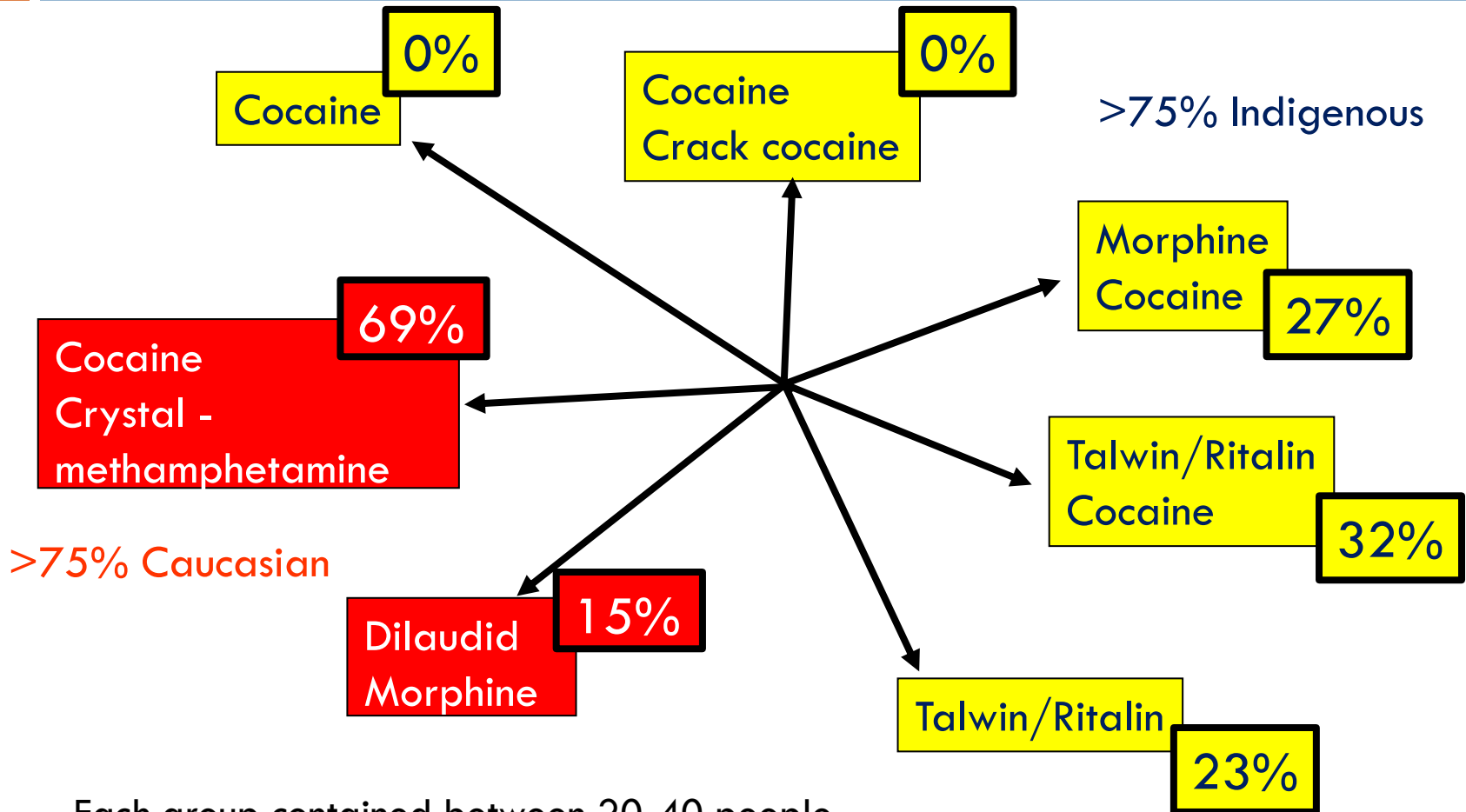
More likely to borrow injecting equipment from other people  
(already used)



# Exploring social context

- Methods for finding groups in data - could represent unidentified or unknown networks of individuals (cluster analysis; latent class analysis)
- Can cluster analysis identify IDU with common characteristics (previously unidentified behavioural traits)?
- Used three grouping variables (separate analysis for males and females)
  - ▣ Ethnicity
  - ▣ Use of used syringes
  - ▣ Types of drugs injected

# Exploring social context

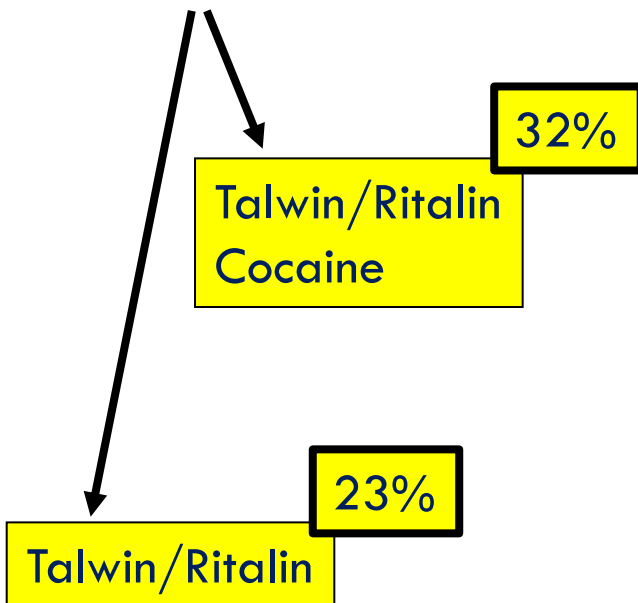


Each group contained between 20-40 people

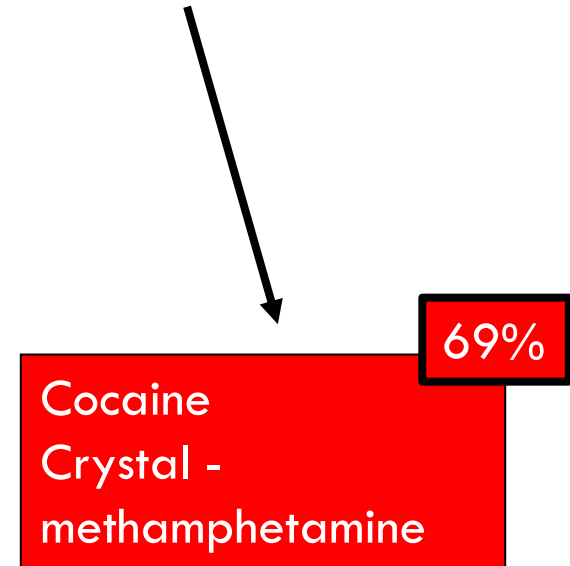
Analyzed additional variables to better understand behavioural characteristics and/or verify findings

# Exploring social context

High prevalence of bloodborne pathogens  
Injection in hotels  
Injection on the street



No HIV, HBV, little HCV  
Average age - 22  
Injecting <3 years  
Inject on the street



# Summary

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- Social epidemiology and social networks
- The importance of place
- Exploratory techniques
  
- ▣ Impact
  - Understanding network structure allows targeted approach for specific population subgroups