Dedication


Acknowledgements

The work of the World Health Organization Collaborating Centre for Urban Health, and the preparation of this Report, has been made possible by the dedication and contributions from leaders and key staff members of the four core partners of the Centre. They are:

* The South African Medical Research Council
* The University of Johannesburg
* The City of Johannesburg
* The University of the Witwatersrand.

We would like to express our special thanks to the members of our Advisory Panel (see Annexure 1) whose insights, expertise and experience are invaluable in our ongoing process of reflection, and in forging our future path.

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Abbreviations

<table>
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<tr>
<th>Abbreviation</th>
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<tr>
<td>AIDS</td>
<td>Acquired immune deficiency syndrome</td>
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<tr>
<td>ALRI</td>
<td>Acute lower respiratory infections</td>
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<tr>
<td>AMAP</td>
<td>Arctic Monitoring and Assessment Programme</td>
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<tr>
<td>EHO</td>
<td>Environmental health officer</td>
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<tr>
<td>EHP</td>
<td>Environmental health practitioner</td>
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<td>CoJ</td>
<td>City of Johannesburg</td>
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<tr>
<td>HECA</td>
<td>Healthy Environments for Children Alliance</td>
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<td>HIV</td>
<td>Human immunodeficiency virus</td>
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<td>IAP</td>
<td>Indoor air pollution</td>
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<tr>
<td>MMT</td>
<td>Methylcyclopentadienyl manganese tricarbonyl</td>
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<tr>
<td>MRC</td>
<td>South African Medical Research Council</td>
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<tr>
<td>NGO(s)</td>
<td>Non-governmental Organization(s)</td>
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<tr>
<td>PCB</td>
<td>Polychlorinated biphenyl</td>
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<tr>
<td>POPs</td>
<td>Persistent organic pollutants</td>
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<tr>
<td>PTS</td>
<td>Persistent toxic substances</td>
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<tr>
<td>QoL</td>
<td>Quality of life</td>
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<tr>
<td>SPH</td>
<td>School of Public Health</td>
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<td>UN</td>
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<td>University of Johannesburg</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>Wits</td>
<td>University of the Witwatersrand</td>
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<td>WSSD</td>
<td>World Summit on Sustainable Development</td>
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Preface

The World Health Organization Collaborating Centre for Urban Health (the Centre) is founded on a partnership involving a research Organization (the South African Medical Research Council), academic and training institutions (the University of the Witwatersrand and the University of Johannesburg) and a service provider (the City of Johannesburg). The main goal of the partnership is to improve urban health through the pooling of the experiences and expertise of representatives of the three partners.

The Centre is committed to a sustainable development model that encourages community participation and addresses inequities in access to resources and services. The Centre recognises, as its first priority, the health needs of the most vulnerable, low-income urban populations.

Although located in a South African setting, the Centre recognises that similar urban health challenges face many African countries, and aims to contribute to finding solutions of relevance to the entire continent.

This report outlines the areas of work and achievements of the World Health Organization Collaborating Centre for Urban Health for the period of November 2004 to October 2005.

Terms of reference

The original terms of reference for the Centre were established jointly in 1995 by the partners in the Centre, and representatives from the World Health Organization's (WHO) Geneva headquarters and the African Regional Office. These terms of reference were reviewed and agreed to by, then South African Minister of Health, Dr Nkosazana Dlamini-Zuma.

The terms of reference are:

1. to collaborate with WHO in the development of urban health, environment and sustainable development policy, programmes and projects in the African region, particularly within southern Africa;

2. to facilitate, undertake and participate in the design and conduct of research on health and environment determinants, and their management in human settlements;

3. to collaborate with WHO Environmental Health Centres and WHO Collaborating Centres in the fields of urban health, environment and sustainable development;

4. to collaborate in strengthening technical and scientific collaboration with member states in the WHO African region in the development of capacity building (human resources and institutional development) in the fields of urban health, environment and sustainable development;

5. to collaborate with the WHO in the development and updating of curricula of health and environment-related professionals (including environmental health professionals) to address emerging urban health, environment and sustainable development issues;

6. to contribute to the development of more effective and efficient approaches to the delivery of appropriate services to promote urban health, the environment and sustainable development; and

7. to promote models for integrated and sustainable development, urban health and quality of life, as in the Healthy Cities Project and urban aspects of the Healthy Environments for Children initiative, with special emphasis on inter-sectoral collaboration and health advocacy.
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This year - 2005 - marks the tenth year of existence of the World Health Organization Collaborating Centre for Urban Health. Over this period the partnership has grown to its current status as an active entity with ongoing pooling of expertise and experiences towards capacity development, and engagement with long-standing and emerging urban health challenges.

Over the past year, the partnership has continued to thrive in an environment of transformation associated with the transition to democracy in South Africa - the ongoing re-shaping of local government systems in Johannesburg, transformation within the Medical Research Council and the enormous challenge of a merger of two of the Centre's partners.

On 1 January 2005, the Rand Afrikaans University and the Technikon Witwatersrand were officially integrated to form the new University of Johannesburg. The new institution is one of the largest contact universities in South Africa, with nine faculties spread over seven different campuses - including the former Vista University campuses of Soweto and the East Rand. Over 40 000 students are currently registered with the University of Johannesburg.

Professors André Swart and Thea de Wet have been deeply involved with the many challenges of organizational transformation at the new University of Johannesburg. As a consequence of the merger, the number of partners within the Centre has been reduced from five to four.

On 29 June 2005 Dr Manto Tshabalala-Msimang, the South African Minister of Health, appointed Professor Anthony MBewu as the new President of the South African Medical Research Council. Professor MBewu is spearheading a new phase in the transformation of the Medical Research Council to better reflect and respond to health challenges in South Africa. A new organizational structure has been developed for the Medical Research Council, and new appointments at senior and executive levels have been made, and are expected in the near future. A committee, headed by Professor Barry Mendelow, has also been appointed to develop a new research strategy for the Medical Research Council. This is expected to be finalised by December 2005. The final recommendations may hold implications for the research foci and form of some units, groups and centres within the Medical Research Council.

A key focus of the Centre over the past year has been to consolidate the efforts commenced during 2003/4 towards building the partnership. This has been achieved through joint work on key projects such as hosting the Seventeenth Annual Conference of the International Society for Environmental Epidemiology in Johannesburg. Another important vehicle in this regard, has been the initiation of the Health, Environment & Development (HEAD) Study that builds on the experiences and lessons learned through the Centre's participation in the now finalized Hillbrow Community Partnership for Health Personnel Education.

