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Predictors of alcohol-exposed pregnancy (AEP) in South Africa

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The public health challenge of alcohol consumption

- Excessive alcohol consumption is responsible for many health, psychological, social and economic problems globally.
- In South Africa in 2002, 7% of disability-adjusted life-years (DALYs) lost and 7.1% of deaths were attributable to alcohol.
- Significant contributor to burden of diseases and mortality

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The context to alcohol consumption in South Africa

- Indigenous, traditional home brewing before and during and after the colonial era
- Prohibition and restriction during the apartheid era, especially for the black/African majority
- Proliferation of homebrews and widespread small-scale outlets especially 'shebeens'
- The *'dop' system* – part payment of farm workers' wages in wine
- Illegal since 1961 – practised till recently; probably still an 'underground' activity
- Black economic empowerment (BEE) is extensive in the alcohol industry

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Fetal Alcohol Syndrome (FAS)

- Invariably, maternal drinking is also a feature of alcohol consumption
- Alcohol abuse/problem drinking have individual adverse effects
- Fetal Alcohol Spectrum Disorders (FASD) - an umbrella term describing the range of symptoms that can be manifested by an individual whose mother drank alcohol during pregnancy
- Fetal Alcohol Syndrome (FAS) is the most recognised form of FASD
- Alcohol-related birth defects & Alcohol-related neuro-development disorders

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Physical features of FAS

- **Discriminating features**
  - Shortened nose
  - Flat midface
  - Indistinct philtrum
  - Thin upper lip
  - Short palpebral fissures
- **Associated features**
  - Epicanthal folds
  - Low nasal bridge
  - Minor ear abnormalities

SOURCE: Mukherjee, Hollins & Turk. An overview of Fetal Alcohol spectrum disorders Available from http://www.intellectualdisability.info (Accessed 1 November 2012)

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FAS as a public health challenge

- The highest global rates of FAS and partial FAS identified in rural farming areas in the Western Cape (WC), Northern Cape (NC) and Gauteng provinces
- Identified rates of FAS of *40.5–46.4/1000* (1997); 65.2–74.2/1000 (1999); and *68.0–89.0/1000* (2001) amongst Grade 1 learners in WC primary school cohorts
- Gauteng province was *19/1000* (2003), combined rate for two locations in the Northern Cape was *67.2/1000* (2001-2004)

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Provinces and major cities
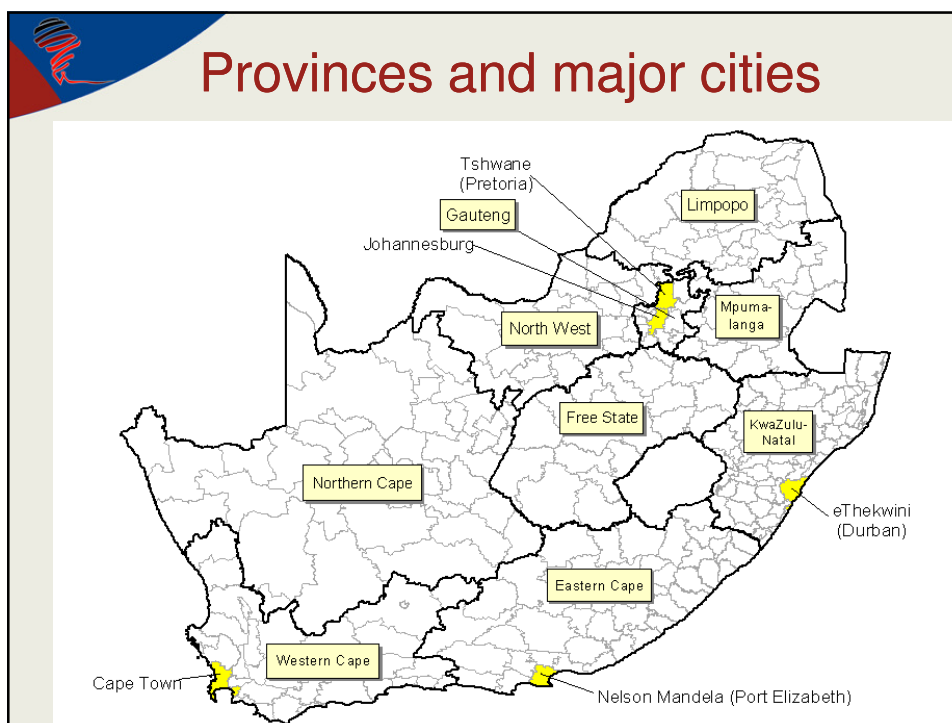
Combating FAS and binge drinking

- Levels of problem drinking among women alcohol are relatively high; not appreciably different from those of men
- Episodic binge drinking especially harmful to the unborn child
- Reduction in FAS require a minimization of women's risk of having an alcohol-exposed pregnancy (AEP)
- Women of child-bearing age, fertile, alcohol use, non-use/ineffective use of contraceptives.

