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Clinic based hearing screening protocols : the feasibility of implementing the Health Professions Council of South Africa Year 2007 Guidelines.

Petrocchi-Bartal, Luisa

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Chapter 1: Background and Rationale

The importance of hearing function in childhood development cannot be understated. A crucial interdependence exists between a child's ability to hear and his language development (Northern & Downs, 2002). Infancy is the critical period in which learning language is crucial to prevent life-long disadvantage (Moeller, 2000; Northern & Downs, 1991). The negative influence hearing impairment usually exerts on a child's development may be pervasive, affecting areas such as cognition (Olusanya, 2005), language, educational, social and emotional competence (Northern & Downs, 1991), literacy development (DesJardin, Ambrose, Martinez, & Eisenberg, 2009), as well as the individual's vocational and thus financial outcomes (Olusanya, 2000; Olusanya, Ruben, & Parving, 2006).

The effects of hearing loss initially occur at the level of the individual once the everyday communication process is hindered (Northern & Downs, 1991), subsequently developing into a societal economic long-term burden if the issue of reduced hearing ability is not addressed as soon as it can possibly be detected [Health Professions Council of South Africa (HPCSA), 2007; Joint Committee on Infant Hearing Screening (JCIH), 2007; Moeller, 2000; Yoshinaga-Itano, 2004]. Decreased social burden and improved quality of life depend on the ability of a hearing screening programme to identify infants at the earliest opportunity (Hutt & Rhodes, 2008).

Advocating for universal newborn hearing screening (UNHS) as a function of early hearing detection and intervention (EHDI) has been accepted as a measure of child health

care best practice (Olusanya, 2005), and has been highlighted internationally as the preferred approach for hearing healthcare in private and public sectors of health care management (JCIH, 2000; Olusanya, Luxon & Wirz, 2005). These health care sectors have ratified early intervention principles as they pertain to EHDI (HPCSA, 2007). Early intervention principles as they pertain to Audiology include a recommendation for diagnosis of hearing impairment with early intervention services implemented by six months of age internationally (JCIH, 2007), and by a maximum of eight months of age in South Africa (HPCSA, 2007).

The feasibility and benefits of EHDI programmes throughout the United States are well documented (Mehl & Thomson, 2002; Theunissen & Swanepoel, 2008). Many developed countries (JCIH, 2007) and some developing world countries (Yee-Arellano, Leal-Garza, & Pauli-Muller, 2006; Olusanya, 2007) have in fact promulgated hearing screening policy based on JCIH principles (Yee-Arellano, Leal-Garza, & Pauli-Muller, 2006). Most developing world contexts have not formally recognized the advantages UNHS presents and have consequently not legislated any hearing screening protocols (Olusanya, 2007).

The reasons cited for this lack of EHDI in most developing world contexts are unclear and complex. Nonetheless, one can assume that additional burdens often endemic to regions like Sub-Saharan Africa, including poverty (Olusanya, 2000) and the burden of life-threatening diseases such as human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) and tuberculosis (Streefland, 2005) have an influence. In these contexts, hearing impairment presents with comparatively less urgency rendering implementation of EHDI to be less of a priority (Olusanya, 2005).

Even within developed world contexts, EHDI's sustainability is challenged when implemented without consideration of contextual relevance (Olusanya, 2005) and appropriate cohesion between relevant stakeholders (White, 2006). EHDI programme efficacy and

sustainability is only achievable if the setting in which it is to be implemented is considered specifically (Olusanya, 2005). The acceptable tenet that EHDI programmes must be contextually relevant are even more crucial in the developing world, where the level of additional difficulties these regions face are considerable compared to developed world environments (Swanepoel, Louw & Hugo, 2007). Contextual variation and relevance has thus been emphasized throughout this report in a bid to lend clarity to the clinical issues revealed.

Given South Africa's inherent cultural and linguistic diversity (World Bank, 2009), the HPCSA (2007) has recognized the need for cultural congruency for EHDI to be effective within the South African milieu. The HPCSA (2007) has in fact provided concrete guidelines, benchmarks and quality indicators for different EHDI contexts. Furthermore, this council has recommended evidence-based assessment of these guidelines and benchmarks within these specifically defined contexts based on the paucity of evidence derived from the South African setting in an effort to continuously improve EHDI services (HPCSA, 2007).

Within Sub-Saharan Africa, it is only countries such as Nigeria and South Africa that have published researched aspects of EHDI as they apply within varying contexts within this part of the developing world (Olusanya & Okolo, 2006). Literature available in these countries reveals a piecemeal approach to evidence gathering, with a need for comprehensive and systematic research in all aspects of EHDI. To date, EHDI within the South African context is under preliminary investigation, with only several published results available (Swanepoel, Storbeck, & Friedland, 2009). Three of these investigations are relatively recent research efforts, with publications spanning the years 2006 to 2007, with one located within the private sector (Swanepoel, Ebrahim, Joseph, & Friedland, 2007), and two located in different aspects of the government sector (Swanepoel, Hugo, & Louw, 2006; Theunissen &

Swanepoel, 2008). The most recent publication (Kanji, Khoza-Shangase & Ballot, 2010) was also located within the government sector. This small number of published data reflects a lack of actualised hearing screening in different contexts of community practice. These studies in fact directly or by implication, recommend for extensions of the current research scope for further expansion of knowledge in the field of early hearing detection and intervention in the South African context so as to formulate appropriate hearing screening protocols based on scientific evidence (Kanji, Khoza-Shanagse & Ballot, 2010; Swanepoel, Ebrahim, Joseph, & Friedland, 2007; Swanepoel, Louw, & Hugo, 2007; Theunissen & Swanepoel, 2008).

Assessment of a hearing screening programme's viability in its original and natural environment is a vital determinant regarding the feasibility of HPCSA EHDI guidelines and the associated UNHS benchmarks in the South African context. It is here that the current study is located, having formed an integral part of the initial assessment on hearing screening protocols and the feasibility of the HPCSA (2007) EHDI guidelines application, particularly in the government sector where it has in fact been observed that hearing screening, nationally, is not taking place as a matter of routine according to the protocols delineated (Theunissen & Swanepoel, 2008). The widespread, focused involvement in hearing screening by the appropriate private and government sectors, the latter which is most commonly accessed by the majority of South Africans, is paramount if the South African 1997 White Paper on the Integrated National Disability Strategy, which advocates equal opportunity for all, is to be actualised for those challenged by impaired hearing ability (Office of the Deputy President T. M. Mbeki, 1997; Theunissen & Swanepoel, 2008).