Work has commenced around the development of an identity and brand for the Centre. A design company was appointed to draft a generic cover, that will henceforth be used on reports and other documentation distributed from the Centre.

This Report will show that the future looks bright for the World Health Organization Collaborating Centre for Urban Health. Over 14 joint research and other projects are currently underway, supplemented by a wide range of additional initiatives to build capacity in urban health and to exploit the pooled expertise and experience of key individuals in the research, academic and service provision domains.

A strategic planning workshop scheduled for 29 November 2005, will be critical in deciding on the path and priorities for the World Health Organization Collaborating Centre for Urban health over the next five to ten years. The timing of this workshop is vital. We are commencing the second decade of democracy in South Africa, during which matters of urban renewal and health are to be afforded high priority at a national level, and through NEPAD, at the level of the African continent.
1. Development of urban health and environment policy, programmes & projects

1.1 The Health, Environment and Development (HEAD) Study

Urbanization and natural population increase, together with a process of household unbundling towards the formation of smaller units, presents ongoing, large-scale challenges in respect of the provision of sufficient urban housing to meet demand, and to ensure that housing promotes health and community development in a sustainable manner. For example, between 1996 and 2001 the South African population grew by 11%, but the number of households grew by 30%.

The HEAD study has been implemented as a response by the Centre to the concerns of urban housing and health in South Africa. HEAD is a long-term project that will monitor health status in relation to housing conditions in five different housing settlements in Johannesburg. The HEAD Study will also serve as a vehicle for student training, research capacity development and the generation of information for planning and decision-making in respect of housing and health in Johannesburg.

The specific objectives of the HEAD study are to:

- conduct annual household surveys of living conditions and health status, with a special focus on children in five sentinel or indicator sites across the city;
- provide experiential training opportunities in research processes for undergraduate students in environmental health at the University of the Johannesburg;
- create opportunities for in-depth research on environment, development and health matters for master’s or doctorate students at the Universities of Johannesburg and the Witwatersrand;
- create continuing development opportunities for environmental health practitioners in the City of Johannesburg in research processes;
- present to the City of Johannesburg, the findings of the annual surveys, and in time, the results of temporal analyses of the data collected through households surveys and other post-graduate student research projects, which may positively influence their policy and service delivery strategies in these areas.

The project will comprise annual cross-sectional surveys in the following sites:

- Hillbrow, a high-rise inner city area;
- Bertrams, an inner city suburb earmarked for rapid development in the run-up to the World Cup Soccer Tournament in 2010 (a local stadium is to be one of the main match venues);
- Riverlea, an old, degraded apartheid township;
- Braamfischerville, a new RDP housing project; and
- Hospital Hill and Sweetwater, two unserviced settlements.

First-year environmental health students at the University of Johannesburg, following a programme of training in research processes and fieldwork techniques, will undertake cross-sectional surveys of living conditions and health status in the selected sentinel sites, using a pre-structured questionnaire and checklist of housing conditions.

Data generated through the annual cross-sectional surveys will be supplemented with data emerging from relevant, additional master’s and doctoral research projects undertaken under the umbrella of the HEAD study. At this time, projects related to mould proliferation in dwellings and the role of environmental health practitioners are being explored. A variety of research methodologies, as appropriate, will be adopted in the supplementary master’s and doctoral research projects.

There will be a strong focus on the outcomes and outputs of initiatives undertaken under the umbrella of the HEAD Study. In particular, participants will be encouraged to publish findings in local and international journals. An effort will also be made to ensure that key research findings are relayed to appropriate city authorities in Johannesburg and as well as elsewhere through the South African Cities Network.

Anticipated specific outcomes of the HEAD Study include:

- students in environmental health at the University of Johannesburg, who will, upon graduation, be well versed with research processes and the housing and health concerns that they are likely to encounter in the South African urban context.
- Master’s and doctoral students at the Universities of Johannesburg and the...
Witwatersrand who will have conducted research on matters of contemporary concern to city managers;
• the provision of information to the City of Johannesburg that will facilitate tracking of changes in respect of living conditions and health in the City.

Anticipated outputs of the HEAD Study include:
• an annual report or research seminar presenting the findings of the annual surveys;
• reports on the findings of student research projects related to a variety of environment, development and health concerns in Johannesburg.
• the provision of experiential training in research processes to more than 50 undergraduate students at the University of the Witwatersrand on an annual basis.

Following approval of the study protocol by the Ethics Committee of the University of the Witwatersrand, the implementation of the HEAD pilot study was co-ordinated by Nisha Naicker. She is a registrar who participated in the Wits School of Public Health/Medical Research Council environmental health rotation. During August/September 2005 interviews were conducted with 584 residents randomly selected from the five study sites. The interviews were conducted by environmental health students from the University of Johannesburg, after an intensive training programme in research processes, including interviewing techniques.

Participating dwellings were selected from lists and maps obtained from the City of Johannesburg’s Planning Department, with each dwelling having been allocated a unique number. In each site, an initial dwelling was randomly selected, with every second dwelling being selected thereafter. In sites where subdivisions existed (such as high-rise apartment buildings), each subdivision was numbered and a random number chosen between one and the total number of subdivisions. The procedure was repeated for the selection of a floor within an apartment building and for the selection of an apartment on a particular floor. Once the first dwelling unit was selected, the second dwelling was chosen to be two doors away from the first, and so on. On completion of an entire floor, the floor above was chosen, with the first dwelling unit on that floor being randomly selected. For example, in Hillbrow/Berea six buildings were randomly selected. In each of the six buildings, 20 apartments were selected. No dwelling lists were available for the informal settlements. A starting point was randomly selected on a map, following which every second house was included in the study. If there was no one home during the first
visit, the house was visited again at another time. If on that occasion there was still no suitable respondent, the next closest dwelling was selected for inclusion in the study.

Preliminary results from the study show that the majority of respondents (70%) were born in South Africa, with the remainder having been born elsewhere in Africa. Amongst those born in South Africa, 59% were from Johannesburg. The highest levels of resident mobility were noted in Bertrams and Hillbrow, where 19% and 24% respectively of households had been residing for less than one year, compared to Riverlea, for example, where the majority of households (more than 90%) had been staying for more than five years. Apart from the informal settlements, the majority of residents made use of electricity for daily cooking and had access to an indoor water supply, as well as waste removal and sanitation services. There were concerns around food security in the informal settlements and Braamfischerville in particular, where more than 30% of households reported that children sometimes (or more frequently) went to bed hungry because there was insufficient food at home.