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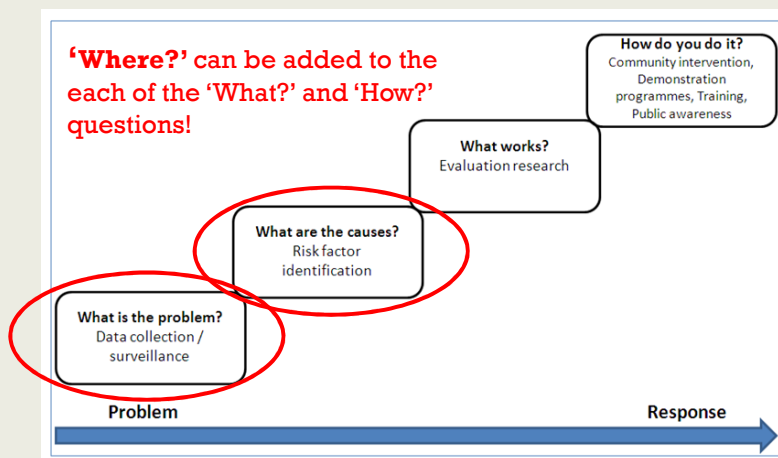Human Sciences
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Research question

- Which are risk and protective factors for having an AEP?
- Particularly useful for informing policy and interventions
- Formative phase of an intervention programme to apply a public health approach to preventing AEP
- Study amongst women aged 18–44 years in two comparison sites:
  - a densely populated urban area
  - sparsely populated rural farming area
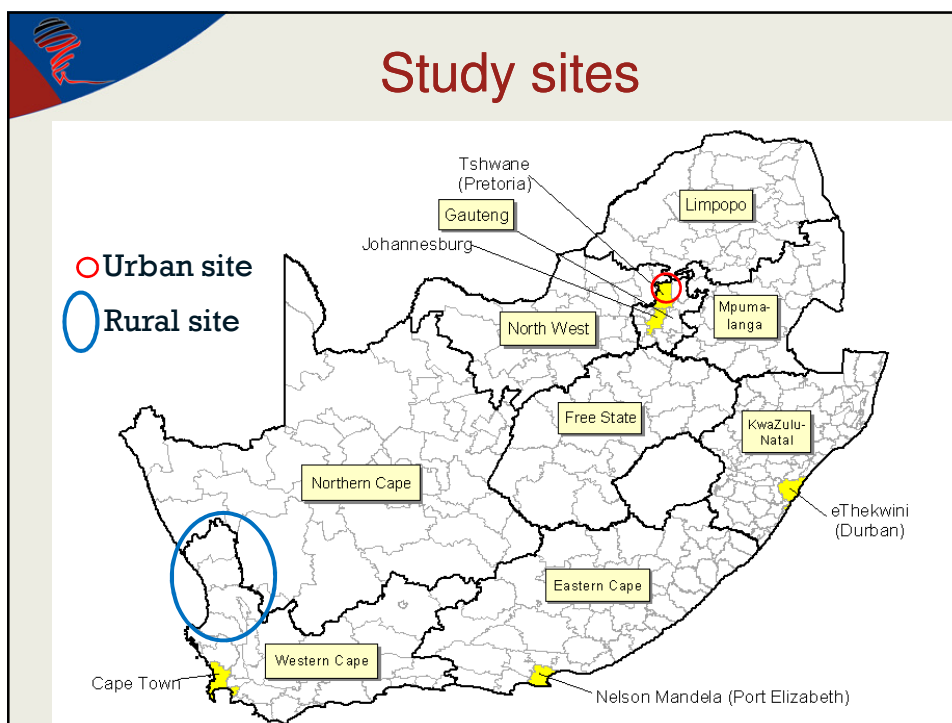
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The public health approach and GIS?

'**Where?**' can be added to the each of the 'What?' and 'How?' questions!

How do you do it?
Community intervention, Demonstration programmes, Training, Public awareness

What works?
Evaluation research

What are the causes?
Risk factor identification

What is the problem?
Data collection / surveillance

Problem   Response

SOURCE: Seedat M. Extending the boundaries of injury prevention theory, research and practice in Africa. *African Safety Promotion* 2002;1:5-15

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Study sites

○ Urban site

◯ Rural site

Tshwane (Pretoria)
Gauteng
Johannesburg
Limpopo
North West
Mpuma-langa
Free State
KwaZulu-Natal
Northern Cape
eThekwini (Durban)
Eastern Cape
Western Cape
Cape Town
Nelson Mandela (Port Elizabeth)

Aims of the study

- The aims of the study were to determine, for each site separately:

  - the extent to which women of childbearing age are at risk of having an AEP

  - the demographic, health, substance use, psycho-social, community, and partner predictors of risk for having an AEP

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Sampling for the FAS study

- Cluster random sampling approach with a goal of recruiting 820 women from the urban site
- Random selection of 82 census enumeration areas (EAs)
- From each area, randomly selected 10 households using aerial photographs
- Within identified households select one eligible woman and invite her to participate in the study.
- Realised sample of 606 (59.5% of total sample)
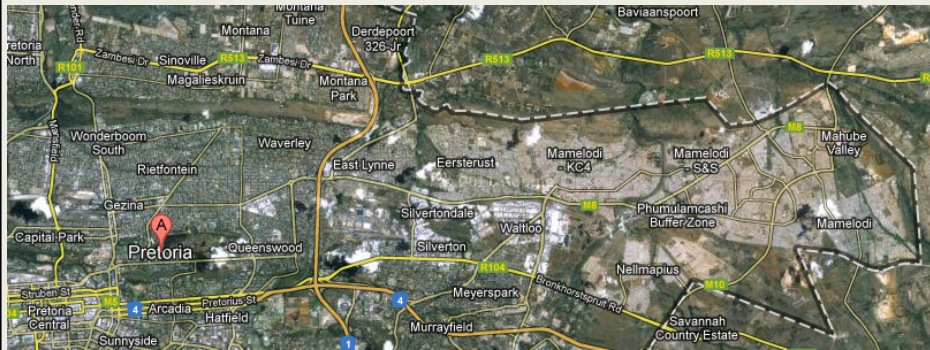
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Sampling for urban area – geographic data needs