Specifically, if inroads are to be made towards actualising the ultimate aim of reducing disability through application of a contextually specific UNHS programme, with appropriate

combination of theoretical and logistical constructs, key issues within the specific screening context must be identified and explored (JCIH, 2000; JCIH, 2007; HPCSA, 2007). The current study has aimed to explore the feasibility of implementing the HPCSA's (2007) guidelines for clinic based hearing screening in the South African primary health care clinic setting.

Chapter 2: Literature Review

2.1 The Importance of Hearing Function in Childhood Development

> Hearing loss in children is a silent, hidden handicap: it is hidden because children, especially infants and toddlers, cannot tell us that they are not hearing well; it is a handicap because, if undetected and untreated, hearing loss in children can lead to delayed speech and language development, social and emotional problems, and academic failure. (Northern & Downs, 1991, p. 2).

Northern and Downs (1991) stress the importance of hearing function in childhood by asserting that language acquisition in humans is auditory-linked and time-locked in an infant's life. These authors emphasise that the child's first two to three years of life are crucial to his/her optimal language development. The established link between hearing and language acquisition highlights the urgency in addressing childhood hearing impairment as early as possible to significantly reduce hearing loss handicap (Northern & Downs, 1991).

The EHDI doctrine of early identification and intervention of hearing loss within a context that facilitates maximum yield is emphasised nationally and internationally by the HPCSA (2007) and JCIH (2001 and 2007). Within the HPCSA and JCIH recommended protocols, critical factors impinge on the principles of EHDI thus influencing the facilitation of maximum actualisation of a child's inherent cognitive, language, academic and social adaptation potential, which may be permanently reduced through delayed hearing loss identification and intervention (HPCSA, 2007; JCIH, 2001; JCIH, 2007). Timeous

identification and intervention is key to maximising communication outcome (Yoshinaga-Itano, 2003), where timeous intervention has been shown to reflect comparable communication outcomes of hearing impaired with with non-hearing impaired individuals (Yoshinaga-Itano, Sedey, Coulter & Mehl, 1998).

2.2 Prevalence of Hearing Loss

Hearing impairment may be caused by many pathological conditions (Rehm & Madore, 2008), and more than half of childhood hearing loss is the result of biological inheritance (Rehm & Madore, 2008). Beyond genetics, some of the causes of congenital hearing loss include maternal rubella, toxoplasmosis, cytomegalovirus, congenital syphilis, ototoxicity, viral infections such as mumps and measles (Stach & Machandran, 2008). The more common acquired causes of hearing loss in children under six years of age include otitis media (Stach & Machandran, 2008) and bacterial meningitis specifically within Sub-Saharan Africa [World Health Organisation (WHO), 2010a].

To contextualize hearing disability, it is important to acknowledge the prevalence of hearing impairment in the broader context of disability per se. Of all the congenital sensory challenges classified as disabilities, hearing loss is reported to be the most prevalent (Olusanya, 2005). According to the World Health Organisation's (WHO) Global Burden of Disease report (2008), hearing loss is one of the leading disabling conditions for all ages. In 2006, the WHO cited 50% of all hearing loss as avoidable through prevention, early identification and treatment. Within the current context of a global estimate of 278 million people living with hearing loss, approximately 25% of disabling hearing impairment (greater than 40dB), is thought to have originated in childhood (WHO, 2009).

Sub-Saharan Africa, the context in which South Africa is placed, is classified as the

poorest of the world regions and is home to many of the least developed countries of the world [United Nations Children's Fund (UNICEF), 2009]. Epidemiological data pertaining to hearing loss, particularly early onset hearing loss, is largely unknown in the developing world (Olusanya, Wirz & Luxon, 2004). Data available highlights targeted populations with specific areas of research focus, for example, determining factors related to permanent congenital and early-onset hearing loss in non-hospital deliveries (Olusanya, Luxon, & Wirz, Benefits, 2004). According to Swanepoel, Ebrahim, Joseph and Friedland (2007), true prevalence data on infant hearing impairment in South Africa is unavailable due to the fact that newborn hearing screening programmes are limited, often inefficiently managed and poorly supported. The screening services available in the public health care sector are reported to be rare and mostly unsystematic (Theunissen & Swanepoel, 2008). Thus, even though Census 2001 (Statistics South Africa, 2005b) cites approximately five percent of the South African population to have reported some form of disability, with approximately 20% of this constituting a hearing impairment (one percent of the census population), this number is not considered to be a true and accurate reflection of the population at large. Broader consideration of developing countries, including Sub-Saharan Africa, has been included for a more accurate reflection of probable prevalence data within the general South African population (Swanepoel, Storbeck, & Friedland, 2009). Within the South African context, the incidence of congenital and early-onset hearing impairment is cited to be not less than 6 per 1000 live-births, especially given the negative perinatal disorders associated with reduced socio-economic conditions and increased environmental risks endemic to the developing world, and also where early hearing loss identification programmes are rare (Olusanya & Newton, 2007; Olusanya, Somefun, & Swanepoel, 2008; UNICEF, 2005). Extrapolating this to the South African context and combining it with estimates for the South African private health sector, estimated as three per one thousand live-births (Swanepoel, Ebrahim, Joseph, &

Friedland, 2007), the national average arrived at is 5.5 per 1000 live-births (Swanepoel, Storbeck, & Friedland, 2009). This translates into 17 births per day (Swanepoel, Storbeck, & Friedland, 2009).

2.3 Early Intervention

Even though it was as early as the 1970's that disability specialists recognised the importance of early identification and intervention in diminishing the effects of disability (UNICEF, 2003), it was only in the 1980s that adequately equipped, effective hearing screening programmes were implemented in the developed world context (Yee-Arellano, Leal-Garza, & Pauli-Muller, 2006).

The genesis of the EHDI movement, and resultant EHDI programmes, stemmed from committees and agencies such as the JCIH (U.S.A., established in 1969), the National Institute of Health (NIH - the U.S.A.s national research agency), and International Working Group on Infant Hearing (IGCH; established in 2003), where recommendations regarding evidence-based preferred practice in varying contexts with collaboration between different sectors, was and continues to be emphasised [Centre for Disease Control and Prevention (CDC), 2009; IGCH, 2009; JCIH, 2000].

According to the JCIH (2007) and the HPCSA (2007), EHDI comprises three key phases for it to be successful:

- Phase one is to screen for hearing loss.
- Phase two is to refer for a diagnostic assessment and confirmation of the hearing loss where possible, and,

- Phase 3 is to refer and implement intervention services in the case of a confirmed hearing loss.

