

Assessment of air- and water-related human health effects among at-risk communities residing in the Upper Olifants Water Management Area

Caradee Wright, Riëtha Oosthuizen, Juanette John, Patricia Albers, Wouter le Roux, Maronel Steyn, Bettina Genthe, Paul Oberholster

AHEAD, 2-4 March 2011
Mopani Camp, Kruger National Park



Acknowledgements

- US Fish & Wildlife Services
- AHEAD GLTFCA
- Merle Whyte
- The Cassidy family
- CSIR PG research funding
- Fieldworker volunteers
- Participating households
- Ethics approval was obtained from CSIR REC (04/2010)



Aim

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To provide baseline information on human health outcomes in a pollution hot spot in the Upper Olifants / Highveld Priority Area and to consider human health impacts and risks

Study duration

1 April 2010 – 31 January 2012

Pollution foci

Water and air pollution



Health outcomes

Diarrhoea, respiratory illnesses, HIV / AIDS, TB, pneumonia, hypertension, diabetes

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Methods

Water sampling

River water samples (3 sites)

Tap water (in-house taps and stand pipes)

Storage container water

- 3 visits, Oct and Nov 2010, Jan 2011
- Bacterial indicator of faecal contamination: E. coli , Clostridia
- Viral indicator of faecal contamination: Somatic coliphages
- Parasites: Giardia and Crypto
- Bacteria: Salmonella and Shigella
- Vibrio cholerae non-toxigenic

Air sampling

Environmental samples (1 site)

- PM₁₀ and transition metals (Mn and Pb)
- SO₂
- NO₂
- Hg

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Methods

Household Questionnaires

1003 households

- 3 sub-areas: Vosman, KwaGuqa, Empumelelweni
- Oct 2010
- Socio-economic demographics, nutrition, health, possible exposure to water and air pollutants, personal hygiene



Clinic data

2 local clinics visited

- 1 year of primary health care data



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Results – Water (River)

Date	Description	<i>Clostridia</i> per 100ml	<i>E. coli</i> per 100ml	Somatic Coliphage per 10ml	<i>Giardia</i> per 10L	<i>Crypto</i> per 10L	<i>Salmonella</i> sp.	<i>Shigella</i>	<i>Vibrio cholerae non-tox</i>
Oct-10	UPPER BRUGSPRUIT	9.90E+04	2.60E+05	0	0	0	Yes	Yes	No
Oct-10	MIDDLE BRUGSPRUIT	9.00E+05	8.16E+05	0	40	10	Yes	Yes	No
Oct-10	LOWER BRUGSRPUIIT	4.00E+05	3.85E+05	0	0	0	Yes	Yes	No
Nov-10	UPPER BRUGSPRUIT	1.50E+05	4.50E+05	8.16E+03	0	0	Yes	Yes	Yes
Nov-10	MIDDLE BRUGSPRUIT	8.50E+04	1.98E+05	5.64E+03	98	0	Yes	Yes	Yes
Nov-10	LOWER BRUGSRPUIIT	4.60E+04	5.26E+04	1.09E+03	0	0	Yes	Yes	No
Jan-11	UPPER BRUGSPRUIT	2.20E+03	3.24E+02	0	to follow	to follow	No	No	No
Jan-11	MIDDLE BRUGSPRUIT	4.30E+03	1.20E+03	0	to follow	to follow	No	No	No
Jan-11	LOWER BRUGSRPUIIT	2.10E+01	2.60E+03	0	to follow	to follow	No	Yes	No

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Results – Water (Households)

Percent of sample with indicator present > 1 (range in parentheses)

Description	<i>Clostridia per 100ml</i>	<i>E. coli per 100ml</i>
In-house tap	42% of samples > 1 (1-3)	9% of samples > 1 (6-10)
Stand pipe (outside)	13% of samples > 1 (1-17)	18% of samples > 1 (4-228)
Storage container	58% of samples > 1 (1-12)	41% of samples > 1 (1-22 800)

Of the 86 household taps, storage containers and stand pipes sampled, 17 pairs of either *in-house tap with storage container* or *stand pipe with storage container* were contaminated with both bacteria for a particular household.