- Cluster random sampling approach with a goal of recruiting 820 women
- Random selection of 82 census enumeration areas (EAs) – **the latest EA boundaries**
- From each area, randomly select 10 households using aerial photographs – **recent and georeferenced aerial photographs**
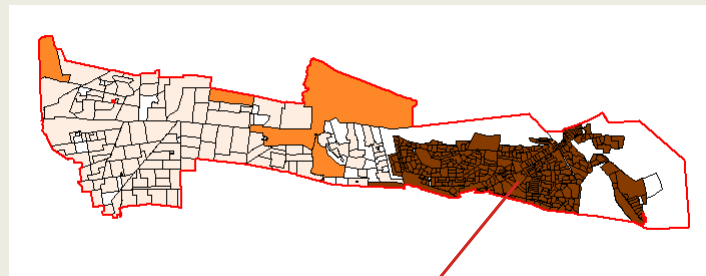- Within identified households select one eligible woman and invite her to participate in the study.

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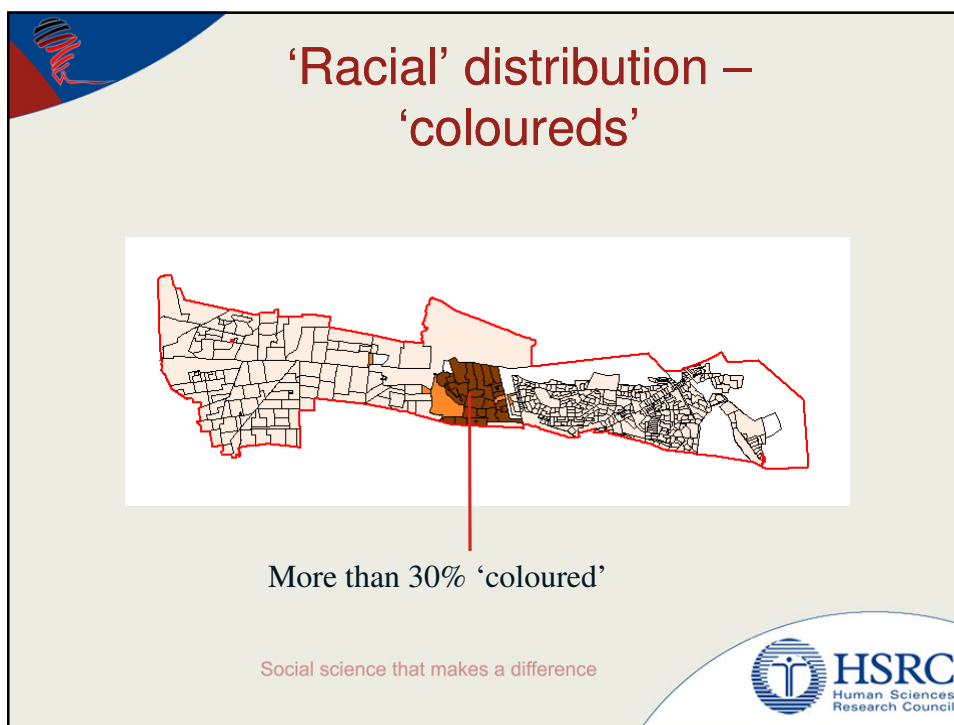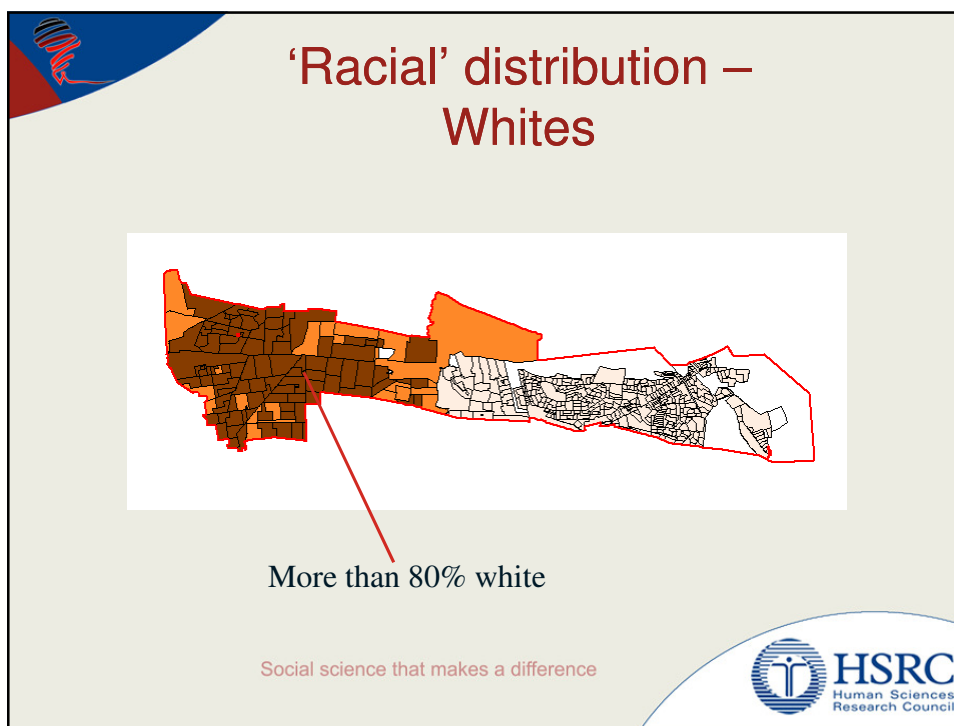## Urban study site – City of Tshwane