The JCIH (2007), as well as international EHDI bodies, including EHDI South Africa and the HPCSA (2007), strongly recommend early detection and intervention of hearing impairment based on an ever increasing supportive body of evidence which has demonstrated the resultant reduced opportunities to learn language as having direct negative ramifications on psycho-social and socio-economic outcomes at an individual and national level (HPCSA, 2007; JCIH, 2007). Speech perception abilities and their predictive role on children's language skills are both critical for literacy development and educational outcomes for the hearing impaired child (DesJardin, Ambrose, Martinez, & Eisenberg, 2009). Thus, early intervention becomes a clear determinant of a child's future outcomes and quality of life.

To prevent the negative consequences associated with hearing impairment, JCIH (2007) and HPCSA (2007) emphasise the EHDI goal as maximising linguistic competence and literacy development and educational outcomes for the hearing impaired child. JCIH (2007) and HPCSA (2007) further stress the importance of capitalising on the child's full potential, and state that all children should have their hearing screened by maximum one month of age, with those that have failed screening [classified as "refers" (HPCSA 2007)] followed up diagnostically by maximum three months of age. By identifying and intervening before six months of age, the likelihood of the hearing impaired child to develop comparably with those with normal hearing, from a linguistic, speech and cognitive viewpoint, is increased dramatically; while those who are identified late demonstrate measurable persistent delays in areas of linguistic, speech and cognitive functioning (Mehl & Thomson, 2002; Moeller 2000; Olusanya, 2005; Yoshinango-Itano, Sedey, Coulter & Mehl, 1998). In addition, by intervening before six months of age, the long-term socio-economic costs involved in

specialised education and social welfare support for the hearing impaired is greatly reduced and the individual's lifetime productivity is improved (Yoshinaga-Itano & Gravel, 2001). Consequently, universal newborn and infant hearing screening is therefore recommended as the preferred option for both public and private health care sectors (JCIH, 2000; Olusanya, Luxon & Wirz, 2005).

The HPCSA and JCIH share common EHDI principles (HPCSA, 2007; JCIH, 2007), with specific variations for the South African context clearly highlighted (HPCSA, 2007; JCIH, 2007):

1. All infants should be able to access hearing screening services, specifically those that use a physiological measure. The JCIH recommends that this should be done at a maximum of one month of age. The HPCSA recommends this be context driven with three contexts highlighted, i.e. at discharge from well-baby nurseries, at discharge from neonatal intensive care units, or at PHC immunisation clinics.
2. JCIH advocates that all infants who do not pass the initial screening and the subsequent follow-up screen should be appropriately evaluated to confirm the diagnosis of hearing impairment by a maximum of three months of age. HPCSA, on the other hand, recommends a maximum of four months of age for those infants serviced by the PHC screening programme.
3. The JCIH recommends that early intervention services should be received by infants who are diagnosed with confirmed permanent hearing loss. These intervention services should be received as soon as possible but within a maximum of six months of age. The HPCSA concurs with this protocol but has extended this time frame by two months to eight months for those infants serviced by the PHC screening programme.

4. Both the JCIH and HPCSA emphasise the importance of a family centred approach where all well-accepted ethical codes of practice are upheld. The HPCSA emphasises recognition and respect of and for family tradition and cultural beliefs. In addition, the HPCSA advocates the intrinsic involvement of caregivers by their ongoing monitoring of their children that pass the initial screen for bilateral hearing loss but present with risk factors for progressive, late-onset bilateral hearing impairment, other auditory disorders and/or language and speech delay.
5. Interdisciplinary intervention is also recognised as key with adequate and integrated information systems to report the specific effectiveness of EHDI systems. The HPCSA emphasises the recommendation to link screening and intervention data systems to assess the long term outcomes for children with hearing impairment.

The aforementioned principles are critical to scrutinise in any context for effective provision of EHDI.

In recognition of the importance of early identification and intervention, advocating for NHS and EHDI has rapidly gained momentum worldwide as a viable strategy for overcoming the negative sequellae of congenital or acquired hearing loss, with a significant amount of evidence that reflects the earlier the identification and intervention, the better the outcome (JCIH 2007, HPCSA 2007; Yee-Arellano, Leal-Garza, & Pauli-Muller, 2006). It has been 17 years since the United States' National Institute on Deafness and other Communication Disorders (NIDCD, 1993) recommended UNHS on all infants before the age of three months in the NIDCD's Consensus Statement on EHDI in Infants and Young Children. By 2005 the United States's significant EHDI goals had been achieved where every state had implemented a NHS programme with an approximate 95% of newborns being screened before hospital discharge (JCIH, 2007). Other first and developing world countries such as the United

Kingdom (Davis & Hind, 2003), Italy (De Capua, Costantini, Martufi, Latini, Gentile, & De Felic, 2007), Mexico (Yee-Arellano, Leal-Garza, & Pauli-Muller, 2006), Switzerland (Cao-Nguyen, Kos, & Guyot, 2007) have recognised the benefits of UNHS and many have legislated hearing screening policies within their countries (Yee-Arellano, Leal-Garza, & Pauli-Muller, 2006). EHDI and appropriate early intervention (EI) is continually showing evidence-based value, but this value is only realised when sufficient coordination between all role-players and stakeholders is achieved (White, 2006).

2.4 EHDI Challenges and Recommendations

As White (2006) asserts, UNHS in itself is a complex task requiring liaison and cohesion between public and non-public sectors of health care. Even in industrialised contexts the intricacies are only well managed with holistic support at an infrastructural level where, for example, health care service delivery must be viewed within the context of budgetary limitations (HPCSA, 2007; White, 2006). Support at an infrastructural level also requires cohesion between all relevant EHDI cohorts (e.g. health, education, voluntary and social services), where logistics and connections between all relevant stakeholders are well defined (HPCSA, 2007; White, 2006). Such inter-sectoral collaboration is considered to be critical to the success of UNHS (White, 2006). The importance of inter-sectoral collaboration and cohesion has been well expressed in the international literature on UNHS in developed world contexts such as the United States, the United Kingdom, and Poland, where UNHS as part of EHDI programmes, are intrinsic to their public health systems (Swanepoel, Louw, & Hugo, 2007). Other countries have followed suit in providing cohesive inter-sectoral UNHS services including Australia, Austria, Belgium, Canada, Germany, Japan, Spain, Sweden, and Taiwan in varied community based and hospital contexts (Coates & Gifkins, 2003; Lin, Huang, Lin, Lin, & Wu, 2004; Weicbold, Nekahm-Heis & Welzl-Mueller, 2006;Yoshinago-Itano, 2003).