Funding has been secured from the Department of Science and Technology for the appointment of a student, Ms Daphney Conco, to undertake the main HEAD study. As part of the agreement with the Department of Science and Technology, Ms Conco is required to complete a doctoral degree. Registrars from the University of the Witwatersrand School of Public Health will also play a key role in the HEAD Study.

The HEAD Study is timed such as to make an important contribution to the global resurgence in research attention devoted to the role of housing in public health.

**Cost of HEAD Study:**
Approximately R30 000.00 per annum (MRC) as well as in-kind contributions from the University of Johannesburg and the University of the Witwatersrand.

### 1.2 WHO Commission on Social Determinants of Health

The World Health Organization has set up a three-year commission to recommend interventions and policies to improve health, and to narrow health inequalities through action on social determinants. The commission’s multiple aims include the compilation of evidence, formulation of policies, raising debate and to set the agenda for interventions within the WHO and beyond. A series of knowledge hubs and networks have been set up focusing on a number of themes (see Figure 1).

The Centre for Health Policy (Wits School of Public Health) was selected as the knowledge hub for the health systems work. The Cities and Health Programme Secretariat of the WHO Kobe Centre, Japan, was selected as the hub for urban settings. The involvement of the WHO Collaborating Centre in these two knowledge hubs and networks will allow for some of the insights from Centre’s research to feed into matters being considered by the Commission.

Following an invitation from the WHO-AFRO Regional Director, the Centre was represented by Prof. André Swart at a **Regional Consultation on Social Determinants of Health**, held in Brazzaville, Congo, from 27 to 29 July 2005.
2.1 Lead exposure and poisoning from paint in South Africa

Even at low concentrations in blood (less than 10 µg/dl), lead is associated with reductions in IQ, mild intellectual impairment, hyperactivity, shortened concentration span and poor school performance. Higher blood lead levels are associated with hearing loss, the emergence of aggressive or violent behaviour, a delay in the onset of puberty and detrimental effects on virtually all organ systems, including the brain, heart, liver, kidneys and circulatory system. Children in Africa are thought to be at particularly high risk of exposure to lead in the environment.

Epidemiological studies undertaken in 2002 and 2003 (as well as earlier), showed that an unacceptably high proportion of first grade South African school children, especially in Johannesburg and other urban settings, have elevated blood lead concentrations. One of the major risk factors for high blood lead concentrations was living in a house or attending a school in close proximity to a heavily trafficked road. These findings contributed to a parliamentary decision to phase out the use of leaded petrol in South Africa as from 1 January 2006.

Exposure to lead-based paint was an additional risk factor for elevated blood lead concentrations. For example, children who lived in homes with peeling paint or who had pica for paint, had significantly elevated blood lead levels, compared to other children. A series of supplementary investigations showed that lead continues to be added to paint in South Africa, despite the existence of a voluntary agreement amongst members of the South African Paint Manufacturers’ Association to limit the use of lead in paint. The lead concentrations in pigmented enamel paints being sold to the general public were, in some instances alarmingly high - up to 189 000 µg/g, compared to the United States of America standard of 5 000 µg/g.

It is likely that lead-based enamel paints are being applied to children's rooms and furniture, as well as toys and playground or educational equipment. In respect of toys (purchased from large toys stores, supermarkets, stationery stores and craft/flea markets in Johannesburg), a preliminary scan showed that paint with lead concentrations up to 145 000 µg/g was being used to coat children's toys, relative to the international standard of 90 µg/g.

On presentation of a technical report on the study findings to the Minister of Health by the Medical Research Council President, Anthony Mbewu, an instruction was given to the Department of Health’s Legal Services Division to draft regulations to ban the use of lead in paint intended for sale to the general public in South Africa.

Little is known of the extent of use of lead in paint in countries elsewhere in Africa, or of the export practices (as well as importation from other countries) of South African paints and painted children's toys and furniture to other African countries.

Cost of Lead Study:
R350 000 (received from the United States Environmental Protection Agency).

2.2 Lead hazard awareness in pregnant women in Johannesburg

A 2002/3 study showed that Johannesburg children were at particular risk of elevated blood lead concentrations. Given the challenges and prohibitive cost of primary prevention (the removal of lead-based paints from homes, schools and other infrastructure) in a developing country setting, it has been decided to conduct a study to measure the impact of a personal and environmental hygiene intervention on children's blood lead levels and neurobehavioural development. In this regard a formative study is currently underway, with the objectives of:

- determining the levels of knowledge among pregnant women of lead hazards;
- determining current personal and environmental hygiene practices; and
- identifying potential sources of lead exposure in the homes of the study population.

The study is being undertaken at the Coronationville Hospital in Johannesburg, which is the only hospital in Gauteng dedicated to the health concerns of women and children. The formative/pilot phase of the research is being undertaken by Ms Tanya Haman as part of a Masters in Public Health course at the School of Public Health (University of the Witwatersrand). Tanya is currently employed as a lecturer at the University of Johannesburg, and her research work is being supervised by Angela Mathee (MRC), Brendon Barnes (MRC) and Andre Swart.

Cost of Study:
Approximately R12 000.00 (MRC).
2.3 Evaluation of the impact of personal/environmental hygiene intervention on the blood lead levels and neurobehavioural performance of young children

In this study, a test group (pregnant women or mothers of young children) will be informed about the sources, hazards, pathways of exposure and mechanisms for exposure prevention in relation to lead. Blood sampling for lead content analysis will take place prenatally (maternal), at birth (cord blood lead levels) and at 1 and 2 years of age. Development assessments will be conducted at various ages, and home assessments will be undertaken to measure the concentrations of lead in paint, water and dust.

Moinca Feit has agreed to work from the MRC as a volunteer and undertake the study towards a doctoral degree.

