KNOWLEDGE, PERCEPTIONS AND BEHAVIOURS AMONGST PREGNANT WOMEN IN RELATION TO CHILD LEAD HAZARDS

Tanya Nadine Haman

Research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfillment for the degree of

Master of Public Health

2007

Student number: 0110605P

Supervisor: Dr A Mathee

Co-supervisor: Prof A Swart

DECLARATION

I Tanya Nadine Haman declare that this research report is my own work. It is being submitted in partial fulfillment for the degree of Master of Public Health at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

……

Tanya Nadine Haman

DEDICATION

All thanks and praise to my Heavenly Father, for granting me the courage, strength and knowledge to succeed in completing my studies.

ABSTRACT

Childhood lead exposure is increasingly becoming a public health concern in developing and developed countries. Children are particularly vulnerable because of their developing body systems and mouthing behaviours. Recent studies have shown that lead exposure during pregnancy could cause harmful effects in unborn babies, subsequently causing ill health during later childhood. Lead poisoning prevention strategies should address exposures before, during and after pregnancy. To develop an appropriate framework for childhood lead exposure preventive strategies, the knowledge, perceptions, and behaviours of pregnant women in relation to child lead hazards had to be explored.

The purpose of this study was to investigate the knowledge, perceptions and behaviours of pregnant women in relation to child lead hazards. To answer the research question, objectives were formulated which were to explore the knowledge of pregnant women regarding the sources and routes of exposure, the health effects of lead and mechanisms to protect children against lead exposure.

The study objectives were achieved by administering an exploratory structured questionnaire. A non-probability convenience sample of 119 pregnant women was selected for data collection. Data was analysed using STATA 9.0 software.

The results showed that only 13 participants (11%) had heard of lead before and the majority of participants (89%, n=107) had not heard of lead before. Four participants (31%, n=13) did not know if lead could be harmful to the health of children. Nine participants (69%, n=13) however, thought that lead could harm the health of children. Six participants (46%, n=13) did not know the health and social problems that lead exposures could cause in children. High risk factors in the living environment of the study population included informal housing, overcrowded living conditions, flaking and peeling paint, poor hand wash behaviour and smoking.

The study concluded that there were low levels of knowledge, lacking perceptions and high-risk behaviours and practices amongst pregnant women in relation to child lead hazards. It further concluded that there were high-risk activities and conditions in the living environment of the studied population.

ACKNOWLEDGEMENTS

I wish to acknowledge and thank the following:

- My supervisors, Dr Angela Mathee and Prof Andre Swart for their guidance, encouragement, patience and support throughout the course of this study.
- The Gauteng Provincial Government in conjunction with the Coronation Hospital Management for granting permission to do the study.
- The staff of the Coronation Hospital Antenatal clinic services.
- The staff of the Environment & Health Research Unit of the South African Medical Research Council, in particular Mr Brendon Barnes my co-investigator and Ms Mirriam Mogotsi, my research assistant for their continued support and assistance throughout the study.
- Dr Mary Kawonga, for her understanding and encouragement throughout this study.
- My caring and loving husband, Reginald for all his support throughout my studies. My children Xavier and Zuhre whose time I used to complete this report. My mother for her support and assistance when completing my research report.

- The staff of the Environmental Health Department of the University of Johannesburg, for their assistance.
- Mr Braimoh Bello for statistical assistance.

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CHAPTER ONE: INTRODUCTION, LITERATURE REVIEW, AIMS AND OBJECTIVES

1.1 LEAD AS A GLOBAL PROBLEM

Lead is a useful, but toxic, heavy metal that can be found in petrol, paint, computers, television sets, electrical appliances, motor cars, batteries and a variety of other products (Tong, von Schirnding & Prapamontol et al., 2000).

People are predominantly exposed to lead through the hand-to-mouth pathway (Bellinger, 2004), for example when chewing nails or sucking fingers, as well as through ingestion of lead-contaminated food, water and non-food items (pica). In a study conducted by the Peruvian Government's Environmental Health division, within their Ministry of Health, between 1998 and 1999, it was found that children ingesting soil, sucking on pencils and placing hands in mouths, were at risk of increased exposure to lead (Torres, 2003).

Of all people, young children face the most danger from lead exposure, as their growing bodies can absorb lead more easily than adults (Landrigan, 1999). Children are

also particularly vulnerable to lead exposure because of higher ingestion and respiration rates, higher metabolic rates, the incomplete state of development of many of their organs, and importantly, because of their natural propensity to explore their environment through touching and tasting (Landrigan, 1999).

The health effects of lead exposure include reductions in IQ scores, hyperactivity, shortened concentration spans, poor performance at school, anaemia (Mathee & von Schirnding, 2002), and lowered lifetime achievements and earnings (Needleman & Bellinger, 1991; Hammond & Dietrich, 1990). Many of the health and social effects of lead are irreversible (Tong, et al., 2000; Bellinger, 2004).

In previous studies conducted (Bellinger, Needleman & Leviton, et al., 1984) foetal exposure to lead has been associated with low birth weight, abnormal development of organs, and later socio-behavioural developmental effects. Pregnant women and women of childbearing age are also at increased risk of lead poisoning, because lead exposure in a pregnant woman can affect the unborn foetus (Hu, Tellez-Rojo & Bellinger, et al., 2006). In pregnant women lead readily crosses the placental barrier during the early stages of gestation (Barltrop & Burlands,

1969; Horiuchi, Horiguchi & Suekane, 1959; Alexander & Delves, 1981; US EPA, 1986). Unborn children are therefore adversely affected by lead exposure during the most critical stages of embryological development of their organs and body systems (Barltrop, et al., 1969; Horiuchi, et al., 1959; Alexander & Delves, 1981; United States Environmental Protection Agency, 1986).

In a study that was conducted in Dhaka, Bangladesh, 90% of the primary school children that were assessed had lead levels that could affect their development and learning abilities (Kaiser, Henderson & Daley, et al., 2001). Some of the risk factors associated with children that had blood levels in excess of 10 micrograms per decilitre (μg/dl) were soil-eating behaviour, living near heavily trafficked roads and low parental education.

There is now scientific consensus that there is not any threshold of safety as far as lead is concerned, and that even a relatively low blood lead concentration may lead to detrimental health and social effects (Lanphear, Dietrich & Berger, et al., 2003). With evidence that clearly suggests that children in all societies are threatened by the global problem of lead exposure (Tong, et al., 2000; Landrigan, 2002; Meyer, McGeehin & Falk, 2003) the

World Health Organization (WHO) (World Health Organization, 2000a) and many other national and international organisations recognise the need for a focus on children everywhere in the world (Carpenter, Chew & Damstra, et al., 2000; Fitzgerald, Schell & Marshall, et al., 1998; Suk, Ruchiwarat & Balakrishnan, et al., 2003; Natural Resources Defense Council, 1997).

1.2 LEAD AS A SOUTH AFRICAN PROBLEM

In South Africa, multiple sources of lead cause contamination of home environments, with the most important contributors being past use of lead in petrol, current use of lead in paint applied in homes and on items with which children come into contact, informal home industries and high risk lead occupations. The widespread use of lead in domestic and industrial South African environments has resulted in pervasive contamination of urban and rural environments (Snodgrass, 1986).

Several studies undertaken in South Africa have shown that large numbers of children have blood lead concentrations above internationally accepted guidelines. For example, studies undertaken in the early 1990's

showed that more than 90% of children in Woodstock, Schotcheskloof, Mitchell's Plain and Hout Bay had high lead levels (von Schirnding, Fuggle & Bradshaw, et al., 1991a). A study undertaken in the Cape Town suburb of Woodstock showed that children attending schools in close proximity to heavily trafficked roads had higher blood lead levels than their counterparts attending schools located further away (von Schirnding, et al., 1991a, von Schirnding & Fuggle, 1996). It was also found that children with elevated blood lead levels tended to live in dilapidated, overcrowded and dusty homes with flaking paint (von Schirnding, et al., 1991a).

A Medical Research Council study undertaken in 1995 (Mathee, von Schirnding & Levin, et al., 2002) showed that 78% of first grade children attending selected study schools in Westbury, Newclare, Alexandra and the inner city of Johannesburg, had blood lead levels equal to or above the internationally accepted action level of 10 μg/dl. In addition findings from this work pointed towards contaminated dust and flaking paints in homes as a potential source of lead poisoning. A case study of an individual South African subject found that the seven-year-old had a blood lead level of 44.4 μg/dl (Mathee, Rollin & Ditlopo, et al., 2003). The study highlighted the

low levels of awareness of lead hazards amongst parents and within the health sector.

In recent times elevated lead levels have become a major concern for marginalised global communities, as they are more likely to be associated with sub-standard living conditions close to industrial and heavily trafficked areas (Tong, et al., 2000). Nriagu, Blankson & Ocran (1996), also point out the influence of sociological and economic factors that predispose African children to environmental lead exposure.

Barnes (2003) argues that ill health factors of the developed world are generally within individual control and those of the developing world beyond individual control. He further states that *"in view of the complex relationship between environment, behaviour and health, ill health in the developing context is significantly linked to the inadequacies of basic infrastructural requirements, with little regard to the importance of individual-level behaviours or related environmental health behaviour change initiatives."* Behaviour change, through health education, has been identified as a potential intervention approach to reduce lead exposure rather than remove lead at the source. Lead exposure related behavioural

interventions generally aim to a) remove lead containing dust from the living environment (environmental hygiene), and b) reduce the hand-to-mouth activity (personal hygiene) through, for example, hand washing (Ettinger, Bornschein & Campbell, et al., 2002).

The Health Belief Model suggests that individual action related to lead poisoning prevention behaviours could be determined by certain factors. Lead poisoning prevention behaviours of high risk communities are largely influenced by their perception of the seriousness of environmental lead exposure and its consequences, the benefits of recommended lead poisoning preventive behaviours as compared to how they perceive these benefits, and their perception of barriers to implementing such behaviours (Nutbeam & Harris, 1999).

1.3 VALUE OF AWARENESS PROGRAMMES

Low awareness presents a major problem in any effort to address lead poisoning in children, yet several studies have shown that efforts to address low awareness in lead poisoning prevention programmes can be instrumental in reducing childhood lead exposure.

The results of a cross-sectional study conducted among 200 Mexican children under the age of 5 years showed that parents, who are informed adequately on potential sources of lead exposure, are likely to act to decrease exposure using lead preventive strategies (Romieu, Carreon & Lopez, et al., 1995).

Shen, Yan & Wu, et al., (2004) reported evidence from a study in China which suggested that educating parents has proved to be an effective approach for children with mild and moderate lead poisoning. Parental education has been proven a stronger predictor than family income, single parenthood, or family size for ensuring the health of children (Zill, 1996).

The Alameda County Lead Poisoning Prevention Programme *"has shown impressive results"* in reducing childhood blood lead levels through increasing awareness with education programmes (Alameda County Lead Poisoning Prevention Programme, 1997).