Specific issues raised in the first world milieu have highlighted the gaps that exist in (a) determining late onset and temporary childhood hearing impairment, (b) the need to not underestimate mild or unilateral hearing loss, and (c) the positioning of screening prior to school entry (Bamford, Uus, & Davis, 2005; Hollenbeck, 2008; Hutt & Rhodes, 2008). Greater application of controls and system cohesion is necessary, where intervention post confirmed diagnosis of hearing loss needs to occur by six months of age, still does not occur in more than half of diagnosed infants where such controls are not in place [American Speech-Language-Hearing Association (ASHA), 2007]. Hollenbeck (2008) further states that continued monitoring and emphasis of cost effectiveness are still critical to UNHS, as are the ethical considerations of parental anxiety and the use of allied key professionals such as nurses in advocating for the importance of all aspects of hearing, hearing screening, diagnosis and development.

Regardless of the vastly differing cultural contexts, despite their industrialised categorisation (United Nations Development Programme, 2007), first world screening protocols are recommended to be as adaptable as is required in order to identify the required population. An example of a developed world context in need of adaptation to capture its specific population is the outpatient hearing screening protocols in the Japanese Okayama prefecture (Fukushima, Mimaki, Fukuda, & Nishizaki, 2008). In this prefecture, home midwifery deliveries, as part of satogaeri bunben, a traditional out-of-hospital birth process, are common, and without specific adaptation to include this prefecture's reality, hearing screening yield would be significantly reduced (Fukushima, Mimaki, Fukuda, & Nishizaki, 2008). It is clear that even at an arguably more sophisticated first world level context, EHDI's value can be reduced if the specific context is not considered and if sufficient coordination between all role-players is not ensured.

The aforementioned first world challenges also prevail in developing world settings; however, the developing world also faces different challenges where EHDI issues are generally compounded (Olusanya, 2005; World Bank, 2008). These include poverty (Olusanya, 2005; World Bank, 2008), hunger, increased child mortality, HIV/AIDS (World Bank, 2009), weak healthcare systems, as well as reduction of resources and infrastructure and reduced access to education (Lasisi, Ayodele, & Ijaduola, 2006; Olusanya, Luxon, & Wirz, 2004). Further documented challenges pertaining to EHDI implementation in developing countries have included (a) out-of -hospital based births and cultural belief systems that do not support medical based intervention of hearing loss, (b) hearing screening and follow-up costs regarded to be in excess of countries' human and material resources, (c) poverty, (d) ignorance, and (e) the pressing nature of other life-threatening diseases which take precedence over the non-life threatening ironically unnoticed, silent epidemic of hearing loss (Olusanya, 2005; Swanepoel, Delport & Swart, 2004). This silent epidemic of hearing loss significantly jeopardises essential quality of life indicators (Swanepoel, Delport & Swart, 2004). Moreover, it is the developing world context which is most disadvantaged, where the lack of resources and poor infrastructure add a confounding negative factor to further reduce opportunities for those communities most in need (Olusanya & Okolo, 2006). Olusanya, Ruben and Parving (2006) further highlight that the earnings of individuals with hearing loss in developed countries are reported to be 40 to 45% less than their hearing counterparts. In developing countries like South Africa, this disparity is envisaged to possibly be even worse, where hearing impairment renders those individuals to be the most disadvantaged (Olusanya, Ruben, & Parving, 2006). It is within this context that the complexity of newborn and infant hearing screening in Sub-Saharan Africa is foregrounded.

2.5 Sub-Saharan Africa and South Africa Contextualised

Sub-Saharan Africa is recognised as the poorest of the world regions and home too many of the least developed countries of the world (UNICEF, 2009). This is the region which accounts for almost a third of all global annual births, the highest poverty rate world-wide, and the associated highest infant mortality rates in the two categories of under five and under one year of age (UNICEF, 2009). It is also the region that accounts for the lowest life expectancy rate at birth (UNICEF, 2009). It is in Sub-Saharan Africa where the often poverty associated significant contextual challenges include reduced urbanisation, high incidences of HIV/AIDS and other infectious diseases which tax basic health service systems (Streefland, 2005).

Within this Sub-Saharan context, South Africa is not considered to be as poor as her Sub-Saharan counterparts (UNICEF, 2009). South Africa is considered to have a unique mix of industrialised and developing world entities with extreme differences in earnings and wealth (World Bank, 2009). South Africa's overall classification is thus one of an upper middle income country where an overall developing world milieu is interspersed with aspects classified as developed contexts (World Bank, 2008). In addition, South Africa is the only Sub-Saharan country to offer tertiary education in the Science of Hearing Impairment and its associated treatment protocols (Theunissen & Swanepoel, 2008).

Despite these positive factors pertaining to South Africa's upper middle income country classification and its availability of tertiary education in the Science of Hearing Impairment (Theunissen and Swanepoel, 2008), the previously mentioned factors such as reduced urbanisation, high incidences of HIV/AIDS and other infectious diseases (Streefland, 2005) have resulted in paucity of scientific evidence emanating from Sub-Saharan Africa (Olusanya & Okolo, 2006; Swanepoel, Ebrahim, Joseph, & Friedland, 2007; Theunissen & Swanepoel,

2008). In Sub-Saharan Africa, setting up EHDI programmes has not proved viable nor sustainable without significant external, non-government funded contributions of finances and professional resources such as contributions by organisations such as the WHO and UNICEF (Olusanya, 2005; Olusanya & Newton, 2007). Thus far, within Sub-Saharan Africa, it is only Nigeria and South Africa that have generated and published scientific data pertaining to EHDI and its envisaged appropriate platforms from which appropriate protocols may be launched (Olusanya & Okolo, 2006; Swanepoel, Ebrahim, Joseph, & Friedland, 2007; Theunissen & Swanepoel, 2008). This lack of plethore of evidence could partly be attributed to reduced availability of tertiary education in the Science of Hearing Impairment. This explanation may also may arguably be one of the reasons for the lack of or at best slow application of EHDI within the Sub-Saharan setting (Theunissen & Swanepoel, 2008). For example, to date, studies conducted in Nigeria have highlighted that at least some form of hearing screening within a child's first year of life is provided as part of the public healthcare system (Olusanya, 2008). However, within the Nigerian context, practical difficulties in accurate identification of high-risk neonates have achieved only a 50% yield, which is regarded as unsatisfactory given the two technologically advanced objective tests which have generally improved the early identification yield (Olusanya, 2008). South Africa has demonstrated fewer systematic attempts at UNHS (Swanepoel, Ebrahim, Joseph, & Friedland, 2007).