**Costing:**
The budget is yet to be determined.

### 2.4 The effects of integrated service delivery on health, well-being and quality of life in Orange Grove and surrounding suburbs: Phase 2 (2005)

In February/March 2004, prior to the implementation of integrated service delivery projects (Social Services, Sport, Recreation and Aquatics, Library and Information Services, Housing, Clinics and Priority Health Programmes, Environmental Health Services, and Local Economic Development), a baseline study was conducted with a stratified random sample of 791 residents. In 2005, 20 fieldworkers administered the questionnaires to 338 respondents (43% of the original sample). One hundred and seven respondents were not found, unknown or had moved, 43 refused to participate and 3 were deceased. With the exception of age, demographics were virtually identical to 2004.

#### Health, well-being and disability

The study results showed that 97% of black respondents rated their health and well-being as good or better, in comparison with 90% in 2004.
Ninety five per cent of white respondents rated their health and well-being as good or better, in comparison with 91% in 2004 (Figure 2). Unemployed respondents tended to rate their health and well-being as poorer than employed respondents. Only 8% of black and 15% of white respondents reported a disability. Respondents with disabilities were less likely to be employed and rated their health and well-being as poorer than respondents without disabilities (p < 0.05). These findings were very similar to 2004 and suggested that health and well-being are relatively stable concepts.

Environmental quality of life
Respondents were most satisfied with their housing and least satisfied with jobs in 2004 and 2005. The major reason for dissatisfaction with jobs in 2004 and 2005 was the lack of local employment opportunities for black and white respondents. There were fluctuations in satisfaction levels between 2004 and 2005. The major reasons for dissatisfaction are shown in Table 1. Dissatisfaction appears to stem from high crime rates, low Metro police service and local government presence, the expense of private health facilities, the lack of public health facilities and pollution from traffic.

Neighbourhood satisfaction and environmental quality of life
All environmental satisfaction domains were regressed on neighbourhood satisfaction and two variables explained 44% of the variance. Housing explained 32% of the variance in neighbourhood satisfaction and an additional 12% was explained by street lighting (Table 2). In 2005, housing accounted for 10% more of the variance in neighbourhood satisfaction than was found in 2004. It is noteworthy that street lighting (a proxy for safety and security) was considered to be an essential aspect of neighbourhood satisfaction in 2005.

In conclusion, unemployed respondents had poorer health and well-being than employed respondents. Both black and white respondents were equally likely to rate their health and well-being as good or better. Health and well-being were the core components of personal quality of life. However, being happy and having a good social life were more important for life satisfaction than being healthy. High crime rates, low Metro police service and local government presence, the expense of private health facilities, the lack of public health facilities and pollution from traffic appear to be the major reasons for dissatisfaction with the environmental quality of life domains. The findings suggest that these integrated service delivery projects have had some influence in improving health and well-being, but have had a minor impact on personal and environmental quality of life. It is possible that a one-year time-frame is too short to see an impact on quality of life.

Cost of Study:
The City of Johannesburg (Region 3) paid for the interviewers and photocopying of the questionnaires (R16 000.00). The costs of data capture and cleaning, as well as data analysis was covered by the MRC.
2.5 Examining the association between manganese and blood lead levels in school children in selected regions of South Africa

In South Africa, anthropogenic sources of manganese and lead derive primarily from industrial activities and vehicular emissions of petrol additives. At elevated levels, both metals are neurotoxic with manganese being also an essential nutritional element.

At present in South Africa, petrol producing oil companies are developing alternative petrol formulations as part of ongoing automobile technology development, as well as in preparation for phasing out of lead as an additive in the country’s fuels by 2006. Among available octane enhancing alternative additives, the methyl tertiary butyl ether (MTBE), ethyl tetra butyl ether (ETBE), ethanol and manganese containing methylcyclopentadienyl manganese tricarbonyl (MMT) are under consideration, with MMT already introduced to petrol in Gauteng in late 2000.

Recently, a number of studies have investigated not only the mechanism of manganese uptake and excretion, but also the possibility of synergistic toxic effects of lead and manganese. A study that concurrently measured lead and manganese blood levels in schoolchildren residing in four different geographical regions of South Africa found that the manganese levels of 12% of the children in Johannesburg, 4% of the children in Cape Town and 8% in Kimberley equalled or exceeded 14 µg/L, the upper normal values as specified by Agency for Toxic Substances Disease registry (ATSDR).

The relationship between blood lead and manganese levels (treating each in turn as a response) was investigated by fitting linear mixed models (multilevel models). An examination of residuals suggested log transformation for manganese, but that of lead did not need to be transformed. The results for the blood manganese and lead levels are summarised in Table 3. In addition, a questionnaire was completed by the caregiver of each child, in order to obtain information on socio-demographic variables and other potential risk factors.

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<td>Pb mean</td>
<td>6.44</td>
<td>9.06</td>
<td>7.07</td>
<td>7.76</td>
<td>5.73</td>
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<td>Std devn</td>
<td>2.90</td>
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<td>2.72</td>
<td>2.88</td>
<td>2.58</td>
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<td>Median</td>
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<td>8.9</td>
<td>6.7</td>
<td>7.9</td>
<td>5.1</td>
<td>5.7</td>
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<tr>
<td>IQR</td>
<td>4.5-8.1</td>
<td>6.7-11.3</td>
<td>5.1-8.4</td>
<td>6.0-9.3</td>
<td>4.0-6.6</td>
<td>4.2-7.4</td>
</tr>
<tr>
<td>Range</td>
<td>1.0-24.5</td>
<td>1.1-18.1</td>
<td>2.1-22.6</td>
<td>2.8-13.4</td>
<td>2.5-17.1</td>
<td>2.4-12.1</td>
</tr>
</tbody>
</table>

Table 3: Concentration of manganese (µG/L) and lead (µG/DL) in blood by study area

MMT, like tetraethyl lead, is a neurotoxin that can cause agitation and convulsions, as well as pulmonary damage at elevated concentrations. Consequences of widespread long-term exposure in the public at all ages, including those with impaired health status, pregnant woman and children, to manganese emission products of MMT are virtually unknown. The potential for injury to the nervous system has never been independently assessed, nor has the possible long-term consequences of widespread early exposure to manganese been examined.

When mixed models were fitted with the natural log of manganese blood concentration as a response variable and the blood lead levels as the principal explanatory variable, the important confounders were found to be the following:

- gender (with blood manganese levels being higher for females); race (with manganese levels being lower for black Africans than for the other races);
When adjusting for these confounders, strong evidence of a linear trend of log (Mn) with increasing blood lead (P<0.001) was found, including significant linear trends for Cape Town, Johannesburg and Kimberley.