Evidence suggests that the majority of lead poisoning prevention studies gear interventions towards increasing the primary caregiver's knowledge of lead poisoning prevention, with minimal attention to social influences on

these preventive behaviours (Endres, Montgomery & Welch, 2002). In view of the latter and the context within which child lead exposure occurs, it can be assumed that the mother as a primary caregiver plays a significant role in determining the exposure of children to lead hazards. To date however, studies have yet to evaluate the effectiveness of behavioural approaches in reducing child lead poisoning in resource-poor contexts.

1.4 SIGNIFICANCE OF THE STUDY

No study has been published to date on the levels of knowledge about lead hazards in South Africa. This is the first known study to respond to this gap in knowledge. The findings of the current study will be of value in the design of a public education strategy to address lead hazard knowledge gaps in public groups similar to the study population.

1.5 THE AIM OF THE STUDY

The overall aim of this study was to determine the knowledge, perceptions and behaviours amongst pregnant women in relation to child lead hazards.

1.6 OBJECTIVES OF THE STUDY

The study had the following key objectives:

- To understand the knowledge of pregnant women regarding the sources and routes of exposure and the health effects of lead.
- To understand the knowledge, perceptions and behaviours of pregnant women regarding mechanisms to protect children against lead exposure.

CHAPTER TWO: RESEARCH METHODOLOGY

2.1 RESEARCH DESIGN

To investigate the knowledge, perceptions and behaviours amongst pregnant women in relation to child lead hazards, and to achieve the objectives of this study, an exploratory, descriptive study was conducted using a structured questionnaire.

The questionnaire was a list of questions, which gave indirect measures of the variables under study (Katzenellenbogen, Joubert & Karim, 1999).

Administration of a structured questionnaire in this study prevented the investigators/researchers from placing their own interpretation on questions. Questions were asked in the same way, with the same probes and clarifications, while recording of responses was done as uniformly as possible (Katzenellenbogen, et al., 1999).

2.2 STUDY POPULATION

2.2.1 The research setting

The study was conducted at the Coronation Hospital, which is situated within Region B of the City of Johannesburg (Appendix A). The Coronation Hospital is dedicated to serving the health needs of women and children in Gauteng, and draws a population from areas within a 5 kilometre radius as well as other areas situated further away in the province. As can be seen in Appendix B, some of the areas within close proximity to the Coronation Hospital include Coronation, Westbury, Newclare, Bosmont, Riverlea, Crosby and Mayfair. The Hospital is situated in close proximity to the N1 Highway and several industries, as well as a mine dump.

Studies conducted in the vicinity of the Hospital have shown that children in the area are particularly vulnerable to lead exposure (Mathee, et al., 2002). For example, in 1995 around 78% of first grade children were shown to have blood lead levels equal to or exceeding the internationally accepted action level of 10 μg/dl (Mathee, et al., 2002). A number of residential suburbs surrounding the Coronation Hospital have areas that are densely populated, heavily trafficked and mostly comprising older housing (Mathee, et al., 2002)(Appendix B).

2.2.2 The target population

Burns and Grove (1997) define a target population as all elements (individuals, objectives, events or substances) that meet the sample criteria for inclusion in a study. The eligible target population in this study was pregnant women attending antenatal clinic services at the Coronation Hospital.

2.2.3 The study sample and sampling method

Babbie (2004) and Burns, et al., (1997) note that sampling is a process of selecting observations (groups of people, events, behaviours or other elements) with which to conduct a study.

In this study a convenience sample of 119 pregnant women attending antenatal clinic services was selected. Burns, et al., (1997) state that in using convenience sampling the pregnant women will be included in the study sample because they happen to be at the right place and the right time. Inclusion of 119 participants in the study provided enough statistical power based on estimated moderate effect size (0.5) and alpha (α=0.05) between high and low risk behaviours. In addition 119 was thought

to provide enough variability in responses to inform the intervention that is specific to a population of pregnant women with a similar cultural and socio-demographic profile.

Patton, as quoted by Flick (2002), mentions that convenience samples may simply be applied to reduce effort, yet from time to time it might be the only suitable method for selection of study participants. Convenience sampling was singled out as the most appropriate method for participant selection (Babbie, 2004), as it was "*justified on its grounds of feasibility", "relying on the availability of participants"*, and considering resource constraints. In line with Babbie's (2004) warnings against the generalisation of study results when using convenience samples, it should be noted that the results of this study would describe participants in the defined research setting and not pregnant women in general.

2.3 DATA COLLECTION

Data collection is the process that informed this study about carefully *"…detailed factual descriptions of the participants"* (Schwandt, 2001).

2.3.1 Data collection methods

Structured one-on-one interviews with the research participants were used for data collection (Appendix C). During these interviews a structured questionnaire was uniformly administered to all of the participants by the interviewers, to collect information on the knowledge, perceptions and behaviours of pregnant women in relation to child lead hazards. The research assistant is a full time employee of the Environment & Health Research Unit of the South African Medical Research Council. Interviews were conducted in a reasonably quiet location to ensure privacy, in close proximity to the queue so that participants retained their positions in the queue.

The first 119 pregnant women that attended the antenatal clinic at Coronation Hospital during the period of data collection were interviewed until the sample size (n=119) was obtained. Some participants did not feel comfortable speaking about personal matters despite being assured about confidentiality. In the event of refusal to participate, the next person in the queue was approached for inclusion in the study sample. For the duration of the data collection period there were 26 refusals. Non-

participation was due to participants not really showing a particular interest in the study.

Questionnaires were administered in the language with which interviewees were most comfortable. Most interviews were conducted in English (90%), 3% in Afrikaans, 5 % in Sotho and 2% in Zulu. Information was collected on the knowledge, perceptions and behaviours of pregnant women in relation to child lead hazards (Appendix C).

Data collection took place from 5 October 2005 to 17 November 2005.

2.3.2 Questionnaire (Data collection tool)

The data collection tool was an exploratory, descriptive and structured questionnaire (Appendix C), which consisted of open and closed-ended questions.

The questionnaire was divided into the following sections: (a) socio-demographic characteristics and attributes, (b) information of the home environment, and (c) knowledge and perceptions, behaviours, cleaning practices and

smoking of the participants in relation to the study objectives.

2.4 THE PILOT STUDY

Babbie (2004) and Katzenellenbogen, et al., (1999), highlight the importance of pre-testing questionnaires so as to improve quality and to correct errors that might have occurred during the design phase. A pilot study was conducted on 5 October 2005, on a sample of 12 participants. The 12 participants resembled a similar profile to the intended study population in that they were all pregnant women attending antenatal clinic services at the study site. All interviews were conducted in English.

During the pilot study, consideration was given to the length of the questionnaire, words and sentences that were not well understood, as well as questions that required prompting. For purposes of improving the quality of data to be collected, participants were asked for their comments and input regarding the method of data collection as well as timing of the interview. The sampling logistics for the formal data collection of the research study were also reviewed.

Following the pilot study, several improvements were effected to the questionnaire to improve flow and the quality of data collected.

2.5 DATA ANALYSIS APPROACH

Data was “double punched” using a Microsoft Excel software package, and subsequently transferred to STATA 9.0 statistical programme using Stattransfer.

Descriptive analysis

The primary aim of this study was to describe the knowledge, perceptions and behaviours of pregnant women in relation to child lead hazards. Thus statistical analyses carried out were basically descriptive using proportions, means and other necessary statistics. Proportions are reported in tables or displayed in graphs. While for most questions, the reported proportions are for the 119 study participants, for a few other questions, the reported proportions are for a particular sub-group who had a particular response to the preceding question.

2.6 RELIABILITY AND VALIDITY

Administration of a standardised questionnaire limited potential observer bias by researchers. During the design of the questionnaire, double-barrelled questions and negative wording, that could have triggered biased responses from the participants, were avoided. Questions of a sensitive nature were formulated with special caution and minimally used where possible. Consideration was given to preceding questions that had a biased context. Herzog (1996) advises researchers that in taking the above precautionary measures, *"…face validity could be built into stimulus wording"*.

The questions asked were a true reflection of issues relevant to lead poisoning prevention in the local and global context. Reliability of the data collection method was optimised by uniform training of the interviewers, prior to commencing with the formal data collection. In line with Flick's (2002) recommendation, questionnaires were constantly re-checked for missing values to ensure completeness of data and to enhance the comparability of the different interviewers.

2.7 ETHICAL CONSIDERATIONS

The research protocol was presented to the Faculty of Health Sciences Postgraduate Committee of the University of the Witwatersrand. Approval was granted by this Committee as per Appendix D. Ethical approval for this study was granted by the Ethics Committee for Research on Human Subjects (Medical) of the University of the Witwatersrand (Appendix E). The Gauteng Provincial Government in conjunction with the Chief Executive Officer of the Coronation Hospital granted permission to conduct the study (Appendix F). Using a participant information sheet (Appendix G), research participants were informed of the study, how much time they were likely to spend participating in the study and possible inconveniences. Participants were also assured of confidentiality based on the fact that study results will only be published as a group. Participants were also informed that they were free to withdraw from the study at any time without necessarily offering any reasons for doing so, and without incurring a penalty of any sort.

Written informed consent was obtained from most of the participants. In cases where written consent could not be obtained, (for example, illiterate participants),

interviewers were given oral consent from the participants and requested to sign on their behalf (Appendix H).

CHAPTER THREE: RESULTS OF THE STUDY

3.1 PROFILE OF THE STUDY POPULATION

On average the study participants were 27 years of age, with the ages of individuals ranging from 18 to 43 years. Most study participants (65%) had acquired secondary school education, while 23% had a post-matric qualification. Ten percent of the study population had only primary school education and 1% percent had never been to school. Fourty-five percent of participants were employed. At the time of data collection, of the 45 % of participants that knew their exact due date, 87% had reached the third trimester of their pregnancy, while 11% were in the second trimester.

Figure 3.1 depicts the distribution of the total household income for the participants. As can be seen, most participants (32%) reported that they did not know (or possibly refused to divulge) what the total monthly household income was. The income of the remainder of the participants was reasonably evenly spread over a range from R1000.00 to more than R5000.00 monthly.