'Racial' distribution – Black Africans

More than 60% black Africans

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'Racial' distribution – Whites

More than 80% white

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'Racial' distribution – 'coloureds'
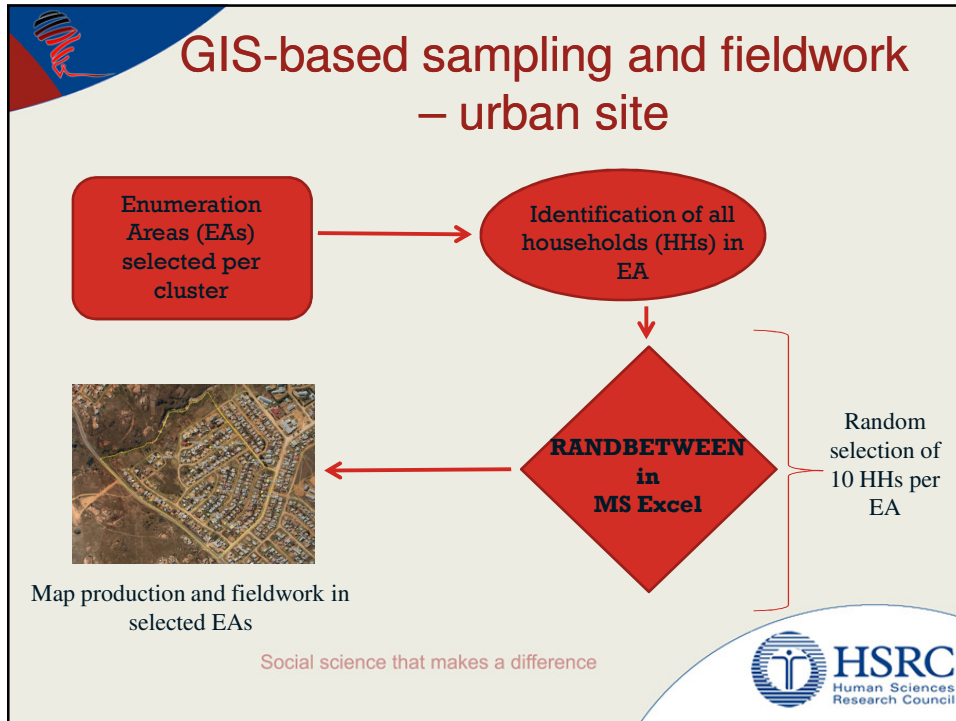

More than 30% 'coloured'

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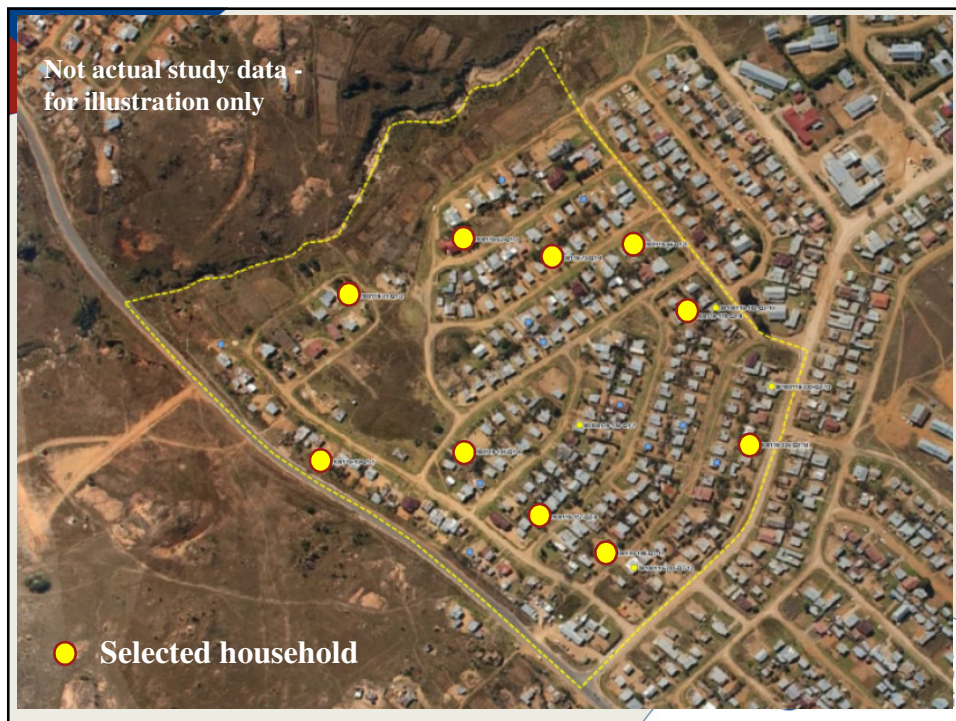
Advantages of using GIS

- Area-based sampling is crucial in population-based suveys; GIS is indispensible
- Express recognition of 'racial' make-up and SES of survey areas
- Proxy for various socio-economic factors
- Match 'race' and language of interviewers with potential respondents
- Random selection of households in the absence of lists prior to start of the fieldwork
- More accurate targeting of households using aerial photographs in formal areas