When fitting mixed models, with blood lead concentration being the response variable and the log of manganese as the principal explanatory, the important confounders were found to be the following:

- gender (with blood lead level being lower in females);
- race (with blood lead level being lowest for Indians and whites and highest for Coloureds);
- whether the house had paint peeling indoors (which led to higher lead levels);
- whether the child ate paint (which leads to higher levels); and
- whether the child attended crèche (which leads to lower levels).

Adjusting for these there was strong evidence of a linear effect of blood manganese level on lead level.

Study Cost:
Engen contributed an amount of R50 000 towards the study.

2.6 Levels of persistent toxic substances in blood and urine from pregnant women from selected areas of South Africa: A pilot study

Levels of persistent toxic substances (PTS) in maternal blood during pregnancy give an indication of the potential risk to the developing foetus. Of particular concern are long-term, subtle effects that might influence reproductive health, pregnancy outcomes, reduce defence against diseases, affect children's mental development, or increase the risk of cancer. Several of these substances move from mother to foetus via the umbilical cord and to the child via its mother's breast milk.

Several multidisciplinary international projects are in progress, that focus on levels of PTS in people of different geographical regions to establish the relationship between levels of these chemicals and health. South Africa, having dimensions of both developed and developing countries, has the potential to contribute to global research in the science of environmental pollutants and human health outcomes. Currently a pilot study is being carried out by the South African Medical Research Council in collaboration with the University of Tromsø (Norway), the Norwegian Institute of Air Research, the Norwegian National Institute of Occupational Health, Centre du Toxicologie de Quebec, Canada and the South African Council for Geoscience to assess possible health risks related to exposure to persistent toxic substances (PTS) in selected areas of South Africa.

Data and sample collection were completed in the rural village of Morokweng, situated in the North West Province. This site was purposely selected because of its isolation from industrial, agricultural and traffic activities to serve as a baseline for other sites that include urban, industrial, mining and fishing areas. To date preliminary data on maternal and newborns as well as some analytical results are completed for polychlorinated biphenyl (PCB) congeners and pesticides. The latter were compared with Russian and Norwegian study populations and showed, as expected, very low levels of contamination for pesticides and PCBs. Analytical work is in progress to assess metal content (both toxic and essential).

Study Cost:
An amount of R90 000.00 (received from the University of Tromsø) was secured for the pilot study.
2.7 Exposure to mercury in informal, small-scale gold mining

There is an increasing population of artisanal gold miners in South Africa, including local as well as foreign workers. There is ongoing interest in assessing the level of exposure amongst artisanal gold miners to mercury.

With support from the Department of Science and Technology, Vathiswa Papu has been appointed to design and undertake a study in this regard. In terms of the contract with the Department of Science and Technology, Ms Papu is required to work towards a doctoral degree.

Cost of Study:
The budgeting process is currently underway.

2.8 Can behavioural change reduce child indoor air pollution exposure in developing countries?

Indoor air pollution is causally associated with acute lower respiratory infections (ALRI) in children, and is the fourth largest killer of young children in developing countries. The sustainability of expensive technological interventions (such as cleaner fuels and stoves) has been questioned in poor rural areas. Behavioural change may offer a cheaper alternative but has yet to be scientifically evaluated. The aim of this study was to determine the impact of a behavioural intervention on child exposure to indoor air pollution and child respiratory health in a poor rural village in South Africa. A cohort of children = 4 years old (N=502) was recruited and allocated to either an intervention (n=244) or control group (n=258).

Results showed that the two groups were well balanced at baseline in terms of socio-economic status, exposure indicators (exposed versus non-exposed, PM10 [kitchen], CO [kitchen] and CO [child]) and child ALRI (including known confounders). The intervention promoted three simple behaviours:

- burn outdoors for longer;
- when fires are brought indoors, to improve ventilation; and
- to reduce the amount of time that children spend in the burning room.

The intervention was implemented amongst primary caregivers in the intervention group after the baseline assessment. Follow-up visits (12 months later) showed significant reductions in adjusted child indoor air pollution exposure indicators amongst the intervention group. While the control group showed evidence of exposure reductions, children in the intervention group were over three times (adjusted OR=3.1) more likely to remain non-exposed during colder winter spells. More importantly, when fires were brought indoors, the intervention group significantly reduced mean PM10 [kitchen] concentrations from 607 to 231 µg/m³, mean CO[kitchen] from 205 to 128ppm and mean CO[child] from 111 to 78ppm while the control group only reduced PM10 [kitchen]. This is the first study of its kind worldwide to highlight the potential of behavioural change to reduce indoor air pollution exposure developing countries. Although the study was implemented in a rural setting without access to modern energy sources (i.e. worst case scenario), plans are underway to implement similar studies in urban contexts.

Costing:
USAID grant implemented through the Academy for Educational Development (AED) (R250 000); and WHO-AFRO (R50 000).
3. Collaboration with WHO and other UN initiatives

3.1 The WHO Healthy Environments for Children initiative (HEC)

The Centre supports the World Health Organization’s Healthy Environments for Children Alliance and the national Healthy Environments for Children Initiative. During the past year work has continued on the preparation of a national State of Children’s Environmental Health Report. Associated with the State of Children’s Environmental Health Report has been a qualitative study to determine the perceptions of children regarding the state of their environment, and the links with health. The working title for this study is ‘Children's Voices’.

Cost:
R7 000 (MRC)

3.2 Children's Voices

'Children's Voices' is a qualitative study involving grade seven and grade nine pupils from 13 schools of differing socio-economic backgrounds in Johannesburg. The study is being coordinated by Anthony Joffe under the umbrella of the Registrars’ Environmental Health Placement Programme. The aim of the study is to assess children’s perceptions of the environment and health. Focus groups discussions were the main mechanism for data collection. A photographic component was also included, in which children photographed aspects of their school and home environment that they liked and disliked.

To date the study has been completed at eleven schools, and fieldwork will be undertaken at a further two schools early in 2006. Transcription of the recorded group discussions is well underway, and about half of the photographs have been printed.

On completion of the data analysis, a report will be prepared, as well as a paper for publication in a scientific, peer-reviewed journal. The main findings will also be presented to the participating schools.