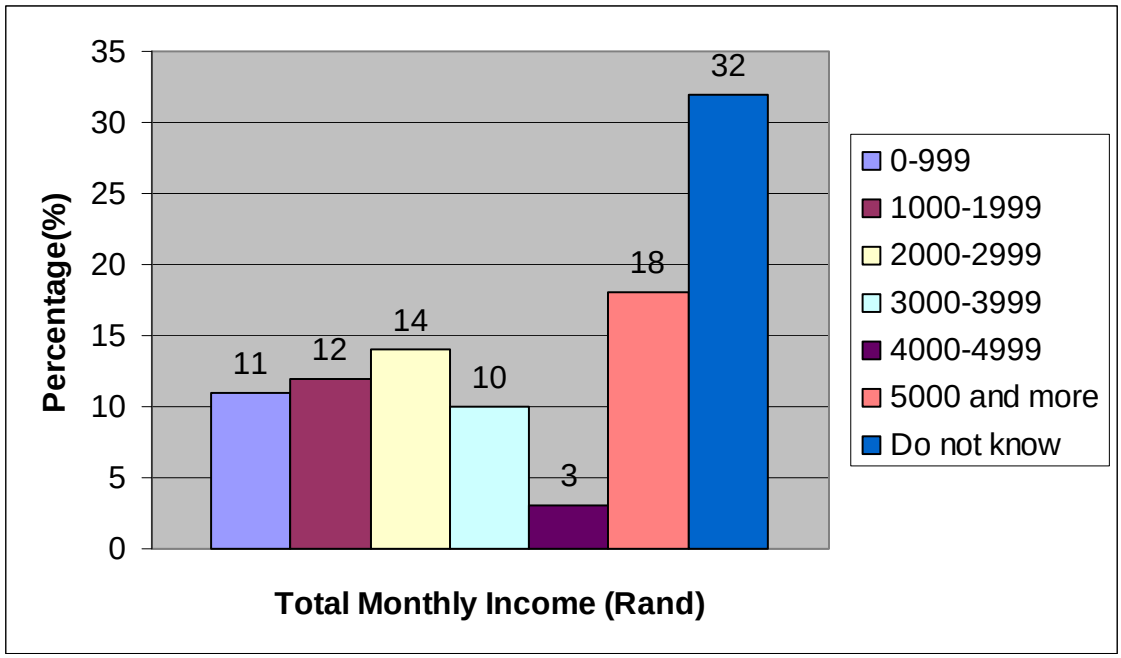

Figure 3.1: The distribution of the total household income per month for the participants (n=119).

At the time of the study, participants reported living in households that were occupied on average by 4 persons. Ten percent of the participants were smokers at the time of the survey, while 26% reported living in a household where at least 1 person regularly smoked. Thirteen percent of the participants reported having drunk alcohol before. Sixty-two percent of the study participants resided within a 5 kilometre radius of the Coronation Hospital. The majority of participants (55%) were planning, following delivery, to use the Well Baby Clinic services of the Coronation Hospital. The remainder planned to use a variety of Well Baby clinics, including those in Soweto (11%), Bosmont (3%), Mayfair (3%), Riverlea (3%),

Crosby (3%), Claremont (2%), Newclare (1%), Brixton (1%) and Sophiatown (1%).

3.2 LIVING ENVIRONMENT OF THE STUDY POPULATION

The majority of respondents (50%) lived in formal, freestanding dwellings, while 30% lived in flats (apartments). Around 13% lived in informal dwellings, while a further 6% lived in backyard structures. Most dwellings (44%) had been constructed within the past 25 years, while 27% and 12% respectively were 25 to 49 years old or more than 50 years old. Seventeen percent of respondents were unaware of the age of the dwelling in which they lived. Electricity was the main fuel used for cooking in 94% of households, with the remainder using paraffin.

A. House dust

Figure 3.2 illustrates that 18% of respondents described their dwellings as very dusty, while 54% said their dwellings were slightly dusty. Twenty-eight percent described their dwellings as not dusty at all.

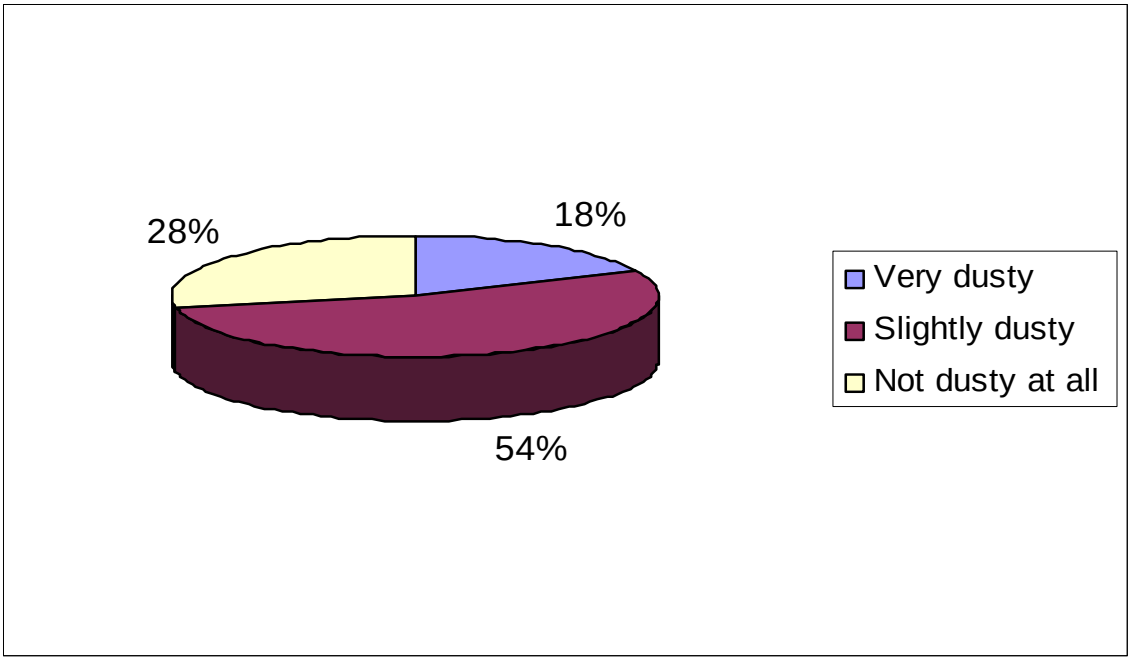

Figure 3.2: The distribution of house dust for the participants (n=119).

B. Front and back garden description

Bare or uncovered soil has been identified as a potential source of lead exposure (Jacobsen, 1996). In this study 10% of the participants reported that their front gardens comprised mainly uncovered soil, while a further 4% said that part of the garden comprised uncovered soil. In terms of the back gardens, 21% reported them to be uncovered, while a further 3% said that part of them were uncovered. Figure 3.3 describes the respondents' description of their back and front gardens.

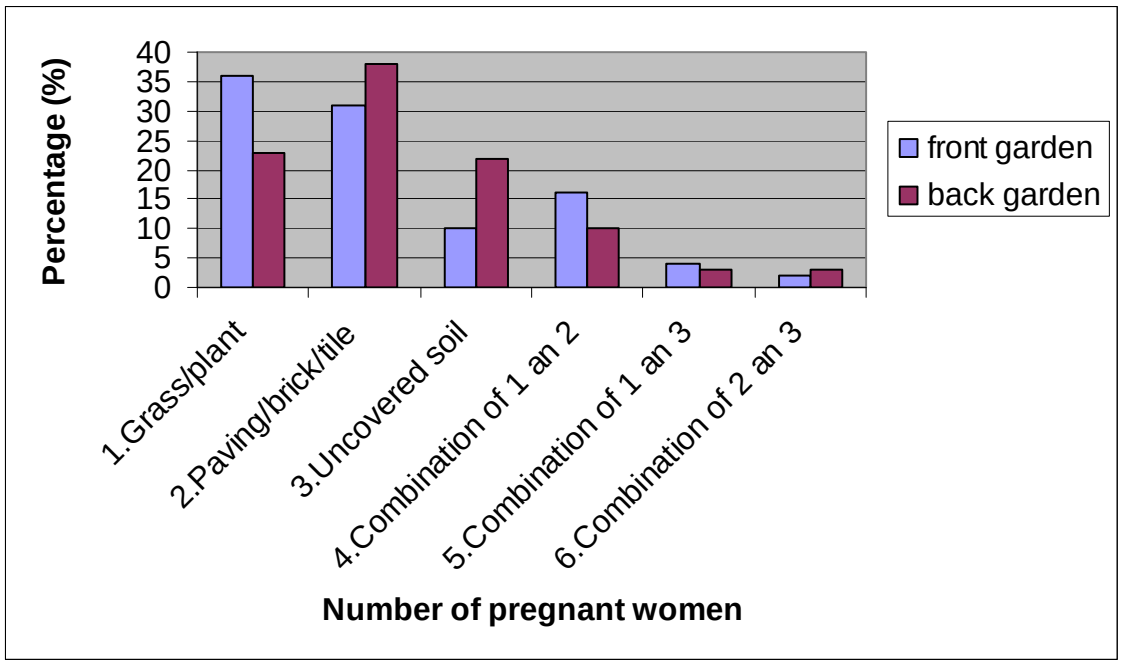

Figure 3.3: The distribution of back and front garden descriptions of the homes of participants (n=119).

C. Paint on inside and outside walls

A study conducted by von Schirnding, et al., (1991a) in children in the Cape Town area highlighted living in homes with flaking paint, as a risk factor associated with elevated blood lead levels. Bright colours of paint, such as red, yellow and orange, have been reported to contain particularly high levels of lead (Graham, 2006; Australian Government, 2007)

Ninety-two percent of participants said that the walls inside their homes have been painted, whereas only 65%

lived in homes in which the outside walls were painted (Figure 3.4).

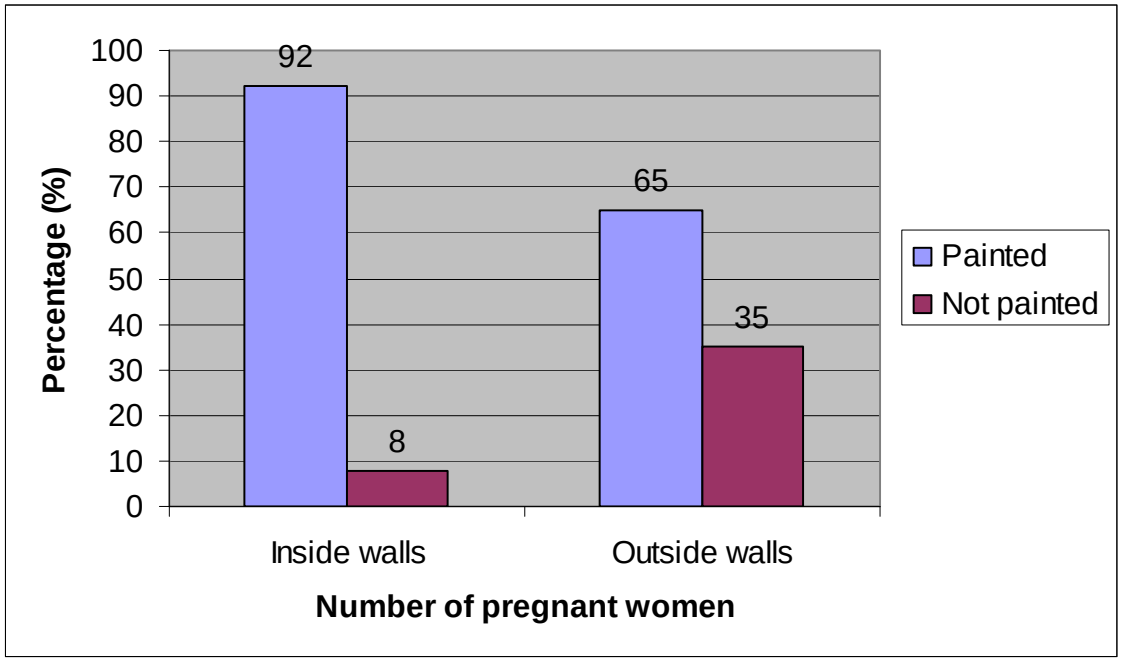

Figure 3.4: The distribution of paint on the inside and outside walls of the homes of participants (n=119)

The majority of participants reported the use of white or cream/beige paint on inside walls (68%) and outside walls (31%), as described in Table 3.1. The use of bright colours of paint such as red, yellow and orange were used on the inside walls (15%) and outside walls (18%) of the participants' homes.