2.6 South African Social Development, Education, and Health Care Policies

South Africa's Department of Social Development guidelines for early childhood development clearly state that it is every child's right to be treated equally (Department of Social Development, 2006). The goal of the South African government's Integrated National Disability Strategy is stated to be the disabled individuals right to play a full and participatory

role in society (Office of the Deputy President T. M. Mbeki, 1997). To this end the South African government has defined, as its departments' and state bodies' responsibility, that definitive steps must be taken to enable people with disability "to access the same fundamental rights and responsibilities as any other South African" (Office of the Deputy President T. M. Mbeki, 1997, p. 5). Accordingly, the South African Department of Social Development (2006) has recommended that special care and support should be available to children with any form of disability in an effort to provide optimum development opportunities to all children and their families. Providing what is best for the child must be a priority (Department of Social Development, 2006). It is during the early years of a child's life that the child acquires concepts, skills and attitudes that form the basis for lifelong learning (Department of Social Development, 2006) and long-term economic benefits may be derived from investment in early intervention programmes (World Bank, 2005).

The Department of Social Development (2006) further highlights these life skills to include the acquisition of language, perceptual-motor skills required for learning to read and write, basic numeracy concepts and skills, problem-solving skills, as well as a love of learning and the establishment and maintenance of relationships. Moreover, they further recognise the child's early years as the ideal phase for "the passing on (of) values that are important for the building of a peaceful, prosperous and democratic society" (2006, p.16). Such values are described to include appreciation of diversity, anti-bias, tolerance and justice and respect for human rights (Department of Social Development, 2006). Hearing function forms a core skill in the proficiency of these early developmental skills (The Irish Deaf Society, 2009). The extent to which hearing loss is detected and developed in children with hearing impairment will determine how these children interact with and participate in their different environments (The Irish Deaf Society, 2009). Issues pertaining to Child Health versus Child Disability are thus inextricably linked.

To date, in terms of hearing healthcare, South Africa's National Department of Health's (DoH) Primary Health Care policy (DoH, 2001; DoH, 2005) has defined in its norms and standards, strategic priorities for the national healthcare system. These strategic priorities include detection and intervention strategies for otitis media with rudimentary identification of associated hearing loss and distribution of hearing aids. Primary Health Care Package protocols pertaining to otitis media and associated hearing loss are detailed below in Excerpt 1, dating back to March 2000 (DoH, 2001), and Excerpts 2,3, 4 and 5, dating back to 2005 (DoH, 2005), which details the nursing scope of practice. The 2005 protocol was provided as an adjunct to the previous protocol on otitis media diagnosis and management, and compiled in consultation with specialists in the field of otitis media and hearing impairment (DoH, 2005). It is important to note that otitis media is categorized as its own entity although it may fall under Integrated Management of Childhood Illnesses protocols pertaining to acute respiratory infections.

Excerpt 1

The Primary Health Care Package - A Set of Norms and Standards, Prevention of Hearing Impairment due to Otitis Media at Clinic Level (DoH, 2001)

1. References prints and educational material 1.1 Health education material for public (posters and pamphlets). 1.2 Copy of the latest edition of the "Guidelines for the prevention of hearing impairment due to otitis media at clinic level". 1.3 Standard Treatment Guidelines on Treatment of Acute and Chronic Otitis Media at PHC
2. Equipment 2.1 Basic equipment: auroscope with spare batteries and bulbs.
3. Medication and supplies 3.1 According to EDL.
4. Competence of Health Staff 4.1 Staff have continuing education on acute respiratory infections (upper and lower) as part

of integrated management of childhood illnesses
4.2 Staff are able to:

4.2.1 Elicit an adequate history from mother and child (e.g. irritable, difficulty sleeping, pulling on ear, runny nose, fever, discharge of pus, snoring, delayed language development, allergy to penicillin).
4.2.2 Use an auroscope and evaluate the eardrum; always palpate lymph nodes, examine throat and test for neck stiffness and mastoid for pain, oedema or tenderness.
4.2.3 Use two hearing tests such as the Voice test and the Swart Questionnaire for babies younger than 12 months.
4.2.4 Distinguish acute otitis media, otitis media with effusion and chronic otitis media and provide relevant management for each, according to protocol.
4.2.5 Use eardrops and dry mops a discharging ear and teach mother how to do it.

5. Referrals:

5.1 Persistent or worsening signs of acute otitis media after 5 - 7 days of treatment.
5.2 Those who on first follow-up still have pain or complications.
5.3 Those with effusion who have moderate or severe hearing loss, or where effusion has persisted for more than a month.
5.4 Patients with pain associated with an ear that has been discharging for more than 2 weeks.
5.5 If there is an inflammatory swelling or tenderness over mastoid.
5.6 If there is neck stiffness or vomiting or drowsiness.
5.7 Large central perforation with significant hearing loss.
5.8 Dry perforation or perforation due to trauma.
5.9 If there is pus discharge suspected to be due to a cholesteatoma.
5.10 Patients with speech, language and/or auditory perceptual problems.

6. Patient education

6.1 Staff provide mother with instruction and follow up.
6.2 Opportunities are taken to inform community health committee and women groups that middle ear problems are very common and if not treated early can lead to hearing loss with effects on a child's development and language skills.

7. Records

7.1 All information on cases is correctly recorded in the appropriate register.
7.2 Registers are kept up to date to ensure continuity of care and recall.

8. Community Based Activity

8.1 The clinic has sensitised the community and receives support from the community health committee.

9. Collaboration

9.1 The clinic staff collaborates with schools, crèches to identify children with ear infection.
9.2 Clinic staffs collaborates with the clinic health committee, the civic organisations and workplaces in the catchment area to enhance health promotion

Excerpt 2

National Health System Guidelines for the Prevention of Hearing Impairment due to Otitis Media at Clinic Level – Acute Otitis Media and Diagnosis Thereof (DoH, 2005)

4.1.1 Acute Otitis Media

The appearance of the eardrum is the main diagnostic feature:
at the beginning of the infection:
– the whole eardrum becomes pink and loses the light reflex,
– then red, particularly around the handle of the malleus,
– the eardrum bulges, losing all the landmarks of a normal eardrum,
– very painful ear.
at an advanced stage:
– hearing impairment is the major symptom
– the pain subsides,
– feeling of fullness in the ear is experienced,
– flow of exudate is experienced in middle ear with certain head movements,
– the eardrum then ruptures, leaving a perforation with a discharge.
These are sure features of acute otitis media.

4.1.2 Diagnostic Procedure for Acute Otitis Media

Examine the ear:
Inspect the pinna, the opening to the ear channel and area around ear for boils or other sores.
Check mastoid area for oedema and tenderness.
Use an otoscope to inspect external auditory canal and eardrum. If necessary, first dry-mop the auditory canal.