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Sampling for the rural site

- All farms listed across the three local municipalities (n=1450)
- Sourced from the Department of Agriculture and the agricultural union
- No need for GIS as in the case of urban site
- Random selection of 150 farms
- Realised sample of 58 farms
- Total of 412 women interviewed (40.5% of the total sample of women)

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Measures used in both sites

- Structured questionnaire, with items used previously amongst similar study populations
  - *Demographic characteristics* (age, education, SES, marital status, socially classified 'race')
  - *Substance use* (alcohol, AUDIT, tobacco use)
  - *Contraceptive use* (lifetime & current use)
  - *Reproductive health factors* (current pregnancy & fertility status)
- Dependent variables
- Independent variables

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Dependent variables

- Three levels of risk of an alcohol-exposed pregnancy
  - **Level 1:** women not pregnant at the time, were fertile, drunk alcohol (frequency and quality discounted), no or ineffective contraception
  - **Level 2:** Above criteria plus reporting to have drunk *at least three drinks* per occasion
  - **Level 3:** Criteria of Level 1, plus reporting to have drunk *at least five drinks* per occasion

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Independent variables (i)

- *Socio-demographic factors:*
  - Three age cohorts (18-24, 25-34, 35-44 years)
  - Below/none vs above primary school education
  - Parity (more than 1 vs 1 or no children)
  - Married/cohabitation vs not
  - Self identified 'race' (black/African, 'coloured', white, Indian)
  - Current vs not current employment
  - 8 item household assets (Yes vs No) as proxy for SES

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Independent variables (ii)

- *Health perceptions:*
  - Health perception (4-item) scale
  - Mental health (5-item) scale based on the Short Form 20 Health Survey
- *Substance use:*
  - Cigarettes smoked in the past 30 days
  - Cannabis (Marijuana) use – ever used
- *Psycho-social factors:*
  - Self-esteem
  - FAS knowledge
  - Religious involvement
  - Male entitlement and cultural prescripts on child-bearing

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Independent variables (iii)

- *Community factors:*
  - Access to recreational facilities
  - Access to alcohol

- *Partner characteristics:*
  - Partner older or younger than 30 years
  - Partner education (Grade 8 and lower vs higher)
  - Partner binge drinking (6 or more drinks per occasion)

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Statistical Analyses

- Percentages calculated of women who reported alcohol use, contraception and Levels 1, 2 & 3 AEP risk
- Logistic regression to determine significant bivariate associations between predictors and the dependent variables
- Multiple logistic regression for all independent variables that significant pair-wise relationship in the bivariate analysis

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Overall results

- Overall 72% of the rural women and 40% of the urban women reported lifetime alcohol use
- Rural women more likely to report:
  - Current alcohol consumption
  - Harmful/hazardous drinking
  - Lifetime, current and regular smoking

- No significant differences in rates between rural and urban women of:
  - Lifetime, current or ineffective contraceptive use
  - Pregnancy or infertility

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Level of AEP risk for interviewed women

Level of AEP risk	Rural site	Urban site
1	21.84%	11.22%
2	16.75%	6.44%
3	8.5%	2.48%

Level 3: women not pregnant at the time, were fertile, no or ineffective contraception, drinks five of more drinks of alcohol per occasion

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Predictors of AEP risk-urban site (i)

- Significantly **greater risk** of **Level 1** AEP (Bivariate logistic regression)

  - 'White' or 'coloured' respondents as opposed to 'black/African'
  - Higher socio-economic status
  - Current smokers
  - Ever use of cannabis
  - Early onset of alcohol consumption (<18 years)
  - Highly accessible recreation facilities

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Predictors of AEP risk–urban site (ii)

- Significantly **less risk** of a **Level 1** AEP
  - Unemployed respondents
  - View that men are entitled to father as many children as they want

- Multiple logistic regression revealed that 'Race' and 'Current smoking' were independently associated with a *Level 1* AEP risk

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Predictors of AEP risk–urban site (iii)

- Six significant **Level 2** risk factors for an AEP (Bivariate logistic regression)
    - 'Race' – 'White' vs 'black/African' & 'coloured' vs 'black/African'
    - Socio-economic status
    - Current smoking
    - Alcohol onset < 18 years
    - Self-esteem
    - Access to recreational facilities
    - Parity and religiosity were ***protective factors***

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Predictors of AEP risk–urban site (iv)

- Four significant **Level 2** risk factors for an AEP (Multiple logistic regression)

    - Current smoker
    - High self-esteem
    - High access to recreational facilities
    - Low religiosity

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Predictors of AEP risk–urban site (v)

- Significant **Level 3** risk factors for an AEP (Bivariate logistic regression)
  - 'Race' – 'White' vs 'black/African'
  - Current smoking
  - Ever smoked cannibis
  - Onset of alcohol use < 18 years
  - Better access to recreational facilities
  - Less risk associated with parity

- No multivariate analysis due to small numbers

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Predictors of AEP risk– rural site (i)

- Significant and greater **Level 1** risk for an AEP (Bivariate logistic regression)
  - Current smoking
  - Onset of alcohol use < 18 years
  - Having a binge drinking partner
- Significant and lesser **Level 1** risk for an AEP
  - More than primary education
  - Higher SES
  - Higher parity
  - High self-esteem
  - FAS knowledge
  - High religiosity

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Predictors of AEP risk– rural site (ii)