Table 3.1: The distribution of paint colours on the inside and outside walls of the homes of participants (n=119).

Paint colour	Inside walls n=109 (%)	Outside walls n=77 (%)
Red	2	5
Yellow	10	9
Orange	3	4
Purple	1	0
Green	6	8
White	39	17
Cream/ Beige	29	14
Blue	3	9
Brown	2	8
Pink	3	23
Grey	2	3
Not sure/ Do not know	0	1

Fifty-one percent of participants said that the walls inside their homes were covered with enamel paint, compared to the 44% that reported PVA/water based paint. A further 17% of participants said that the inside walls of their homes were covered with enamel paint, and 73% said PVA/water based paint. Figure 3.5 illustrates the type of paint used in the homes of participants.

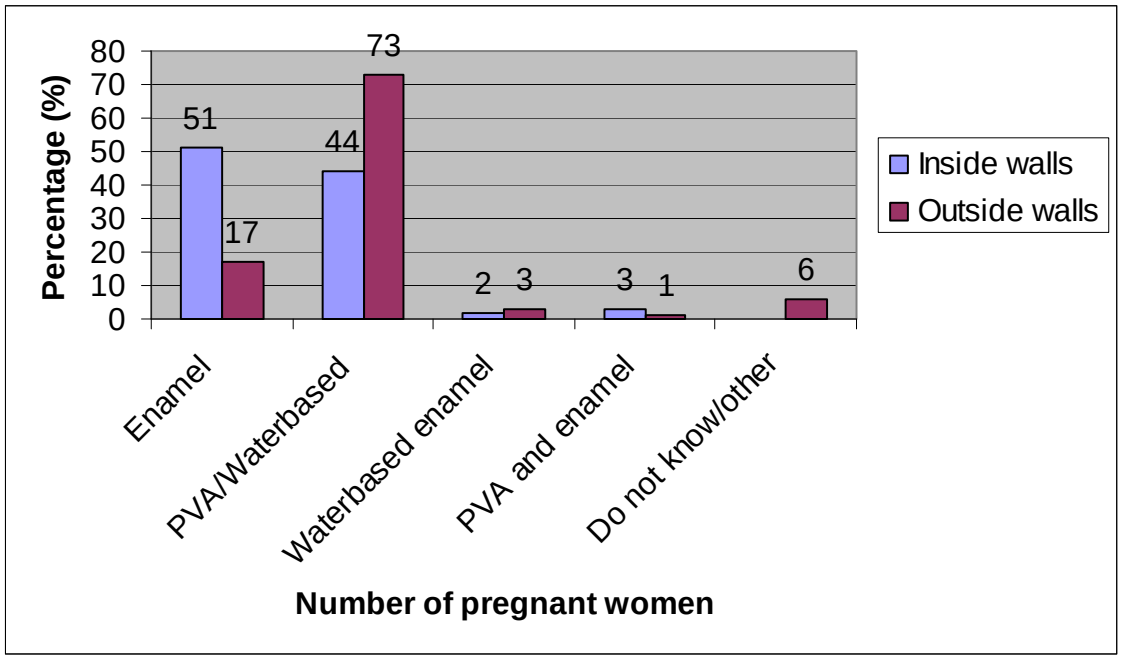

Figure 3.5: The distribution of paint types on the inside and outside walls of the homes of participants (n=119).

Twenty percent of participants reported flaking and peeling of paint on inside walls, and 22% reported the same condition of paint on outside walls.

D. High-risk lead occupations

Eight participants said that they lived with persons involved in building and renovations, 5 participants (4%) said that they lived with persons working in the spray painting industry, 4 participants (3%) lived with members that worked in car repair workshops and 7 participants (6%) lived with persons doing electrical repair work. Other responses included household members that worked

with guns (3 participants, 3%) and did soldering with lead (3 participants, 3%).

E. High-risk activities at home

Where electrical appliances using lead solder are fixed at home, or if car repairs and spray painting is undertaken, these activities can contaminate the living environment and cause an increase in blood lead levels (Mathee, et al. 2002).

When asked about lead associated high risk activities at home, 9 participants said that cars were being fixed, 7 participants said that electrical appliances were fixed using lead solder, 4 participants said that spray painting was done and 2 participants said that scrap metal recycling was undertaken.

3.3 KNOWLEDGE ABOUT LEAD

Of the 119 women interviewed, only 13 (11%) had heard of lead. Of these, 3 participants said that lead has chemical properties, 2 participants said that lead makes people sick and that it has physiological effects and

another 2 participants said that lead has environmental effects. Thirty-one percent of participants were either not sure or did not know the sources of lead at all. Four participants said that lead could be found in petrol or at petrol stations, 3 participants associated lead with mining areas and their surroundings. Other responses included lead could be found in school pencils, and at dumping sites.

Ten participants said that lead could be harmful to health, and 3 participants did not know, while 6 participants were unsure or did not know how lead could be harmful to the health of adults. Apart from thinking that lead is unhealthy when there is too much in your body, other responses from the remaining 7 participants included lead can affect the chest of an adult, or it can cause a heart attack and it can make you sick when it gets into your blood.

Four participants did not know if lead could be harmful to the health of children, and 9 participants thought that lead could harm the health of children.

Six participants did not know what health and social problems lead exposure in children could cause. Three

participants said that lead could cause poor concentration ability in children. Four more participants thought that lead could cause physiological damage in children, such as cancer, lung and kidney infections, disturbed growth and paralysis.

Of the 8 participants that said children are more vulnerable than adults to lead exposure, 5 participants thought that children are more vulnerable than adults because of their weakened or underdeveloped immune systems. Two participants thought that the playful nature of children makes them more vulnerable than adults, while 1 participant said that children are more vulnerable because lead can be transferred congenitally.

Seven participants thought that lead exposure in children is very serious compared to other health problems. Six participants were not sure about how seriously lead exposure in children compared to other health problems.

Five participants did not know how lead gets into the bodies of children. Three participants thought that lead gets into children's bodies through inhalation, while 2 participants thought that lead could be ingested. Only 1 participant thought that lead could be transferred to

children congenitally. Other responses included that lead could enter children's bodies while walking past mining areas.

3.4 BEHAVIOURS AND PRACTICES

Figure 3.6 illustrates the responses of participants when asked about the pica frequencies of non-food items such as paint, cement/plaster and sand/soil. Eighteen percent of participants reported ever eating sand/soil.

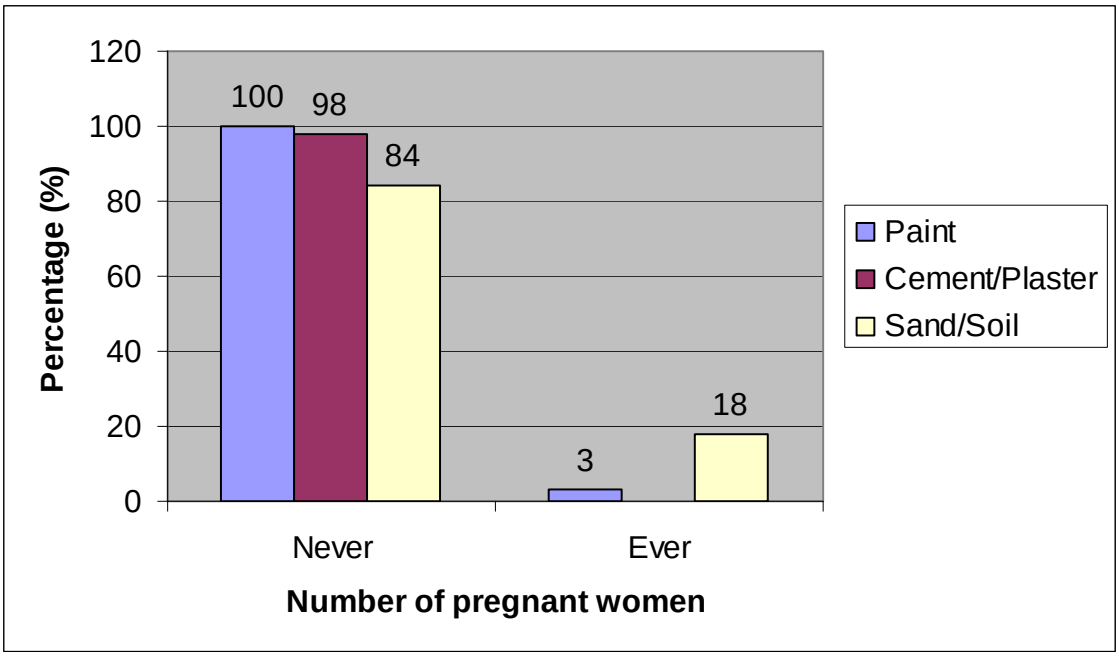

Figure 3.6: The distribution of pica frequencies and tendencies of the participants (n=119)

A. Foods consumed in last 24 hours

Foods that are rich in calcium, zinc and iron offer protection against the harmful effects of lead (Mahaffey, 1995; Han, Pfizenmaier & Garcia, et al., 2000). Some of these foods were consumed as follows by the participants using a 24 hour recall period:

- Yoghurt; by 58 participants (48%)
- Milk; 93 participants (78%)
- Cheese; 54 participants (45%)
- Red meat; 73 participants (61%)
- Cereal; 63 participants (53%)
- Beans; 41 participants (34%)
- Chicken; 68 participants (57%)
- Peanut butter; 55 participants (46%)

B. Feeding of babies

Seventy-eight participants (67%, n=117) said that they were planning to breast-feed and 6% bottle-feed their babies once born, whereas 27% were planning to make use of both (bottle and breast). Of the 78 participants that said they would breast-feed their babies, 17% intended to breast-feed exclusively, 79% said that they

will initially breast-feed and then switch to bottle-feeding, and 4% were unsure of their intentions.

C. Preparation of bottle feeds

Of the 101 participants who planned use of exclusive or some bottle-feeding, 92% said they would prepare their baby's bottle-feeds with water that was boiled in a kettle or a pot, 3% intended using hot tap water, and 5% did not know how they would prepare the bottle-feeds.

D. Hand washing behaviour

When asked about hand-washing after cleaning, 82% of participants reported that they always or often washed their hands, while 14% washed their hands sometimes and 3% reported never washing their hands. Before cooking 91% of participants always or often washed their hands and 9% sometimes washed their hands. After going to the toilet, 95% reported that they always or often washed their hands, while 5% said that they sometimes washed their hands. When washing their hands, 91% of participants said that they used soap and water, whereas the remaining 9% reported using water only.