A combination of pus discharge and a perforation of the ear drum is the main diagnostic feature. In addition to this, a foul smell can be experienced if the condition is due to a cholesteatoma.

NB: Not all otorrhoea is due to otitis media, if there is no perforation it may be due to infection in the ear canal (otitis externa).

Excerpt 3

National Health System Guidelines for the Prevention of Hearing Impairment due to Otitis Media at Clinic Level - Referrals (DoH, 2005)

4.3.4 Referral

– All patients who have pain associated with an ear that has been discharging for more than two weeks.
– All patients with inflammatory swelling and tenderness over the mastoid area.
– All patients with neck stiffness, vomiting or who have had a change in their level of consciousness
– All patients with a facial nerve paralysis.
– Large central perforation with significant hearing loss.
– Dry perforations resulting from any conditions.
All perforations due to trauma with an advice that they should not introduce anything in the ear canal.
– All patients with pus discharge suspected to be the result of a cholesteatoma.
– **All patients with speech, language and/or auditory perceptual problems.**
– All patients not responding to treatment.

Excerpt 4

National Health System Guidelines for the Prevention of Hearing Impairment due to Otitis Media at Clinic Level – Follow-Up (DoH, 2005)

4.3.5 Follow-up
– Reassess two weeks after starting treatment to see whether the ear is getting dry.
– If it is not, continue with dry mopping and ear – drops for another two weeks. If it is not improving, refer to doctor or ENT specialist.
– If the ear is dry, conduct a hearing test.
– Refer all patients with moderate to profound hearing loss.
– Refer all patients who still have a perforation if they have had more than one or two episodes of pus discharge from the ear.

Excerpt 5 overleaf, details the parental interview questions and hearing tests provided as part of the updated National Health System Guidelines for the Prevention of Hearing Impairment due to Otitis Media at Clinic Level (DoH, 2005)

Excerpt 5

National Health System Guidelines for the Prevention of Hearing Impairment due to Otitis Media at Clinic Level – the Voice Test and Swart Questionnaire (DoH, 2005)

The voice test is not applicable to children younger than 12 months old, in which case the Swart Questionnaire can be used.

THE VOICE TEST FOR HEARING LOSS

With normal hearing one should be able to understand what is being said in a whispered voice from 1 metre in a quiet room. If there were moderate hearing impairment then the speaker would have to speak in a normal voice. If there were severe to profound hearing impairment, the speaker would have to shout and the patient will still not be able to hear what is being said. These three volumes are the basis of the voice test.

To do the voice test, tell your patient to repeat after you what you are going to say to him/her (or in the case of smaller children, ask them to do something like 'Touch your nose', etc.). Stand behind them at arm's length and say something in a soft whisper. If they accurately repeat what you have said they have normal hearing in at least one ear. If they cannot understand what you have said, say something else in a normal conversational voice. If they cannot hear your whispered voice, say something else in a loud voice. If they cannot hear your conversational voice, but can hear your loud voice, then they have severe hearing impairment.

SWART QUESTIONAIRE FOR USE IN ASSESSING HEARING IN BABIES

Baby only a few weeks old:
Does your baby appear to be listening to you when you talk or sing?
Does your baby open its eyes or blink when there is a noise?
Baby about six months old:
Does your baby enjoy you talking or playing word games with you?
Does your baby try to see where a noise is coming from by turning its eyes or head towards the noise?
Baby about nine months old:
Does your baby appear to enjoy babbling and making other noises?
Does your baby appear to respond to very soft sounds?
Baby about a year old:
Is your baby starting to say baby words?
Does your baby respond when you call its name and names?
Baby about one and a half years old:
Is your baby starting to use simple words?
Does your baby pick up or point to things around the house when you ask?
Babies of two years or older:
Is your baby putting words together and try to talk to you?
Do you think your baby can hear normally even if you speak with a very soft voice?
If the answer is **no** to any of the above questions, the child should be referred for an audiological evaluation.

From the above excerpts, it is evident that specific recommendations pertaining to defined EHDI standards and strategies as promulgated by the JCIH (JCIH, 2000; JCIH, 2007) and HPCSA (2007) are conspicuously absent. There are however indications that the complexity of hearing impairment may be understood at a government level, where the Mother Child Women's Health (MCWH) division within the National DoH recognizes that special attention in health care planning is required for children with disability such as deafness. The MCWH division's specific aims highlight the need to develop systems that strive to achieve delineated goals and targets pertaining to women's and child's health, with one main aim of targeting disease prevention and treatment through screening, surveillance and specific interventions in its early stage (DoH, 2001). It is at this level where the hearing screening protocols as defined on an infant's Road to Health Chart (RtHC) are placed, where hearing screening is required at three months, six months and greater than twelve months of age (DoH, 2004). On the RtHC itself, specific screening techniques are detailed as follows:

- Does baby appear to listen when someone is talking or singing? (at 3 months)"
- "Does baby turn to a loud noise? (at 6 months)"
- "Voice test: Hearing impairment (>12 months)"

Excerpt 6 reflects specific details as these pertain to detecting hearing impairment.

Excerpt 6

Road to Health Chart – Guidelines for Health Workers: Visual/Hearing Screening (DoH, 2004)

2.2.4 Visual/hearing screening
Visual test: From 6 weeks onwards a baby should be able to follow horizontally with both eyes a moving object *(pencil/pen),* held about 20-30cm from the face, from full left gaze to full right gaze. From 3 years onwards simple eye charts can be used.

Voice test: Stand at arm's length behind a young child *(>12 months)* and say something in a **soft whisper**. If the child accurately repeats what was said, the child has normal hearing in at least one ear. If the child cannot understand what was said, repeat something else in a **normal conversational voice**. If the child cannot hear your whispered voice, but can hear your conversational voice, the child has a moderate hearing impairment. If the child still cannot hear, say something in a **loud voice**. If the child cannot hear your conversational voice, but can hear your load voice, then the child has a severe hearing impairment.

Notwithstanding the above efforts by the South African government to address hearing impairment in terms of otitis media and in terms of developmental milestones, other than the non-government HPCSA EHDI recommended guidelines, precise EHDI definition at a government legislative level (other than a moral obligation with emphasis on EHDI's importance in 2007 by the then Minister of Health, Manto Tshabalala-Msimang (DoH, 2007) has not as yet been formalised (Swanepoel, Storbeck & Friedland (2009). The present terminology lacks certain strategic detail required, such as logistics pertaining to personnel and expenditure (Office of the Deputy President T.M. Mbeki, 2007; Swanepoel, Delport & Swart, 2007; Theunissen & Swanepoel, 2008).