Study Cost:
R20 000.00 (MRC) + personnel time contributions from MRC and Wits School of Public Health.
4. Collaboration in strengthening technical & scientific collaboration with member states in the WHO-Afro region in the development of capacity building

4.1 Understanding child lead exposure in Gabarone, Botswana: a pilot study

Child lead exposure is associated with a number of ill health outcomes amongst young children, including reductions in IQ, cognitive, affective and behavioural impacts as well as lowered school performance. Currently no data exists on child lead exposure in Botswana. The aim of this work is to describe child lead exposure amongst 300 pre-school children in Gabarone, Botswana. The specific objectives are:

- to determine lead levels in painted surfaces, soil and dust in and around the homes and play areas of children aged 1-6 years in Gabarone;
- to determine lead levels in drinking water from the surveyed children's homes and schools;
- to determine blood lead levels of children aged 1-6;
- to assess the level of awareness on lead among the parents of children who will participate in the pilot project.

This study is due to commence in January 2006 and forms part of extending the work of the Centre into neighbouring African countries.

Study Cost:
an undetermined contribution from the University of Botswana

4.2 Sharing environment and health information resources

Funding has been applied for from the United States Environmental Protection Agency to design and produce public awareness materials in relation to lead hazard awareness in South Africa, with particular emphasis on the risk of lead-based paint in the home setting. To date two posters and a 'lead in toys alert' have been finalised. An agreement to make electronic copies of the materials available to WHO-AFRO for further distribution to African member states, is written into the proposal.

Cost:
R72 000.00 (from the United States Environmental Protection Agency)

In partnership with the National Department of Health, a collation of case studies of healthy schools has been drafted. In particular, the case studies reflect instances in which school communities, in partnership with parents, local government departments and non-governmental Organizations, have implemented relatively simple measures to improve the school environment and children's health. The healthy schools case studies will also be made available to WHO-AFRO.

Cost:
R20 000.00 (from MRC) for design costs. The National Department of Health to pay for reproduction and distribution costs.
4.3 A partnership for housing and health research: four African cities

After being informed about the HEAD Study, the African Population and Health Research Centre (APHRC) has approached the Centre to discuss a possible partnership with three other African cities. There is interest in undertaking similar studies (to the HEAD study) in the cities of Blantyre, Accra and Nairobi. An initial meeting to discuss areas of potential cooperation was held in Johannesburg with representatives of APHRC.

Cost: not applicable at this stage

4.4 Building capacity in environmental health

Following from the success of the short course for environmental health practitioners offered by the Centre during 2004, the Minister of Health, Namibia, extended an invitation to Professor André Swart to facilitate a workshop in Windhoek with a specific focus on the development of capacity in environmental health.

The workshop, held from 15 to 17 August 2005 in Windhoek, Namibia, was attended by 60 delegates, including municipal councillors, environmental health practitioners and other specialists providing technical support for environmental health activities.

During his opening address, the Minister of Health and Social Services, the Honorable Richard Nchabi Kamwi, highlighted the importance of environmental health in the Namibian strategy for rendering health services, and the importance of knowledge networks, including those with South Africa. The workshop focused on the use of indicators, planning for health outcomes and implementing risk assessment and management strategies.

Current discussions are focusing on future exchange visits, while negotiations with the City of Windhoek is well advanced to provide support for two environmental health practitioners to undertake master’s level studies at the University of Johannesburg.

5. Development and updating of curricula of health and environment-related professionals

5.1 Environment & health training module at the University of the Witwatersrand

Each year Angela Mathee coordinates an environment and health module as part of the Masters in Public Health degree offered at the Wits School of Public Health of the University of the Witwatersrand. Representatives from all of the WHOCCUH partner Organizations teach on the module.

The module includes topics such as long-standing and emerging issues of concern in environmental health, the changing role of environmental health practitioners, indoor and ambient air pollution, housing and health, environmental exposure to pollutants such as lead, mercury and endocrine disruptors, urban environmental health concerns emerging from the Birth-to-Twenty Study and models for environmental health action.

In 2005 the module attracted 39 students from South Africa, the United States of America, Lesotho, Zimbabwe, the United Kingdom, Uganda, Nigeria, Democratic Republic of Congo, Kenya and Botswana.

5.2 Public Health Medicine registrars’ environmental health rotation

As part of their training programme, the Public Health Medicine registrars (trainee specialists in Public Health Medicine) are required to spend six months in an Environmental Health Unit. In a highly successful collaborative venture, the Wits School of Public Health decided to allocate one registrar for six monthly rotations to the Centre with effect from March 2004. To date, four registrars have participated in the initiative and undertaken wide-ranging collaborative projects. These include:

- Anthony Joffe (drafting the first national State of Children’s Environmental Health Report and coordinating the Children’s Voices study);
- Debsalu Basu (drafting a paper on urban housing and health in Johannesburg);
- Nisha Naicker (undertaking the pilot study for the HEAD Project);
- Sinola Rajaram (to conduct a study on the relationship between daily temperature and child hospital visits over three years at the Coronationville and Baragwanath Hospitals, as the entry point to a focus on global climate change).
6. Development of more effective and efficient delivery of appropriate services to

6.1 WHOCCUH publication on housing and health in South Africa

Following a recommendation from the Centre’s Advisory Panel meeting of August 2003, a working group has been created to draft a paper on the experience and lessons learned by the partners of the WHOCCUH concerning research undertaken on urban housing and health in South Africa. The paper will draw on the housing-related experience and research conducted by the Centre’s partners over the past decade, and will include work undertaken in, for example, Hillbrow, Alexandra, Port Elizabeth, Newclare, Bertrams, Noordhoek, Hout Bay and other areas, in relation to informal housing, shack farms, high rise flats, “RDP” housing and townships dwelling.

Cost: Not Applicable

6.2 The changing role of environmental health practitioners

With the transition to democracy, there has been a dramatic shift in the scope of work of environmental health practitioners (EHPs) - from a focus on control to one of development and change facilitation, especially in informal settlements and areas of degradation. As a consequence, there is a need for training and re-training of EHPs, as well as an assessment of new approaches being adopted and their feasibility and effectiveness.

It has been decided to develop a new research study, with the current aims of examining the perceptions and practices of EHPs. The main goal of this study will be to contribute to a changing model for the provision of environmental health services in South Africa.

An application has been submitted to the MRC for an internship to conduct a nation-wide survey of the perceptions, knowledge and practices of EHPs regarding the discipline of environmental health. In addition, it is planned that Rob Couch, a doctoral student at South Bank University, includes Johannesburg in a study of the changing role of environmental health officers. Rob Couch has undertaken work in this area in the United Kingdom and Tanzania.