E. Housekeeping behaviours and practices

Participants were interviewed about certain housekeeping behaviours, and 84% reported cleaning their floors every day, whereas 14% reported doing this either once or twice a week. To clean their floors most participants (55%) used a dry broom, 3% used a wet mop and cleaning solution and 3% used only a wet mop and water. A further 32% alternated between using a dry broom and wet mop to clean the floors of their homes. Figure 3.7 illustrates the sweeping tools reported by participants.

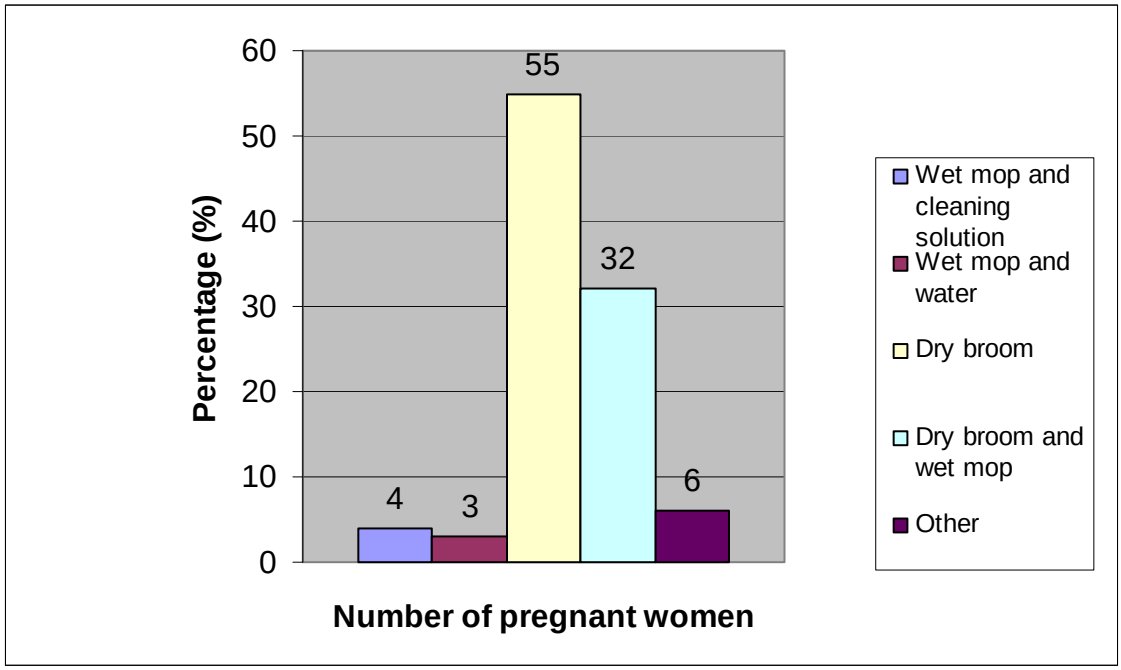

Figure 3.7: The distribution of sweeping tools used by the participants (n=119).

Sixty percent of participants did not use any detergent at all when sweeping their floors, while the remainder used

Handy Andy, washing powder, dishwashing liquid, Domestos, tile-cleaning solutions, or a combination of these. When asked about dusting their homes, 81% of participants reported dusting their homes every day and 37% dusted either once or twice a week.

Twenty-four percent of participants used some sort of detergent when dusting and 70% reported using only a dry cloth. When asked about the detergent used when dusting, 21% reported not using any detergent at all and the remainder used some sort of detergent.

Participants were asked how cleaning their homes thoroughly, washing their hands frequently and stopping children from putting non-food items in their mouths as well as playing in dusty areas would impact on the prevention of childhood lead poisoning. In all 4 questions more than 80% of the respondents were not sure about the impact that these behaviours would have on childhood lead poisoning prevention (Table 3.2).

Table 3.2: The distribution of the impact of preventive actions/ behaviours of the participants (n=119).

Action	Large impact (%)	Small impact (%)	No impact (%)	Not sure (%)
Cleaning your home thoroughly	12	3	3	82
Washing your hands frequently	13	3	0	84
Stopping children from putting non-food items in their mouths	12	3	2	83
Stopping children playing in dusty areas	11	2	2	85

CHAPTER FOUR: DISCUSSION, MAIN FINDINGS, CONCLUSIONS, STUDY SUMMARY, LIMITATIONS AND RECOMMENDATIONS

4.1 DISCUSSION OF THE MAIN FINDINGS AND CONCLUSIONS DRAWN FROM THE STUDY

A. The high-risk lead exposure status of the study community

This study reported on lead hazard awareness in a community perceived to be at high risk of lead exposure. It further showed evidence of a range of practices and behaviours that potentially contribute to the high-risk status of the study population. For example:

- Ten percent of the participants were smokers at the time of the survey, while 26% reported living in a household where at least 1 person regularly smoked. Lead is contained in cigarette smoke (Suna, Asakawa & Jitsunari, et al., 1991) and can cause harmful health effects in children when inhaled through second-hand smoke (Physicians for a smoke-free Canada, 2001). Mathee, et al., (2002) associated increased blood lead levels of children in Alexandra,

Johannesburg, with living in the presence of co-smoking household members.

- Fifty-six percent of participants lived in close proximity to a busy road. In a study that was conducted amongst children in Mexico City, hand dirt predicted blood lead levels, and exposures were related to heavily trafficked streets (Romieu, et al., 1995). Evidence from previous studies conducted in South Africa (von Schirnding, et al., 1991a), suggested that children attending schools in heavily trafficked areas are at increased risk of lead exposure. Finally, in streets with very busy vehicular traffic, the turbulence created by the speeding vehicles increases and disperses street dust, where it may adhere to pedestrian shoes and pet feet, and eventually be easily tracked into homes (Root, 2000).

- Nearly 23% of participants earned less than R2000.00 per month and von Schirnding, Bradshaw & Fuggle, et al., (1991b) reported that a lowered family income was an associated risk factor for lead exposure that contributed to significant differences between cases and controls in that particular study.

- Twenty-seven percent of participants lived in homes of 25 to 24 years old, whereas 12% lived in homes of more than 50 years old. Kim, Staley & Curtis, et al., (2002) reported that elevated blood lead levels were associated with living in older homes. von Schirnding, et al., (1991a) found that children living in older and deteriorating homes in the inner city of Cape Town were at increased risk of lead exposure.

- Eighteen percent of participants reported that their homes were very dusty. Dust is an important pathway of exposure for lead exposure through hand-to-mouth activity, of children in particular (Healthy Children Project Fact Sheet, 2007; Jacobsen, 1996; Manuel, 1999). Numerous studies of individual children confirm the importance of lead-paint contaminated house dust as the most important vehicle for lead ingestion in American children (Barltrop & Burlands, 1974; Charney, Kessler & Farfel, 1983).

- Ten percent of participants reported front gardens that comprised mainly uncovered soil, and 21% said their homes had back gardens with bare soil.

Children can ingest lead dust through putting their hands in their mouths, when they eat with their hands and when they suck on their fingers (National Referral Centre for Lead Poisoning in India, 2001).

- Fifty-one percent of participants lived in homes where inside walls were covered with enamel paint. Twenty percent of participants reported flaking and peeling of paint on inside walls, and 22% reported the same condition of paint on outside walls. von Schirnding, et al., (1991b), have linked elevated blood lead levels to living in dwellings with flaking paint on walls. Montgomery & Mathee (2005) referred to findings of a preliminary study that pointed at the continued use of lead-based paints in Johannesburg, South Africa as a potential source of lead exposure. On 6 December 2005 the South African Minister of Health announced a National Lead Prevention Awareness Campaign, aimed at creating awareness about the hazards associated with lead-based paints used on children's products (South African National Department of Health press release, 2005). Legislation is currently being drafted to restrict the use of lead in paint in South Africa (Graham, 2005), yet for many children already

affected by lead exposure this prolonged intervention may come far too late (Mathee, Rollin & Levin, et. al., 2007). Mathee, et al., (2007), further emphasise that investigations previously conducted clearly highlight the continued use of lead-based paints in South Africa, despite previous efforts to educate the public about the risks associated with the use of lead-based paints.

- The study participants reported high-risk home based activities such as car repairs (8%), fixing of electrical appliances with lead solder (6%), spray painting (3%) and scrap metal recycling (2%). The booming of these ”cottage industries” in South Africa, is likely to be a contributing factor to the highest blood lead levels noted in studies conducted in Johannesburg (Mathee, et al., 2002). Rees & Schneider (1993) reported that dismantling of batteries and subsequent contamination of the environment are known contributors to cases of lead poisoning in the Greater Johannesburg area.

The above confirms the status of this community as high-risk for exposure to lead.

B. Levels of Knowledge about lead

The study community had very low levels of knowledge about lead, as only 11% had heard of lead before. Limited awareness about lead and its associated aspects was found as 31% of the participants did not know the sources of lead at all and only 15% thought that lead has an effect on the health of people, whereas 46% did not know the health and social effects that lead can cause in children. A study conducted in south western Nigeria in 2004 found that participants similarly had little knowledge of the health effects and limited awareness of the sources of lead exposure (Adebamowo, Agbede & Sridhar, et al., 2006). Adebamowo, et al., (2006), further report that there has been little emphasis on chronic lead exposure in Nigeria, yet it is among those factors responsible for more *"morbidity, disability-adjusted quality of life loss and mortality than in developed countries."*

In Abdul-Alim's (2005), report on the elevated blood lead levels of 2 Milwaukee toddlers, 1 at 29 µg/dl, and the other at 46 µg/dl, he reflects on the low awareness about lead poisoning that exists in Milwaukee despite ongoing lead poisoning prevention and control efforts.

In a cross-sectional study conducted in Ohio, Polivka (1999) reported that knowledge about lead poisoning prevention measures were generally very low among the interviewed respondents.

C. Behaviours

In this study the participants reported on dusting and mopping behaviours. Eighty-four percent of the participants reported cleaning their floors every day. Thirty-six percent said that they used a wet mop to clean their floors and 55% used a dry broom for this purpose. Of the interviewed women 81% reported dusting their homes every day. Twenty-four percent of participants used some sort of detergent when dusting and 70% reported using only a dry cloth. The findings of the study highlight that certain mopping and dusting behaviours exist in the study population, yet there is room for improvement to optimize dust-free home environments as a potential source of lead exposure.

The Centers for Disease Control (2003), recommends damp-mopping and dusting while cleaning homes in order to reduce lead exposure from dust, soil and flaking or peeling paint. Manuel (1999) explains the dangers of

house dust that contains lead and recommends strongly the use of wet-mopping and dusting practices for the improvement of indoor air quality.

4.2 RELEVANCE OF THE STUDY

This study is the first reported study in South Africa of the knowledge, perceptions and behaviours of pregnant women in relation to child lead hazards. The study forms a base-line for future measurement of public knowledge of lead hazards, against which the success and shortcomings of the South African National Lead Awareness Campaign that was launched on 6 December 2005 can be assessed.

In addition this study will inform the design of a behavioural intervention for the prevention of lead exposure in the South African context. The feasibility of such an intervention is the topic of a current doctoral thesis (Feit, personal communication).