Until EHDI is formalised as an integrated nationalised health care strategy, a significant portion of South African hearing impaired children's rights will remain marginalised. This is despite South Africa's health care infrastructure having been described as comparatively well-developed (Swanepoel, Delport, & Swart, 2004; Swanepoel, 2006). This is also despite the fact that South Africa is the only Sub-Saharan country to offer tertiary education in the Science of Hearing Impairment (Theunissen & Swanepoel, 2008). It is within South Africa's

access to health care services, that the country's developing versus developed world differences are patent as described by Swanepoel, Storbeck and Friedland (2009). The majority of health care expenditure in South Africa originates from the approximate 15% minority of the public that accesses the private health sector, with the approximate 85% majority reliant on the less resourced, albeit at minimal cost, public health sector (ANC Today, 2005; Swanepoel, Storbeck, & Friedland, 2009).

One of the formalised strategies adopted to reduce the disparity between South Africa's industrialised versus developing world realities is based on the WHO's recommendations, where health care reform was initiated by the newly appointed post-Apartheid government of 1994 (South African Government Communication and Information System, 2009). This health care reform constituted a shift from a curative hospital based system to an integrated community based service to include the needs of the majority for more equitable provision of health services (South African Government Communication and Information System, 2009). At present, the healthcare system, as far as it pertains to detection and intervention of hearing impairment, is formally tiered as follows (Swanepoel, Louw, & Hugo, 2007):

- Tertiary Level, Provincial Hospital with specialised service provision [Audiology and Ear Nose and Throat (ENT) clinics].
- Secondary Level, Regional Hospital with specialised service provision (Diagnostic Audiology services).
- Primary Level MCWH Clinics (at a district level) with community nurses and lay volunteers providing services including implementation of immunisation programmes.

It is within the primary level MCWH clinics where the previously mentioned hearing screening protocols in reference to otitis media and the RtHC are implemented (DoH, 2001;

DoH, 2005).

2.7 South African Context Specific EHDI Challenges and Suitability

As is evident from the literature reviewed thus far, the complexities of EHDI service delivery vary according to different contexts (Olusanya, Luxon, & Wirz; 2004). These complexities necessitate that hearing screening environments and techniques for detecting hearing deficiencies be scrutinised in terms of appropriate contextual specific suitability. Various platforms for NHS in the developing world context have been put forward. These include Expanded Programmes on Immunisation (EPI), the Baby-Friendly Hospital Initiative, Integrated Management of Childhood Illness (IMCI), and National Ear Care Programmes (Olusanya, Luxon, & Wirz; 2004). Each deserves evaluation in terms of appropriate fit per developing world context, bearing in mind that the UNHS goal is for wide screening coverage with the highest possible yield (Olusanya, Luxon, & Wirz; 2004). EPI appears to be of specific significance because of its apparent compliance herewith, either in place of or as an adjunct to hospital-based neonatal hearing screening (Olusanya, Wirz & Luxon, 2004; Olusanya, Okolo & Ijaduoal, 2000). Of major significance is that globally, immunisation programmes are often the most established child health intervention and, through multilateral collaborations, are often the best supported beyond the individual country's capacity (Olusanya & Okolo, 2006). It is the MCWH clinic construct which promulgates EPI strategies, which is may be the reason why this is the location of choice recommended by Swanepoel, Louw, and Hugo (2007). In turn, the MCWH EPI setting is the recommended setting for EHDI programme implementation at a PHC clinic level (HPCSA, 2007). South African EPI targeted strategies include guidelines for immunisation days available, with no turn-aways for infants presenting on a non-immunisation day (DoH, 2001). These EPI targeted strategies also include methods prompting infants return for follow-up

immunisations (DoH, 2001). Immunisation coverage in 2006 for infants under a year of age was at 91.8% for GP and 71.4% for NW (Day & Gray, 2008). EPI strategies also include specific immunisation campaigns which have reflected a progressive increase of children fully immunised nationally, for specific conditions such as measles, from 78% in 2002 to 84.6% in December 2008 (DoH, 2009). Through the high yield demonstrated by these EPI capture rates (DoH, 2009), it is envisaged that the South African government's Integrated National Disability Strategy and its well developed Department of Social Development's guidelines for early childhood development will be actualised as far as facilitating inclusion of those children who are hearing impaired. However, it is not capture rates alone that account for South African specific contextual challenges.

Additional challenges inherent to the South African EHDI sevice delivery are the financial inequities in terms of health service funding present between districts (DoH, 2009), with operational autonomy now sanctioned and already excercised at a district level (DoH, 2009). Comparison of district health service provision reflects PHC spending per capita uninsured (those utilising DoH services) of approximately R289 per person in GP (consisting of 6 districts and 12 sub-districts), and approximately R349 per capita in NW (consisting of 4 districts and 21 sub-districts) (Day & Gray, 2008). Thus, despite the overall deprivational index rating (Day & Gray, 2008), where GP is generally more advantaged than NW at a municipal and socio-economic level (Day & Gray, 2008), more government funds are spent per individual in NW compared to those in GP. Inequities such as these are reflective of the context specific challenges South Africa faces (HPCSA, 2007), where provision of effective national EHDI programme implementation may be hampered by disparities in district health care funding.

The HPCSA's EHDI guidelines (2007) provide due consideration of the context specific

complexities inherent in EHDI programme implementation, where developed world JCIH protocols (2000; 2007) have been adapted with apparent contextual congruency. However, without further research into the feasibility of these protocols, their functional adequacy remains questionable.

2.8 JCIH and HPCSA – A Developed World versus Developing World Comparison

The industrialised world's benchmarks for Newborn and Infant Hearing Screening (NIHS) best practice are the already mentioned in the JCIH 2000 and JCIH revised 2007 guidelines (JCIH, 2000; JCIH, 2007). Bearing in mind that the number of births attended by skilled personnel (such as nurses) in developed world contexts far exceed those within a developing world contexts (United Nations Development Programme, 2007), JCIH (2000) and JCIH (2007) pertinent factors and latest refinements include:

1. Amendment of its initial defined target for UNHS programs from "permanent bilateral or unilateral, sensory or conductive hearing loss, averaging 30 to 40 dB or more in the frequency region important for speech recognition (approximately 500-4000 Hz)" to include neural hearing loss (e.g., "auditory neuropathy/dys-synchrony") in infants admitted to the neonatal intensive care unit (NICU)" (JCIH, 2007, p. 898).