- **Level 1** risk for an AEP (Multiple logistic regression)
  - Current smoking
  - Onset of alcohol use < 18 years were significant

- Significant **Level 1** protecive factors against an AEP
  - More than primary education
  - FAS knowledge
  - Higher parity

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Predictors of AEP risk– rural site (iii)

- **Level 2** risk for an AEP (Bivariate logistic regression)
  - Current smoking *(also after multivariate analysis)*
  - Onset of alcohol use < 18 years were significant
  - Binge drinking partner

- **Level 2** protecive factors against an AEP
  - More than primary education *(also after multivariate analysis)*
  - Higher parity *(also after multivariate analysis)*
  - High self-esteem
  - Religiosity

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Predictors of AEP risk– rural site (v)

- **Level 3** risk for an AEP (Bivariate logistic regression)
  - Current smoking *(also after multivariate analysis)*
  - Use of cannibis
  - Onset of alcohol use < 18 years *(also after multivariate analysis)*
  - Binge drinking partner *(also after multivariate analysis)*

- **Level 3** protecive factors against an AEP
  - Being older (25-35 vs 18-24 years)
  - Higher parity
  - High self-esteem
  - Religiosity

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Discussion of results (i)

- One in nine women (urban area) and one in five (rural area) were at risk of an AEP
- Current alcohol users, fertile, not pregnant and non-effective contraceptive users
- Level 3 risk: typically consuming five or more drinks per occasion – proportions were 8.50% (rural women) and 2.48% (urban) – similar to an urban US risk of AEP study (1% - 2%)
- These match most recently reported FAS rates for an urban area in Gauteng of 1.9% (2003) and a rural area in the Western Cape of 6.8% - 8.9% (2007)

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Images of Level 2 AEP 'at risk' women

- **Urban site** – A smoker with no or few children, high self-esteem, low religious involvement, with high access to recreational facilities that may serve alcohol

- **Rural site** – A woman who is impoverished and marginalised, a smoker with no or few children, low self-esteem and minimal education

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Images of Level 1 AEP 'at risk' women

- **Urban site** – A 'white' or 'coloured' woman, with high access to recreational facilities that may serve alcohol

- **Rural site** – A woman who a smoker, started drinking alcohol as a minor, have at most one child and have little knowledge of adverse affects of alcohol on the foetus

- Strikingly, High self-esteem was associated with an increase (urban women) and decrease (rural women) AEP risk

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Changing patterns in urban women's alcohol use

- Strikingly, high self-esteem was associated with an increase in AEP risk for urban women
- The converse was true for rural women, high self-esteem was associated with a decrease in AEP risk
- Changing gender roles, increase alcohol consumption for women with higher SES in developing countries
- Women's improved social and economic opportunities
- Alcohol advertising targeted at women

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Divergent results from this study

- No significant association with mental or physical health perceptions
- Parity was associated with lower risk of AEP, as opposed to other studies
- Likelihood is that AEP is reduced as having children exposes the mother to family planning and other ante-natal advice

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Further research

- Binge drinking (Level 3) risk produced similar rates for FAS in comparable study sites
- Points to the value of community-based studies to estimate FAS rates – proxy value
- Less need for active case ascertainment with financial and technical implications
- Need to research under 18's – unplanned pregnancies and substance abuse likely
- Location-specific target interventions and the specific sub-groups of women
- Association with smoking and drinking

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Full paper reference

Predictors of risk of alcohol-exposed pregnancies among women in an urban and a rural area of South Africa

Neo K. Morojele [a,*], Leslie London [b], Steve A. Olorunju [c], Maila J. Matjila [d], Adlai S. Davids [e], Kirstie M. Rendall-Mkosi [d]

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Liquor availability and FAS

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Follow-up to the FAS study

Liquor outlet density, deprivation and implications for foetal alcohol syndrome prevention in the Bergriver municipality in the Western Cape, South Africa

Yasmin Bowers[a*1], Kirstie Rendall-Mkosi[b], Adlai Davids[c], Elmarie Nel[d], Nontobeko Jacobs[e], and Leslie London[e]
a Mount Sinai School of Medicine Department of Community and Preventative Medicine International Exchange Program for Minority Students, New York City, NY, USA;
b School of Health Systems and Public Health, University of Pretoria, Pretoria, South Africa;
c Human Sciences Research Council, Port Elizabeth, South Africa;
dMedical Research Council, Pretoria, South Africa;
e School of Public Health and Family Medicine, University of Cape Town, Cape Town, South Africa;

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Follow-up to the FAS study at the rural site

- A study was designed to explore the relationship of alcohol availability and accessibility in one of the local municipalities - Bergriver
- Relation to deprivation of an at-risk population susceptible to FAS