4.3 STUDY SUMMARY

4.3.1 Purpose and objectives of the study

The purpose of the study was to describe the knowledge, perceptions and behaviours of pregnant women in relation to child lead hazards. A descriptive, structured questionnaire was utilised to explore the knowledge, perceptions and behaviours of pregnant women in relation to child lead hazards.

To answer the research question, the following study objectives were formulated:

- To understand the knowledge of pregnant women regarding the sources and routes of exposure and the health effects of lead.
- To understand the knowledge, perceptions and behaviours of pregnant women regarding mechanisms to protect children against lead exposure.

4.3.2 Methodology

To achieve the objectives of the study exploratory one-on-one interviews were conducted. During these interviews structured questionnaires, inclusive of open and closed-ended questions were administered. A pilot study was conducted on participants resembling similar characteristics to those of the actual study, to assess the

effectiveness of the questionnaire. Data was collected from 119 pregnant women by the researcher (also referred to as the principal investigator) and 1 research assistant. Appropriate measures to ensure ethical conduct and to protect the interests of the participants were implemented and adhered to.

4.3.3 Population and sample

The population included eligible pregnant women attending antenatal clinic services at Coronation Hospital, deemed competent at the time of the interview and who spoke English, Afrikaans, Zulu and Sotho. Non-probability convenience sampling was used for selection of a sample of pregnant woman attending antenatal services for the duration of the data collection period.

4.4 LIMITATIONS OF THE STUDY

The results of this study cannot be generalized to similar study populations at other hospital settings within Gauteng, as the study site, and areas in close proximity, lend it open to unique characteristics of particular interest when investigating lead exposure in a population.

The data collection tool could not explore variables in the fullest of detail and no associated relationships were measured, as this was not one of the objectives of the study, but would have provided useful information on some of the variables.

The researcher believes that addressing the following issues will contribute towards influencing knowledge, behaviours and perceptions of pregnant women in relation to child lead hazards favourably.

4.5 RECOMMENDATIONS

4.5.1 Increasing awareness

A. Education of parents

In response to the findings of this particular study, immediate action is required to first educate pregnant mothers at the Coronation study site in relation to child lead hazards.

The antenatal clinic could be the departure point for health education to pregnant mothers about lead, its associated impacts and the control and prevention of

childhood lead exposure. This intervention could be further strengthened when mothers return to well-baby clinics to have their children immunized and assessed on a routine basis. The Centers for Disease Control (CDC) and Prevention (Atlanta GA) recommended the education of parents during well-baby clinic visits. Despite the limited successes of such a strategy (Chaisson & Glotzer, 1996) in the USA, this is a possible avenue for parental education that should be explored in South Africa.

Interventions aimed at pregnant mothers is of great public health concern, as evidence suggested that screening and intervention any later than the first trimester may be too late to prevent adverse foetal neurotoxic effects (Hu, et al., 2006).

The results of a study conducted in Pennsylvania in the USA, assessed caregivers' knowledge and perceptions of preventing childhood lead poisoning (Chaisson & Glotzer, 1996). These results were used by the Philadelphia Department of Public Health to review and modify education and outreach to prevent lead poisoning. In the same way the findings of this research study will inform a bigger study that will implement and assess lead poisoning preventive behaviours amongst pregnant women

in Gauteng. Informed populations are essential to the successes of strategies to address environmental health issues.

B. Education of small children

Health education should not just be aimed at caregivers, and or parents only, but also focus on small children. The protection of the rights and health of children are entrenched in the South African Constitution (Republic of South Africa, 1996), and echoed by The Millennium Development Goals (United Nations, 2000), as well as the support areas of the Bangkok Statement (WHO, 2002b). The Healthy Environments for Children's Initiative (HECI) (WHO, 2002c), and the Health and Development (HEAD) study is the ideal platform for exploring and implementing a health education intervention to address the concerns, emanating from this research study.

The Health and Development (HEAD) study is a five year panel study conducted under the World Health Collaboration Centre for Urban Health (WHOCCUH) partnership. In this partnership the Medical Research Council, the City of Johannesburg, the University of the Witwatersrand and the University of Johannesburg pool

their resources and expertise to create a better understanding of the critical elements of urban health through the Health and Development (HEAD) study. For this reason it is essential that health education programmes targeted at pre-school children, as well as primary and high-school learners should echo the importance of lead exposure prevention in society.

C. Education of communities

Awareness campaigns should be extended to also address the lack of knowledge that could exist amongst other members of the family that are not always the mother, but fulfil the role of primary caregiver. Employees within child-care facilities, such as crèches, day-care centres, nursery schools as well as primary and high schools should also receive the benefit of education campaigns aimed at increasing awareness about lead exposure and its prevention and control.

Claudio, Torres & Sanjurjo, et al, (1998) propose that community residents should not just be used as subjects of studies. They should be used to increase the mutual understanding of environmental health, when actively participating in all aspects of research studies.

Bland, Kegler & Escoffery, et al., (2005), have found in relation to subjective norms, support for an interpersonal component in lead poisoning preventive programmes. Strategies could be devised at family or community level to target the attitudes of important referent individuals, such as grandmothers.

Community outreach and education strategies will always be threatened by a general lack of public knowledge of science, complex dynamics of scientific data and disagreeing scientists, influencing the communication of risk. Adding to the obstacles of risk communication, might be environmental health issues that may not be considered to be a priority in the midst of compromised socio-economic circumstances (Jensen, 1996).

Although this may be the case, communities will always welcome outreach efforts and be interested in how pollution affects their health and the health of their families. For this reason attempts to address environmental health issues through health education should strive towards empowering communities, leaving them with a legacy of ownership and responsibility (Rowan, 1996).

In doing so, health education as an outreach strategy will draw on the strengths of the Health Belief Model. Informed health education strategies can assist affected communities by enhancing their perception of the seriousness and susceptibility of lead hazards thus influencing their realisation of the associated threats. At the same time, health education efforts can influence perceptions around benefits and barriers of lead poisoning preventive behaviours and actions. The latter will attempt to facilitate understanding of preventive actions that may well outweigh the associated barriers.

Finally if perceived threats and outcome expectations associated with lead poisoning can be conceptualized in the mind of the lead poisoning preventive individual, communities will act in the interest of their own health (Nutbeam & Harris, 1999).

D. Professional education

Campaigns or programmes aimed at educating professional public health practitioners will create a platform for these professionals to assist in identifying high-risk living environments and actively participate in the prevention and control of environmental lead

exposure. For example, with increased knowledge on lead exposure and its associated aspects, medical practitioners, nursing staff and environmental health practitioners, within the local context, can assist communities with health education, identification of high-risk environments, as well as participation in prevention and control strategies.

4.5.2 Policy Formulation

- Public health practitioners should actively participate in the advocacy of lead prevention strategies as well as fully participate in the formulation of policies, guidelines and legislation to reduce lead hazards.
- Government departments should interact in a multi-disciplinary approach to address key issues pertinent to reducing lead exposure, acknowledging the very important role of affected communities in this regard.
- Government should build capacity amongst its stakeholders and accelerate the finalisation of legislation that will restrict the use of lead in consumer products, such as paint. In the interim a process should be identified and clearly communicated, that will enforce stricter measures or impose penalties on unscrupulous operators, that

continues to use lead in paint, especially paint used for products with which children come into contact.

- The pending legislation for the control of lead in paint and existing legislation that controls the use of lead in other products should be used to develop uniform standards and guidelines that will assist in controlling permissible levels of lead in the South African environment. Campaigns to educate relevant communities on these standards should be introduced and pro-actively advocated by all stakeholders in the interest of public health.
- Policy-makers and implementers of land-use legislation should be sensitised to the associated risks of locating residential areas in close proximity to heavily trafficked roads and other potential sources of lead exposure. Land-use development planning activities in high-risk lead affected areas should be revisited and assessed so as to ensure that any future planning will not increase the risk of exposure any further.

4.5.3 Secondary prevention

A well-structured and clearly communicated framework, lead by the Health Department, needs to be developed in

order to deal with existing cases of lead poisoning. Equipment and other resources required to allow health facilities at the appropriate level to conduct blood-screening activities in high-risk communities, should be provided. Support and training should also be provided to staff working in these facilities.

4.5.4 Surveillance and ongoing research

Ongoing research activities and surveillance programmes could be useful in identifying populations at risk of lead exposure. Effective monitoring of affected communities should be implemented, maintained and regularly evaluated. Local municipality infrastructure could assist with maintaining databases on high-risk lead exposure environments using their Geographical Information Systems (GIS). These databases can be further enhanced if they could run concurrently with networks of surveillance data from laboratories, research entities, audit information or environmental assessments, for example, to monitor trends and assist with lead control and prevention programmes.

More research should be conducted to explore the complexities surrounding the knowledge, perceptions and behaviours of communities in relation to lead hazards. Capacity building amongst local resources should be enhanced to conduct research of this nature.

Our children are the adults and leaders of tomorrow. If we want to encourage sustainable populations, it is essential to protect them from physical and psychological damage that could harm them in the form of toxic exposures.

4.6 CONCLUSION

The study described the knowledge, perceptions and behaviours amongst pregnant women in relation to child lead hazards at the antenatal clinic facilities of the Coronation Hospital in Gauteng. It can be concluded that amongst the study population:

- There are low levels of knowledge about the sources and routes of lead exposure.
- There is limited knowledge of the health and social effects of lead exposure in children and adults.
- There is evidence of conditions, within the living environment, that potentially increase exposure to

lead, for example; (1) peeling and flaking paint in homes, (2) front and back yard gardens with uncovered/bare soil, (3) the presence of house dust and (4) living in close proximity of busy vehicular traffic.

- There are high-risk lead exposure behaviours and practices such as pica for soil, smoking of cigarettes and backyard cottage industries such as car repairs and spray painting, electrical repairs using lead solder and scrap metal recycling.

Opportunities exist for behaviour change interventions that could potentially reduce exposure to lead in children and the community at large. For example:

- Improved hand-washing
- Improved housing maintenance, such as repairs to peeling paint
- Covering of bare soil in front and backyards
- Smoking cessation
- Improved house-cleaning, such as mopping and dusting with soapy water.

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APPENDIX A

Satellite map of the Coronation Hospital and its surroundings

Source: Google Earth

APPENDIX B

Satellite map of areas surrounding Coronation Hospital, within a radius of five kilometres

Source: Google Earth

APPENDIX C

KNOWLEDGE, PERCEPTIONS AND BEHAVIOURS IN RELATION TO CHILD LEAD HAZARDS STUDY (DATA COLLECTION TOOL)

This questionnaire is part of a study to determine the knowledge, perceptions and behaviours of pregnant women in relation to child lead hazards. We would be most grateful if we could take about 45 minutes of your time to respond to the questions. We thank you in advance for your assistance in this important study.