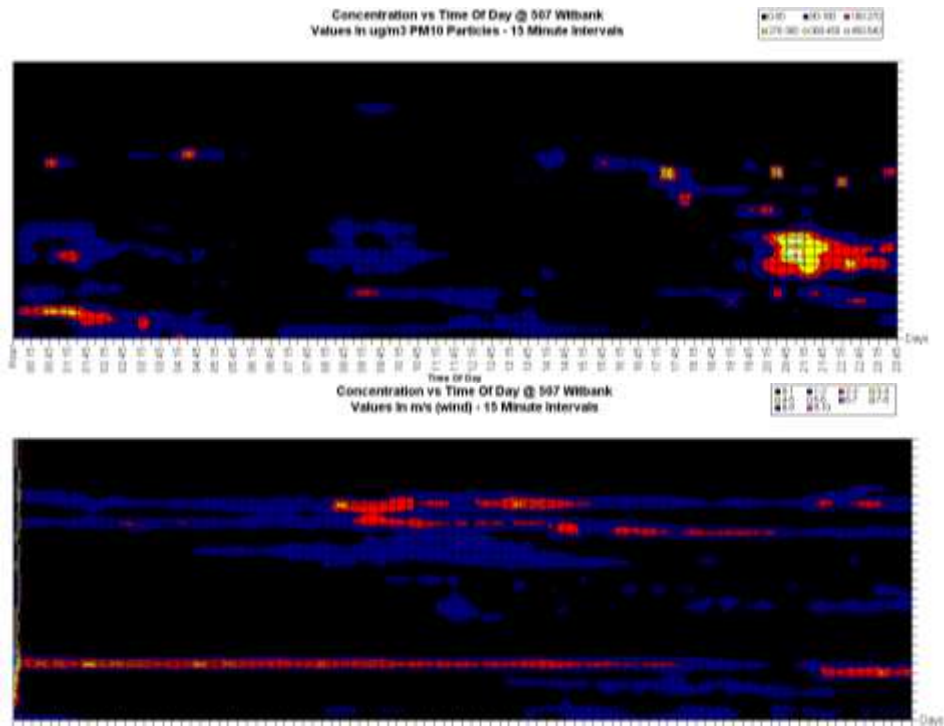
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Results – Ambient Air

- PM₁₀, 24-hr averages ,no exceedances (SA 24-hr standard = 120 µg/m³)
- Pb concentrations, below detection limits of 0.01 µg/m³
- Mn concentrations, 2 week total = 14.7 µg/m³ (WHO annual guideline = 0.15 µg/m³)
- SO₂, 2 week total = 8.3 µg/m³ (SA annual standard = 50 µg/m³)
- NO₂, 2 week total = 19.5 µg/m³ (SA annual standard = 40 µg/m³)
- Total mercury, 2 week total = 0.0022 µg/m³ (WHO annual guideline 1 µg/m³)



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Results – Community

Demographics

- Average age = 26 years
- **52%** males
- **20%** unemployed, **30%** students

Services, facilities, accessibility

- **Main sources of water supply** was piped water into house (**69%**), stand pipe or borehole in the yard (**21%**) and communal pipe or borehole outside the yard (**4%**)
- **91%** of households collecting and storing water, cleaned their storage containers
- **20%** of households said they treated their water, mostly by boiling (**66%**)
- **2/3rds** of households using a scoop to decant water, drank from the scoop
- **97%** of households had a toilet in the yard
- Refuse is collected from **62%** of households
- Most households are close to a transport point or clinic but not a hospital



Results – Community

Environmental pollution exposure

- **89%** of households did not use the Brugspruit
- Of those who did,
 - **63** households used water from the Brugspruit for washing laundry
 - **43** households used it for drinking purposes
 - **9** households for swimming
 - **7** households for watering vegetable gardens
- Coal was used for cooking (**5%** of households) and heating (**29%** of households)
- Tobacco smoking occurred in **23%** of households