6.3 Global climate change

As part of the registrars’ environmental health placement programme, Sinola Rajaram will be undertaking the first study under the umbrella of the Centre in relation to global climate change.
There is now increasing consensus that:

* the effects of global climate change are already being felt;
* that for the first time in earth's history a significant contribution to climate change is being made by human activity; and
* those most likely to bear the brunt of phenomena associated with climate change are children, especially in sub-Saharan Africa.

At this stage it is planned that a study be conducted at Coronationville and Baragwanath Hospitals, which will look at daily hospital visits in relation to daily temperature. The study period will be from 2003 to 2005. A protocol is currently being drafted for submission to the University of the Witwatersrand Ethics Committee.

The study findings will be used as a vehicle to comment on the state of preparedness in South Africa regarding the likely child-related outcomes of climate change phenomena such as increased daily temperature. This study is pertinent in light of the fact that this summer is predicted to be the hottest in South Africa for more than 30 years.

**Cost:**
R5 000 and in-kind contribution from School of Public Health of the University of the Witwatersrand.

### 6.4 Siyakhana Bezuidenhout Park Food and Garden Project

On 1 September 2005, the Johannesburg City Parks, in the presence of the Minister of Health, Dr Manto Tshabalala-Msimang, local councillors and officials from the South African Police Service, launched the Siyakhana Bezuidenhout Park Food and Garden Project. The project developed as a result of the involvement of the Health Promotion Unit (Wits) in civic initiatives aimed at improving urban quality of life.

In inner city Johannesburg, children are at risk because of a lack of health education and promotion initiatives and inadequacies in the registration and management of crèches. For example, three hundred inner city Early Childhood Development Centres cater for 12 000 children, most of which are not registered with the Department of Social Welfare, and therefore do not benefit from government poverty alleviation feeding programmes.

Bezuidenhout Park (Region 8) is a popular recreation centre for children and adults, and was a logical choice for the establishment of the Siyakhana Food and Garden Project.

Johannesburg City Parks (JCP) provided the Health Promotion Unit with 1.5 hectares of park space to provide vegetables, fruits and herbs for the benefit of children attending Early Childhood Development Centres, as well as non-governmental Organizations providing care and support for people living with HIV/AIDS.

The project is aligned with the Integrated Development Plan for the City of Johannesburg. Other initiatives under the umbrella of the Project include life skills training, permaculture and income generation. The skills development programme emphasises the establishment of healthy plant and vegetable nurseries, bee keeping units, earthworm farms, vegetable plots and orchard and herb production as a business. A long-term goal is to have participants develop their own food and herb gardens as small to medium enterprises (SMEs).
7. Promotion of urban health programmes as evolving models for intersectoral collaboration and health advocacy

7.1 Contributing towards the development of a Human Development Strategy for the City of Johannesburg

The City of Johannesburg has developed a 10-year plan for fighting poverty and promoting human development. The three key points are:

- safeguarding and supporting poor and vulnerable households,
- championing rights and opportunities, and
- building prospects for social inclusion.

Various Centre partners were involved in the identification and contribution of data to the preparation of background reports and informing the final strategy. Liz Thomas (MRC) participated in the reference group for the preparation of the Johannesburg Human Development Strategy.

In cooperation with representatives of the City of Johannesburg and the Development Bank of Southern Africa, the Centre for Social Development in Africa (CSDA) at the University of Johannesburg is developing a Johannesburg focused baseline household study on human development. The primary aim of the study is to gain a better understanding of households, livelihoods and urban poverty. The data gained in the study will serve two broad purposes:

- to inform human and social development policy and programmes; and
- serve as a baseline evaluation for a possible longitudinal or panel study of 3000+ households in the city's three poorest administrative regions.

The Principal Investigators are Professors Leila Patel and Thea de Wet, together with Mr Marcel Korth, who is a junior researcher on the project.

The City of Johannesburg's Human Development Strategy represents the City's plan to fight poverty and inequality, and promote human development. The complexity of urban poverty requires a detailed analysis and understanding of households, their livelihood strategies, local level social organisation and their implications for urban social policy.

The study will benefit the City of Johannesburg in at least four ways:

- it will provide a baseline for the monitoring of the City's Human Development Strategy;
- it will provide the City and other relevant stakeholders with vital information on changing trends in households, intra-household dynamics and livelihood systems;
- it will establish a foundation for future policy formulation to address poverty, inequality and social exclusion; and
- it will contribute to improved planning and implementation of the Joburg Triangle’s three strategic areas of intervention:
  1. safeguarding and supporting poor and vulnerable households;
  2. championing rights and opportunities; and
  3. building prospects for social inclusion.

The empirical framework for the study is informed by Beall and Kanjii’s analytical strategy on households, livelihoods and urban poverty. Beall and Kanjii’s strategy analyses the linkages between households and larger-scale economic, social and political processes. In addition, an adapted livelihoods framework will serve to inform an in-depth analysis of:

- changing household trends in the city;
- intra-household dynamics like production and reproduction processes, decision-making powers and social relations, gender relations, as well as coping strategies.

As part of the preparatory work for a comprehensive project proposal, the Centre has engaged in multiple activities. Firstly, existing data and research on human development in Johannesburg was identified and a comprehensive bibliography was compiled. Secondly, preliminary qualitative data on composition and household size was collected from two dozen households in Soweto and Orange Farm. More qualitative data will shortly be collected in other areas of the City, including high-density inner-city areas and informal settlements. Thirdly, a survey of 100 registered households (account holders with the City) and 50 non-registered households (non-account holders, e.g. informal settlements) will be conducted during the coming weeks. This will serve to test household definitions formulated from the qualitative research already completed, and pilot some of the questions to be included in the proposed baseline study discussed above.

This study will make a significant contribution to the City's implementation of its Human...
Development Strategy. Data collected will assist the City of Johannesburg and other stakeholders in implementing appropriate social and human development programmes that benefit the city's poor. The study will make a contribution to bringing about sustained improvements in the well-being of the individual, family, community and society at large. It is expected that the study will contribute to the broader aim of building a truly World-Class African City for All.

**Cost:**
Funded by the University of Johannesburg (R100 000), Development Bank of Southern Africa (R50 000) and the City of Johannesburg (R50 000).