NAME OF THE INTERVIEWER: _____

DATE OF THE INTERVIEW: _____

PARTICIPANT CODE: (1-119)_____

INFORMATION OF THE RESEARCH PARTICIPANT

1. What is the due date for your baby's delivery?

_____

2. Which clinic will you be taking your baby to for immunisations (injections and check-ups)?

_____

3. What is the name of the suburb and street in which you live permanently?

_____

4. What is you age?

_____

5. What is your highest level of education?
(Tick the appropriate box off)

1. None	2. Primary education	3. Secondary education	4. Post matric education	5. Other (please specify)

6. What is the highest level of education of your husband/ partner?
(Tick the appropriate box off)

1. None	2. Primary education	3. Secondary education	4. Post matric education	5. Other (please specify)

7. Are you currently employed? (Yes or No)

_____ If yes, what type of work do you do?

_____

8. What is the average monthly income for all members of your household?
(Tick the appropriate box off)

1. 0-R999	2. R1000-R1999	3. R2000-R2999	4. R3000-R3999	5. R4000-R4999	6. ≥ R5000	7. Do not know

HOME ENVIRONMENT

9. How would you describe your home?
(Tick the appropriate box off)

1. House	2. Flat	3. Backyard dwelling	4. Informal house (Shack)	5. Other (please specify)

10. Approximately how old is your home, in years?
(Tick the appropriate box off)

1. 0-24 years	2. 25-49 years	3. ≥ 50 years	4. Do not know

11. How many rooms not counting the kitchen, bathroom or toilet, does your home have?

1. Main house	
2. Backyard rooms	

12. What fuel is used in your home to cook most of the time?
(Tick the appropriate box off)

1. Electricity	2. Paraffin	3. Gas	4. Wood	5. Coal	6. Other (please specify)

13. Would you describe your home as?
(Tick the appropriate box off)

1. Very dusty	2. Slightly dusty	3. Not dusty at all

14. How would you describe the vehicular traffic on the road on which you live?
(Tick the appropriate box off)

1. Very busy	2. Busy	3. Quiet	4. Very quiet	5. Other (please specify)

15. Where do you get your water from most of the time?
(Tick the appropriate box off)

1. Indoor tap	2. Outdoor tap on site	3. Communal water supply	4. Other (please specify)

16. What types of water pipes does your home have?
(Tick the appropriate box off)

1. Metal	2. Plastic	3. Other (please specify)	4. Do not know

17. How would you describe the front garden surface of your home?
(Tick the appropriate box off)

1. Grass and/or plants	2. Paving, bricks or tiling	3. Uncovered soil	4. Other (please specify)

18. How would you describe the back garden surface of your home?
(Tick the appropriate box off)

1. Grass and/or plants	2. Paving, bricks or tiling	3. Uncovered soil	4. Other (please specify)

Please provide the following information about the walls of your house.

19. Are the walls of your house painted?
(Tick the appropriate box off)

Inside walls		Outside walls	
Painted	Not painted	Painted	Not painted

20. What colour paint is on the walls of your house?

Inside walls	Outside walls

21. What type of paint is used on the walls of your house?
(Tick the appropriate box off)

Inside walls	1. Enamel	2. PVA/ Water based	3. Water based enamel	4. Do not know
Outside walls	1. Enamel	2. PVA/ Water based	3. Water based enamel	4. Do not know

22. How would you describe the condition of the paint on the walls of your house?
(Tick the appropriate box off)

Inside walls	1. Flaking and peeling off	2. Not flaking and peeling off
Outside walls	1. Flaking and peeling off	2. Not flaking and peeling off

23. How would you describe the floor surfaces inside your home?
(Tick the appropriate box off)

Bedrooms	1. Carpeted/ covered with rugs	2. Concrete	3. Tiled	4. Wood	5. Other (please specify)
Kitchen	1. Carpeted/ covered with rugs	2. Concrete	3. Tiled	4. Wood	5. Other (please specify)
Lounge	1. Carpeted/ covered with rugs	2. Concrete	3. Tiled	4. Wood	5. Other (please specify)

24. Has all or part of your house been painted during the past year?
(Tick the appropriate box off)

1. Yes	2. No	3. Do not know

25. Has there been major repairs or renovation work done to the house in the past year? (Tick the appropriate box off)

1. Yes	2. No	3. Do not know

26. How many people live permanently in your home?

---

27. Does anyone living in your home work in any of the following places or have the following jobs?
(Tick the appropriate box off)

Car repairs workshop	Yes	No	Do not know
Spray painting workshop	Yes	No	Do not know
Battery manufacturing or repair factory	Yes	No	Do not know
Make stained glass	Yes	No	Do not know
Repairs to electrical appliances	Yes	No	Do not know
Jewellery maker	Yes	No	Do not know
Painting company	Yes	No	Do not know
Scrap metal facility	Yes	No	Do not know
Lead mine	Yes	No	Do not know
Plumbing company	Yes	No	Do not know
Welding company	Yes	No	Do not know
Work with guns or ammunition (for example police service	Yes	No	Do not know
Fishing	Yes	No	Do not know
Pottery work	Yes	No	Do not know
Soldering	Yes	No	Do not know
House or building renovations	Yes	No	Do not know
Electrician	Yes	No	Do not know
Panel beater	Yes	No	Do not know
Petrol station	Yes	No	Do not know

28. Does anyone regularly do any of the following at home?
(Tick the appropriate box off)

Fix cars	Yes	No	Do not know
Do spray painting of cars	Yes	No	Do not know
Make metal jewellery	Yes	No	Do not know
Make stained glass	Yes	No	Do not know
Fix electrical appliances using lead solder	Yes	No	Do not know
Scrap metal recycling	Yes	No	Do not know

LEAD KNOWLEDGE AND PERCEPTIONS

29. Have you ever heard of something called lead?
(Tick the appropriate box off)

1. Yes	2. No

30. If yes, what do you know about lead?

_____
_____
_____

31. Where do you think lead can be found?

_____
_____
_____

32. Do you think that lead can be harmful to health?
(Tick the appropriate box off)

1. Yes	2. No	3. Do not know

33. If yes, how can lead be harmful to the health of adults?

_____
_____
_____

34. Do you think that lead is harmful to the health of children?
(Tick the appropriate box off)

1. Yes	2. No	3. Do not know

35. How do you think children get lead into their bodies?

_____
_____
_____

36. What are the health and social problems that can be caused by lead in children?

_____
_____
_____

37. Do you think that children are more vulnerable than adults to lead exposure?
(Tick the appropriate box off)

1. Yes	2. No	3. Do not know

38. If yes, why do you think so?

_____
_____
_____

39. True or false:

Certain exposures (such as chemicals and metals) can be transferred from mothers to their unborn babies during pregnancy:
(Tick the appropriate box off)

1. True	2. False	3. Not sure

40. Compared to other health problems how serious is lead exposure in children?
(Tick the appropriate box off)

1. Very serious	2. Not serious at all	3. Not sure

BEHAVIOURS

PICA AND PREGNANCY

41. Have you ever eaten any of the following?
(Tick the appropriate box off)

Cement/ plaster	Never	Sometimes	Often	Always
Paint	Never	Sometimes	Often	Always
Sand/ soil	Never	Sometimes	Often	Always
Sticks	Never	Sometimes	Often	Always
Match sticks	Never	Sometimes	Often	Always
Cigarette ends	Never	Sometimes	Often	Always
Other (please specify)				
1.	Never	Sometimes	Often	Always
2.	Never	Sometimes	Often	Always
3.	Never	Sometimes	Often	Always

42. Do you use any make-up?
(Tick the appropriate box off)

1. Yes	2. No

43. If yes, please specify the kinds of make-up that you use?

_____
_____
_____

44. Which of the following foods did you eat within the last 24 hours?
(Tick the appropriate box off)

Spinach	1. Yes	2. No
Yoghurt	1. Yes	2. No
Milk	1. Yes	2. No
Cheese	1. Yes	2. No
Nuts (Almonds)	1. Yes	2. No
Red meat	1. Yes	2. No
Chicken liver	1. Yes	2. No
Fish	1. Yes	2. No
Cereal	1. Yes	2. No
Beans	1. Yes	2. No
Peas	1. Yes	2. No
Lentils	1. Yes	2. No
Chicken	1. Yes	2. No
Peanut butter	1. Yes	2. No

45. How will you feed you r new baby?
(Tick the appropriate box off)

1. Breast feed	2. Bottle feed	3. Combination of breast and bottle feeding

46. Do you ever intend to switch to bottle formula?
(Tick the appropriate box off)

1. Yes	2. No	3. Do not know

47. If yes, how will you prepare the formula of bottle feeds for your new baby?
(Tick the appropriate box off)

1. With cold tap water	2. With hot tap water	3. With water boiled in a pot or kettle

48. How often do you wash your hands at the following times?
(Tick the appropriate box off)

Before meals	Never	Sometimes	Often	Always
After using the toilet	Never	Sometimes	Often	Always
After cleaning	Never	Sometimes	Often	Always

49. What do you use to wash your hands, most of the times?
(Tick the appropriate box off)

1. Cold water & soap, or any other detergent	2. Hot water & soap, or any other detergent	3. Water only	4. Others (please specify)

CLEANING PRACTICES: WET MOPPING AND/OR DUSTING

50. How often do you sweep the floors of your home?
(Tick the appropriate box off)

1. Never	2. Once a month	3. Once a week	4. Twice a week	5. Every day

51. When sweeping the floors do you use?
(Tick the appropriate box off)

1. A dry broom	2. A wet mop (soaked in water only)	3. A wet mop (soaked in water and a cleaning solution)

52. What detergent do you use?

_____

53. How often is your home dusted?
(Tick the appropriate box off)

1. Never	2. Once a month	3. Once a week	4. Twice a week	5. Every day

54. When dusting, do you use a:
(Tick the appropriate box off)

1. Dry cloth	2. Damp cloth (soaked in water only)	3. Wet cloth (soaked in water and a cleaning solution)

55. What detergent do you use to dust?

_____

56. In your opinion, what impact do you think each of the following behaviours might have on children's exposure to lead?
(Tick the appropriate box off)

Cleaning your home more thoroughly	No impact	Small impact	Large impact	Not sure
Washing your hands more frequently	No impact	Small impact	Large impact	Not sure
Stopping children putting non-food items in their mouths	No impact	Small impact	Large impact	Not sure
Stopping children playing in dusty areas	No impact	Small impact	Large impact	Not sure

57. How difficult is it to improve each of the above behaviours
(Tick the appropriate box off)

Cleaning your home more thoroughly	Not difficult	Fairly difficult	Very difficult	Not sure
Washing your hands more frequently	Not difficult	Fairly difficult	Very difficult	Not sure
Stopping children putting non-food items in their mouths	Not difficult	Fairly difficult	Very difficult	Not sure
Stopping children playing in dusty areas	Not difficult	Fairly difficult	Very difficult	Not sure

SMOKING

58. Do you smoke cigarettes?
(Tick the appropriate box off)

1. Yes	2. No

59. If yes, ask the following:
How many cigarettes do you smoke per day?

_____

60. How long have you been smoking?

_____

61. Where do you smoke most of the time?
(Tick the appropriate box off)

1. Inside the house	2. Outside the house

62. How many people regularly smoke, at least one cigarette per day inside your home?

_____

63. Have you drunk any of the following?
(Tick the appropriate box off)

Concoctions	1. Yes	2. No
Home made beer	1. Yes	2. No
Alcohol	1. Yes	2. No
Beer	1. Yes	2. No
Other alcoholic drinks (please specify)		
1.	1. Yes	2. No
2.	1. Yes	2. No
3.	1. Yes	2. No

OTHER SIBLINGS

64. Do you have any other children under the age of five years?
(Tick the appropriate box off)

1. Yes	2. No

If yes, then ask the following questions:

65. Have you ever noticed your child/ children placing any of the following objects in his/her/their mouth(s)?
(Tick the appropriate box off)

Cement/ plaster	1. Yes	2. No	3. Do not know
Paint	1. Yes	2. No	3. Do not know
Sand/ soil	1. Yes	2. No	3. Do not know
Sticks	1. Yes	2. No	3. Do not know
Match sticks	1. Yes	2. No	3. Do not know
Cigarette ends	1. Yes	2. No	3. Do not know
Other (please specify)			
1.	1. Yes	2. No	3. Do not know
2.	1. Yes	2. No	3. Do not know
3.	1. Yes	2. No	3. Do not know

66. Do your child/ children still eat non-food items?
(Tick the appropriate box off)

1. Yes	2. No

67. How often do the child/ children wash his/her/their hand(s) at the following times?
(Tick the appropriate box off)

Before meals	Never	Sometimes	Often	Always
After using the toilet	Never	Sometimes	Often	Always
After cleaning	Never	Sometimes	Often	Always

THE END OF THE INTERVIEW
KINDLY THANK THE RESEARCH PARTICIPANTS FOR THEIR TIME AND PARTICIPATION.