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Results – Community

Health and hygiene

- 77% of households perceived themselves to be in good health
- 96% of households said they washed their hands after using the toilet and before eating

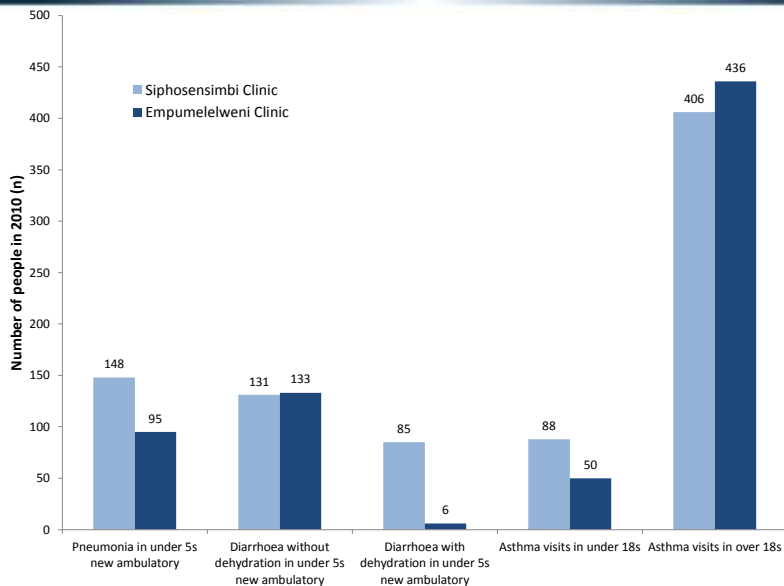
Health outcome	% households	Health outcome	% households
Sinusitis	42%	Asthma	10%
High blood pressure	36%	Diabetes	10%
Arthritis	18%	Bronchitis	9%
Diarrhoea past month	14%	Depression	5%
Ear ache	12%	TB	5%
Hay fever	11%	Pneumonia	4%

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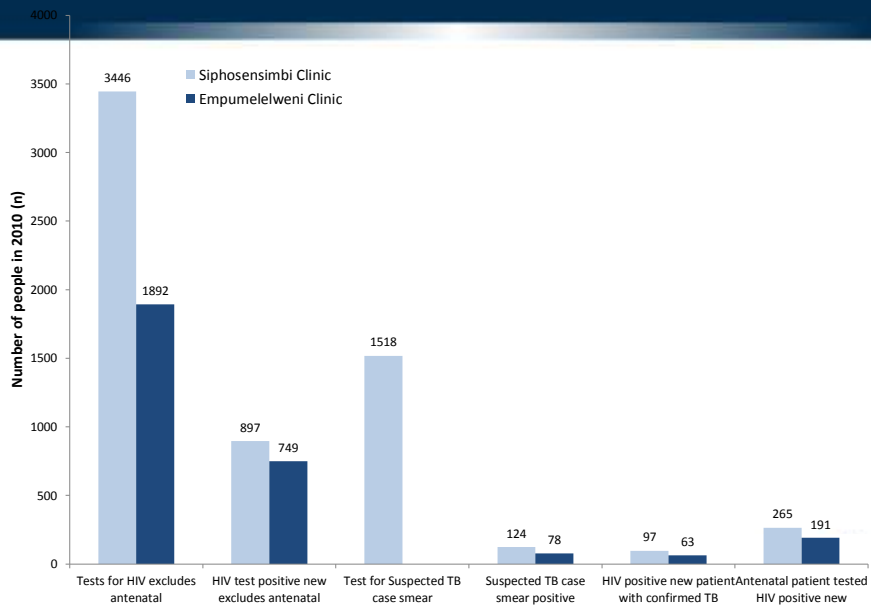
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Results – Clinic data

Total number of people by indicator at each clinic in 2010



Results – Clinic data



Ongoing Research

- Statistical analyses are ongoing
- Final water sample results due soon
- Preparation of a risk-based platform to inform decision-making
- Feedback to key stakeholders, local government, councillors and community



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