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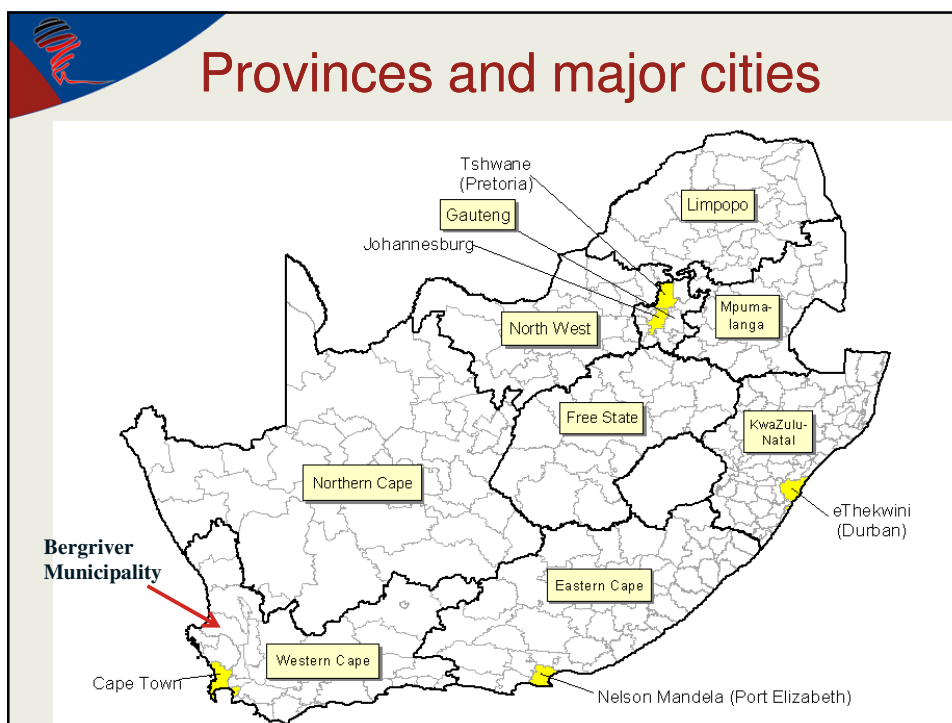
Follow-up to the FAS study at the rural site

- Studies of natural experiments clarify the relationships between alcohol availability and consumption.

- Worker strikes or prohibitions on sales reduces the rates of alcohol consumption and drinking-related problems (Edwards *et al.* 1994, cited in Grover 2000).

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Rationale for 'Outlet density' study

- Proven association between alcohol availability, rates of alcohol consumption, and drinking-related problems
- Outlet density impacts consumption - low-cost or volume-discounted alcohol available
- High outlet density also reflects heavy drinking norms and underlying community features
- Reduction in alcohol availability caused by worker strikes or prohibitions – reduces alcohol consumption and drinking-related problems