APPENDIX D

Faculty of Health Sciences

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

7 York Road PARKTOWN Johannesburg 2193 Telegrams WITSMED Telex 4-24655.SA
FAX 643-4318 TELEPHONE 717-2075/2076
E-MAIL healthpg@health.wits.ac.za

MRS TN HAMAN
POSTNET SUITE 292
P/BAG X8
NORTHRIDING
2162

APPLICATION NUMBER 0110605P
STATUS (DEG 111) (MM816) PZZ

2005-06-28

Dear Mrs Haman

Approval of protocol entitled Knowledge, perceptions and behaviours amongst pregnant women in relation to child lead hazards

I should like to advise you that the protocol and title that you have submitted for the degree of Master Of Public Health (Part-Time) have been approved by the Postgraduate Committee at its recent meeting. Please remember that any amendment to this title has to be endorsed by your Head of Department and formally approved by the Postgraduate Committee.

Ms A Mathee, Dr A Swart has/have been appointed as your supervisor/s. Please maintain regular contact with your supervisor who must be kept advised of your progress.

Please note that approval by the Postgraduate Committee is always given subject to permission from the relevant Ethics Committee, and a copy of your clearance certificate should be lodged with the Faculty Office as soon as possible, if this has not already been done.

Yours sincerely

S Benn (Mrs)
Faculty Registrar
Faculty of Health Sciences

Telephone 717-2075/2076

Copies - Head of Department_____Supervisor/s

APPENDIX E

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Haman

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER M050334**
PROJECT	Knowledge, Perceptions & Behaviours Amngst Pregnant Women in Relation to Child Lead Hazards
INVESTIGATORS	Ms TN Haman
DEPARTMENT	School of Public Health
DATE CONSIDERED	05.04.01
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 05.06.20 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : A Mathee

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

APPENDIX F

PROVINCIAL RESEARCH COMMITTEE.

RESEARCH EVALUATION FORM FOR APPROVAL BY THE HEAD OF THE DEPARTMENT.

Submission date:22-09-2005

Title: Knowledge , perceptions and behaviours amongst pregnant women in relation to child lead hazards

Principal investigator: Tanya Nadine Haman

Research Site(s): The Coronation Hospital is situated within Administration Region 4 of the City of Johannesburg .

Type of research: non trial

Summary:

The overall aim of the study is to determine the knowledge, perceptions and behaviours amongst pregnant women in relation to child lead hazards, which will inform the design of a health education component of a behavioural intervention to reduce child lead exposure. In order to do so, the study will have the following key objectives:

1. To understand the knowledge, perceptions and behaviours of pregnant women regarding lead and the associated impacts on child health and development.
2. To understand the knowledge, perceptions and behaviours of pregnant women regarding the sources and routes of childhood exposure to lead.
3. To understand the knowledge, perceptions and behaviours of pregnant women regarding the mechanisms to protect children against lead exposure.

4. To determine the knowledge, perceptions and behaviours of pregnant women regarding current and intended personal and domestic environmental hygiene practices.

A convenience sample of 120 pregnant women will provide enough statistical power based on estimated moderate effect size (5.) and alpha (a'=0.05) between high and low risk behaviours. In addition, 120 are thought to provide enough variability in responses to inform the intervention that is specific to a population of pregnant women.

Motivation

The study has been done for the purpose of partial fulfillment of a degree of Master of Public Health (field of Health measurement). This is a straight forward study.
The topic is quite unique and interesting. The choice of the hospital is justified by the fact that this hospital serves a diverse population. Studies conducted in suburbs in the vicinity of the hospital have shown that children in the area are particularly vulnerable to lead exposure. For example, in 1995 around 75% of first grade school children were shown to have blood lead levels equating or exceeding the internationally accepted action level of ug/dl.

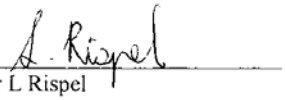
Ethical approval has been granted by the Wits Ethics committee. Permission is now been sought to conduct the study in the Province.

We have for now no objection to recommend that the study be conducted immediately.

The Evaluator:

Dr ML Likibi
Specialist Research and Epidemiology

Approved/not ~~approved~~



Dr L Rispel
HOD
Date: 27/9/2005

APPENDIX G

Participant Information Sheet

UNIVERSITY OF THE WITWATERSRAND/ MRC LOGO

STUDY TITLE: KNOWLEDGE, PERCEPTIONS AND BEHAVIOURS

PARTICIPANT INFORMATION SHEET

PRINCIPAL INVESTIGATOR/ INTERVIEWER:

Tanya Haman, MPH student, University of the Witwatersrand.

RESEARCH ASSISTANT/ INTERVIEWER:

Mirriam Mogotsi, Health and Development Research Group, MRC, SA.

DATE AND TIME OF INFORMED CONSENT DISCUSSION:

				:
dd	mm	yyyy		Time

INTRODUCTION

Good Day

I am [name](Tanya Haman, a MPH student from the University of the Witwatersrand/ Mirriam Mogotsi, from the Health and Development Research Group, of the Medical Research Council of South Africa.

You are invited to volunteer to participate in a research study that will investigate pregnant women, attending the antenatal clinic at Coronationville Hospital that lives within a 1km radius of the hospital.

Before agreeing to participate in this research study, it is important that you understand the following explanation of the purpose of the study, the study procedures, benefits, risks, discomforts, and your right to withdraw from the study at any time. This information leaflet is to help you decide if you would like to participate. You should fully understand what is involved before you agree to take part in this study. If you have any questions, which are not fully explained in this leaflet, do not hesitate to ask the study investigators.

PURPOSE OF THE STUDY

The purpose of the study is to find out what pregnant women know (knowledge) how they understand (perception) and behave with regards to children being exposed to lead.

BENEFITS OF THE STUDY

You will receive no direct benefit from this study, although the Health and Development Research Group of the Medical Research Council of South Africa may benefit from better understanding the knowledge, perception and behavior of pregnant women with regards to lead hazards that children may be exposed to.

PROCEDURES

If you agree to participate in this study and you reside within 1km of the Coronationville Hospital, an interviewer will ask you questions from a standard list. This interview will take about 45 minutes of your time. The interview will take place in a quiet location inside the clinic building. You may refuse to answer any question that is asked. The questions will help us understand what you know, how you understand and behave with regards to children being exposed to lead, by looking at the following:

- Where children can be exposed to lead.
- How lead gets into the bodies of children.
- How children can become sick from lead exposure.
- What can be done to stop children from becoming exposed to lead?
- Things that we do in and around the home that can stop children from becoming exposed and sick of lead.

RISKS, STRESS OR DISCOMFORT

You may feel some distress from answering some of the questions. You may stop your participation in the interview at any time. Special arrangements will be made to keep your place in the queue, during the interview. If you are accompanied by your children, they will be kept occupied to allow you to participate in the interview undisturbed.

REIMBURSEMENT FOR STUDY PARTICIPATION

You will not be paid to participate in this study.

CONFIDENTIALITY

The study team will keep all information confidential. Data that may be reported in academic journals will not include any information that identifies you as a participant in this study. The results of this investigation will be published, but only as a group. No names of anybody mentioned in this interview will be written down or given to anyone. Confidentiality will be assured by using a code and not your name on all results.

OTHER INFORMATION

Remember that your participation in this study is completely voluntary, and that you may withdraw your participation at any time without having to give a reason. Not taking part in this investigation or withdrawing from it, will carry no penalty of any sort.

Would you like to participate? IF NO, thank you for your time! IF YES, is this a good time for you or can we arrange another time to do the interview?
If you are happy to participate in this investigation please read and sign the attached consent form.

SOURCE OF ADDITIONAL INFORMATION

If you want any information regarding your rights as a research participant, or complaints regarding this research study, you may contact Professor Cleaton-Jones of the University of the Witwatersrand, Ethics Committee for Research on Human Subjects (Medical), which is an independent committee established to help protect the rights of research participants at (011) 717 2100.

For research information you may contact Tanya Haman (Principal investigator), at (011) 406 2277 or at tanyhama@twr.ac.za.

You may also contact any of the following persons:

Angela Mathee	(Project manager)	Amathee@mrc.ac.za
Brendon Barnes	(Co-investigator)	bbarnes@mrc.ac.za
Mirriam Mogotsi	(Research Assistant)	mirriam.mogotsi@mrc.ac.za

Medical Research Council, Health and Development Group, P O Box 87373, Houghton, 2041, Tel: (011) 643 7403, Fax: (011) 642-6832,

Thank You
The Researchers

APPENDIX H

UNIVERSITY OF THE WITWATERSRAND/MRC LOGO

INFORMED CONSENT FORM

I hereby agree that I have been informed by the research team about the nature, conduct, benefits and risks of the study. I have also received, read and understood the information in the participant information sheet (Annexure 1), regarding the study. I am aware that the findings of the study will be confidential, and that my name will not be linked with any responses. I may at any stage, without prejudice withdraw my consent and participation in the study. I have had sufficient opportunity to ask questions and (of my free will) declare myself prepared to participate in the study.

_____

(Printed name of participant) (Signature/mark) (Date)

INTERVIEWERS, IF THE RESPONDENT IS UNCOMFORTABLE WITH WRITING, PLEASE OBTAIN VERBAL CONSENT AND SIGN ON THEIR BEHALF BELOW.

I, _____ (name of the interviewer), certify that I have explained the information sheet to the research participant who has given verbal approval to participate in the knowledge, perceptions and behaviours study amongst pregnant women in relation child lead hazards.

Signed: _____ Date: ___/ /2005 _____

Witness (If applicable)

_____

(Printed name) Signature/ Mark Date