### 7.2 Addressing HIV as a developmental issue

There is a growing awareness of the impact of HIV on families' coping strategies, communities, and local government. In the light of a lack of policy guidance at a national, provincial or local level, the MRC has committed itself to a focus on HIV as a developmental issue. A range of initiatives is underway in conjunction with a range of partners.

**Cost:**
Funders for HIV and development policy is INCA Capacity Building Fund for over R600 000.

The HIV/AIDS Directorate of the Johannesburg Health Department has prepared a draft strategy called Jozi Ihlomile. The strategy aims to address HIV in informal settlements through a multi-pronged developmental strategy including a range of partners. Initially, the work has focused on six pilot sites. Here, volunteers, who were paid a stipend, have been commissioned to, inter alia, undertake a survey of community needs. The MRC has been asked to assist the City of Johannesburg in the evaluation of the study questionnaire, and to advise on the development of an ongoing monitoring and evaluation system. Further, preliminary analysis of the data in one of the settlements, Sol Plaatje, has highlighted a range of needs and informed the approach. The analysis has been undertaken for Johannesburg, in part by a student working on her Master's in Development Planning at the University of the Witwatersrand, Ms Tsholofelo Thabane, under the supervision of Liz Thomas.

A joint funding proposal has been submitted to the Canadian CIDA by Planact, the Medical Research Council and the City of Johannesburg to fund a two-year health focused community development approach to address HIV/AIDS in Sol Plaatje and Ivory Park. The funding will help to implement the Jozi Ihlomile project as a pilot and advise the steering committee on how the initiative should be rolled out in the whole of Johannesburg.

The acting Chief Director focusing on HIV and local government in the National Department of Provincial and Local Government, has expressed interest in the approach being used as a model for other informal settlements. Further, this is of importance as the new national housing strategy ‘Breaking New Ground’ has paid limited attention to HIV and social development issues in the new national informal settlement development policy. The idea of documenting good practice and making it more accessible via video and electronic media has been supported. The Chief Director of Research in the National Department of Health has supported the idea of making resources available to documenting good practice at a local level such as that likely to emerge in Jozi Ihlomile.

**Cost:**
A Johannesburg City funding application was submitted to Canadian CIDA, proposal over R1 million pa.
The way forward

The emphasis over the past year has been on further consolidation of the World Health Organization Collaborating Centre for Urban Health as a partnership. This has been achieved through the initiation and implementation of a number of joint projects and programmes. Key among these has been the commencement of the Health, Environment and Development Study in Johannesburg, in which all of the partner Organizations are vital participants, the ongoing Registrars' Environmental Health Placement Programme and sharing in the challenge of hosting the Seventeenth Annual Conference of the International Society for Environmental Epidemiology. Over the next year, efforts will continue regarding the building of the World Health Organization Collaborating Centre as a partnership.

A key concern for the future is the way in which the Centre will "add value" to existing initiatives and how the Centre identifies and responds to critical research questions. In this regard, an important event on the Centre's calendar will be the strategic planning meeting scheduled for 29 November 2005. Among the objectives of the meeting will be to:

* review the terms of reference;
* decide on critical future projects;
* develop a fund-raising strategy;
* develop a strategy to increase the Centre's relevance to the World Health Organization-AFRO; and to
* initiate the development of a 'marketing/communications' strategy.

An important output of the strategic planning meeting will be a five-year plan that will guide the Centre in the years to come. Input from the Advisory Panel will be of particular importance in this regard.

Annexure 1: Members of the advisory panel

* Dr Thuthula Balfour, Development Bank of Southern Africa
* Ms Jackie Friedenthal, Department of Science & Technology
* Professor Trudy Harpham, South Bank University, London (chairperson)
* Professor Anthony Mbewu, South African Medical Research Council
* Professor Sue Parnell, University of Cape Town
* Dr Ram Saloojee, Gauteng Provincial Legislature
* Dr Tim Wilson, National Department of Health
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Annexure 2: Key individuals who participated in the work of the World Health Organization Collaborating Centre in 2004/5

Brendon Barnes, South African Medical Research Council
Debashu Basu, University of Johannesburg
Refik Bismillah, City of Johannesburg
Daphney Conco, South African Medical Research Council
Thea de Wet, University of Johannesburg
Tanya Haman, University of Johannesburg
Anthony Joffe, University of the Witwatersrand
Xoliswa Kupiso, South African Medical Research Council
Mpule Mdlalose, Independent Student
Peter Manganye, City of Johannesburg
Benny Maphaka, City of Johannesburg
Angela Mathee, South African Medical Research Council
Mirriam Mogotsi, South African Medical Research Council
Nisha Naicker, University of the Witwatersrand
Shan Naidoo, University of the Witwatersrand
Vathiswa Papu, South African Medical Research Council
Sinola Rajaram, University of Johannesburg
Halina Röllin, South African Medical Research Council
Mike Rudolph, University of the Witwatersrand
Joseph Shikwambane, University of Johannesburg
Rochelle Spadoni, South African Medical Research Council
Frikkie Swanepoel, City of Johannesburg
Andre Swart, University of Johannesburg
Elizabeth Thomas, South African Medical Research Council
Margaret Westaway, South African Medical Research Council
Carmen Whittle, University of Johannesburg
Annexure 3: Media coverage (selected press releases)

http://www.themercy.co.za/index.php?fSectionId=2835&fArticleId=2813141


I. Articles in Press in Indexed Journals


II. Published Articles


III. Book Chapters & Book Reviews


IV. Reports


V. Conference Presentations


6. De Wet T. Planning a qualitative study: Understanding community response to the availability of Antiretroviral Therapy in South Africa, Center for Disease Control (CDC, Atlanta), Tulane University (USA), University of the Western Cape (UWC), Rand Afrikaans University (RAU), at RAU, Johannesburg, 11-15 October 2004.


10. MacKeown JM. Sugar and dental caries - an update. Invited speaker at the 2005 Sugar and Health Symposium: No beating about the sugar bush. Ubizane Wildlife Reserve,
Zululand, KwaZulu/Natal, 8-10 May 2005.


VI CD-ROM


VI DISSERTATIONS


With the transition to democracy, there has been a dramatic shift in the scope of work of environmental health practitioners (EHPs) - from a focus on control to one of development and change facilitation, especially in informal settlements...

Photos by Angela Nalule, Brandon Barnes and Greg Marinovich. Design by Andrew van der Merwe and Cyrille Bajer.