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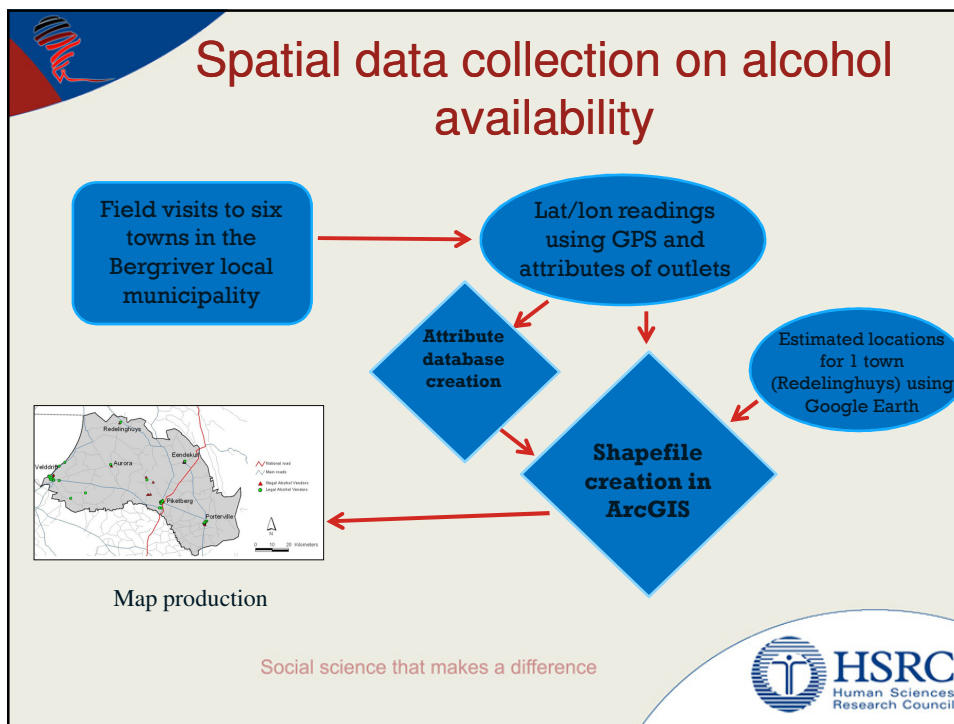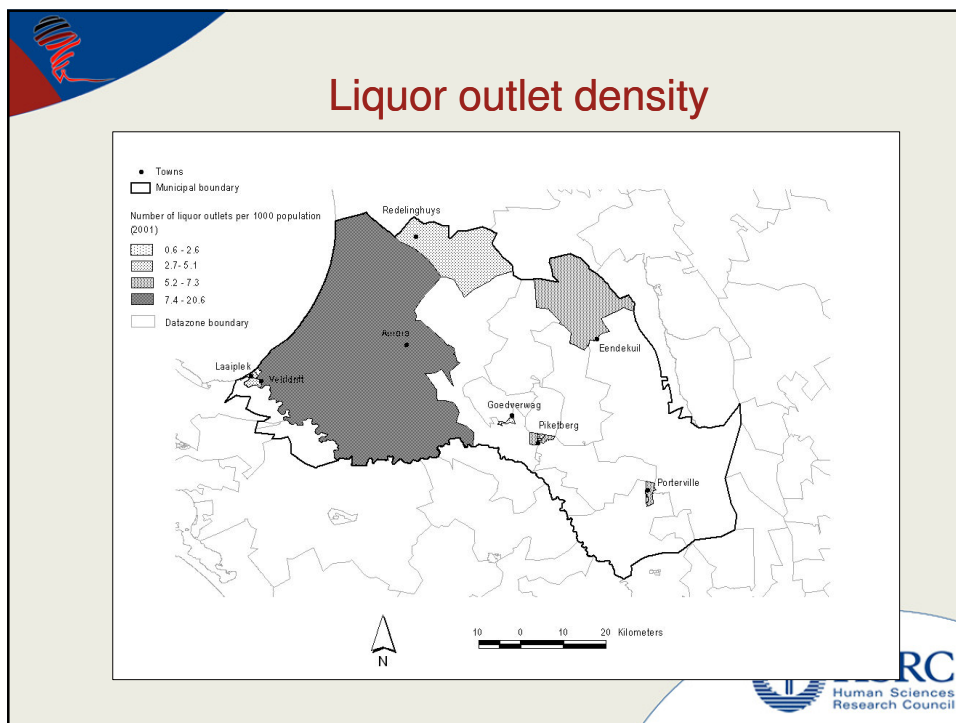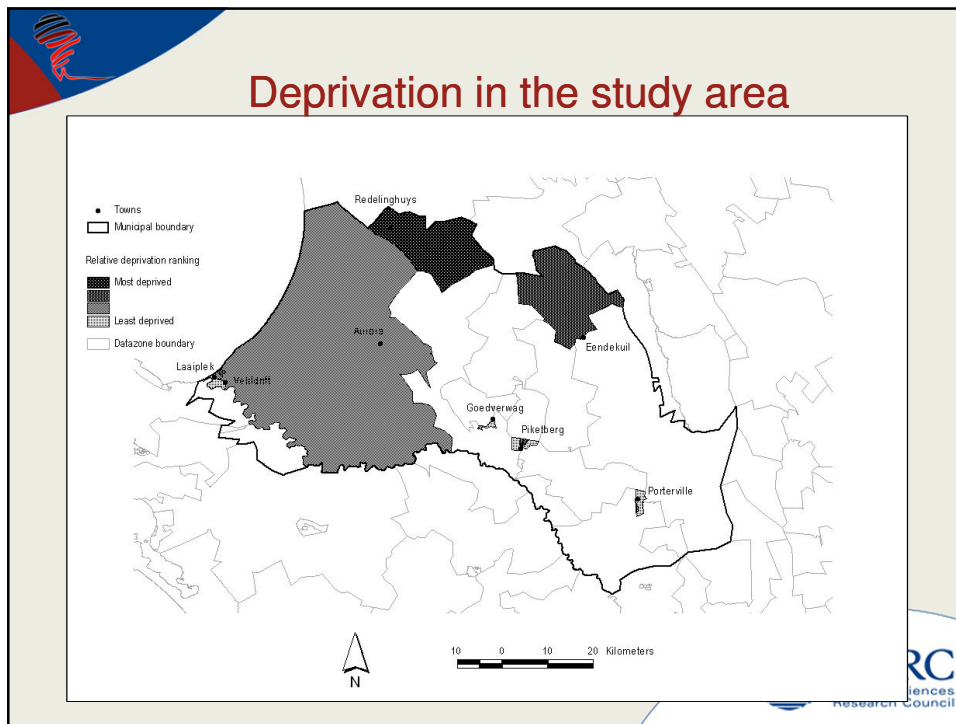
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Rationale for 'Outlet density' study (ii)

- Outlet density is therefore potentially important in efforts to minimise alcohol-related harm in the community.
- Study to explore the relationship of alcohol availability and accessibility and an at-risk population susceptible to AEP.
- Mapping these outlets using GPS and GIS to provide data on alcohol accessibility

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Spatial data collection on alcohol availability

Legal and Illegal liquor outlets

Deprivation in the study area

Liquor outlet density

Results of the mapping

- A total of 112 liquor outlets were recorded in the study area
- Forty-seven (42%) were illegal outlets
- Velddrift, Piketberg and Porterville have 98 (88%) of the recorded liquor outlets.
- Eendekuil is a village with a relatively small population of about 1000 persons
- Six of the 8 liquor were illegal at the time of the study

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Outlet density vs deprivation

- Spearman Rank Correlation was calculated for deprivation rank and outlet density rankings
- A modestly positive association was found between deprivation and illegal outlet density (0.38)
- Inverse association was found for the relationship between deprivation and legal outlet density (-0.20)
- Illegal outlets in more deprived areas; legal outlets were located in less deprived areas

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Future directions

- Collection of health data at the same scale as alcohol outlet density; including mobile outlets
- Further spatial analysis of the impact of alcohol accessibility on health, AEP and other adverse outcomes
- Visual representation through GIS documentation can offer a visual action strategy for AEP monitoring, intervention, and regulation
- Consideration of AEP and other adverse health effects in certain areas in liquor license applications?

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Acknowledgements

- Dr Sherif Amer of Faculty of ITC at the University of Twente for involving SAHARA and the HSRC in the funding application, and
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- Ms Ginie Gerrits-Oosterlaken (ITC) & Ms Yvette Nahimana (NUR) for all my travel and other arrangements
- SAHARA and the HSRC for affording me this opportunity to reconnect with my *alma mater*, the ITC

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Thank you very much!

Merci beaucoup!

Murakoze tyane!

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