2. Recognition, as evidenced in large-scale research, that in children, the hearing losses listed below result in negative cognitive, educational and inter-relational and socio-economic sequellae:
    - mild to profound bilateral hearing loss
    - moderate to profound unilateral sensori-neural hearing loss
    - minimal flat or sloping sensory hearing loss
3. Separate protocols for well- infant versus neonatal intensive care unit nurseries

(Automated Auditory Brainstem Response (AABR) testing added to the Otoacoustic Emission (OAE) protocol at specific times).

4. All infants should have their hearing screened by a maximum of one month of age.
5. Those who are referred are recommended for a complete audiological evaluation by maximum three months of age.
6. Infants with diagnosed hearing loss are to receive intervention by maximum six months of age.
7. Ongoing surveillance of communicative development from two months of age as part of well-child visits.

(JCIH, 2000; JCIH, 2007)

The HPCSA (2007) has formulated its position statement based on the above but with the unique contextual considerations required, with appropriate scientifically based rationale. Points recommended for consideration include:

1. EHDI programmes implementation to be integrated through inter-sectoral collaboration with provincial and district service delivery mechanisms inclusive of government (specifically the DoH's MCWH unit, Social Development's Disabilities and Early Childhood Development unit and Education), non-government and private role players (including professionals such as audiologists, nursing staff, community health care workers, community health care volunteers, and caregivers). Collaboration is to include the Provincial Directorates of Finance to ensure appropriate allocation of funds for hearing screening implementation with appropriate use of technology.
2. As a minimal criterion, targeting permanent bilateral hearing loss of a minimum of 40dB averaged across 500Hz, 1, 2 and 4 kHz, with possible improved stringency when more resources become available.

3. In conjunction with this minimal criterion, a unilateral OAE pass criterion is recommended as an intermediate solution than risk-based screening in identifying those children most in need of intervention. It is also a means of reducing the financial and personnel requirements involved in follow-up evaluations.
4. Use of objective physiological measures is recommended as part of a UNHS approach not only to identify congenital but also early onset bilateral hearing loss. These include the high specificity and sensitivity of AABR and OAE [distortion product otoacoustic emissions (DPOAE) and transient evoked otoacoustic emissions (TEOAE)] with (a) automated response detection criterion to reduce effects of screener bias, test outcome errors (b) ensuring consistency across those screened, across test conditions, and screening personnel.
5. Specifically, AABR is recommended for neonatal intensive care unit infant hearing screening particularly because of the higher prevalence of auditory neuropathy associated with multiple hearing loss risk indicators. OAE is recommended in the primary health care immunisation visit context. High frequency tympanometry is recommended in the tertiary and secondary hospital context to further differentiate OAE refer results in terms of aetiology.
6. In order to achieve hearing screening for newborns and infants on a universal scale, three contexts are recommended specific to the South African environment. These are, at neonatal intensive care unit discharge, well-baby nurseries, and at PHC immunisation visits.
7. At immunisation clinics specifically, considerations are to include (a) technology utilised

   (b) screening timing to coincide with the first immunisation at six weeks of age and to improve follow-up return rates and re-screens coordinated, with subsequent

immunisation visits at ten and fourteen weeks and later at nine months. In addition, due consideration must be given to (a) screening friendly acoustically appropriate environments (b) available screening personnel (c) information management and quality control (d) and the ethically important referral resources for diagnostic evaluation. Lastly, in compliance with JCIH 2000, confidentiality, language and culturally sensitive communication aspects must be clearly defined.

8. Diagnosis to be confirmed by maximum four months of age with intervention by maximum eight months of age.
9. Ongoing surveillance by caregivers for infants at risk of delayed onset (including a rescreen of a unilateral refer) for progressive hearing loss.
10. Benchmarks and quality indicators (to be monitored monthly as per the JCIH 2000 recommendations) for the above clinic based programme.

(HPCSA, 2007)

HPCSA (2007) Clinic screening **benchmarks** and **quality indicators** include:

- Ninety five percent of infants through their attendance of their six week immunisation should be screened after six months of initiation of the clinic screening programme, as reflected in the quality indicator of actual percentage of infants screened at their six week immunisation visit as well as the percentage of those screened at the age of six weeks.
- A less than five percent referral rate for audiological and medical assessment within one year of initiation of the programme.
- Efforts to follow-up on a minimum of 95% referrals for a rescreen post the initial screen to be documented by the audiologist managing the EHDI programme, with adequate consideration of influencing factors such as (a) a lack of demographic information (b) changes in contact details or addresses (c) facility access, and (d)

personal limitations including poverty. A return rate of seventy percent or more is considered ideal.

Further overall **quality indicators** include calculation and documentation of:

- Percentage of bilateral refers for a rescreen/diagnostic evaluation targeting permanent bilateral hearing loss of a minimum of 40dB averaged across 500Hz, 1, 2 and 4 kHz
- Percentage of unilateral refers requiring rescreens in six to nine months.
- Percentage of refers who return for follow-up services, be they rescreens or diagnostic services.
- Percentage of rescreen refers who are referred for audiologic and/or medical evaluation.
- Percentage of families who refuse screening.
- Percentage of caregivers who report a positive attitude towards the screening programme post the initial screen.

(HPCSA, 2007)

As is visible from the above JCIH (2007) and HPCSA (2007) protocols, in first world contexts, the objective AABR is recommended as the preferred assessment tool on neonatal intensive care unit babies because of its increased sensitivity and specificity as it relates to VIIIth nerve and lower brainstem neural synchrony. VIIIth nerve and lower brainstem neural synchrony is of specific concern in low birth-weight infants, where false negatives and positives are generally reduced (JCIH 2007; HPCSA, 2007). Otoacoustic Emissions, TEOAE and DPOAE, either as an individual or combined tool, are the other objective measure(s) recommended on well newborns and infants, where cochlear outer hair cell function is recorded (JCIH, 2007). Here, false negatives and positives are generally also reduced and

sensitivity and specificity increased according to alternative measures for hearing ability such as subjective behavioural observation audiometry (Lutman, 2000). Both AABR and OAE screening assessments have further advantages such as improved time efficiency and reliability compared to other hearing screening measures (Olusanya, Luxon, & Wirz, 2004).

Screening criteria in first world contexts can afford to be more stringent where, because of increased budgetary and infrastructural resources (including but not limited to adequate inter-sectoral liaison and diagnostic referral resources) (White, 2006), more sensitive approaches to hearing screening are made possible (Lutman, 2000). Such increased approach sensitivity includes a unilateral hearing screening refer, which may constitute a recommendation for a rescreen or diagnostic hearing evaluation (HPCSA, 2007). In developing world contexts, because of reduced resources, a bilateral hearing loss referral protocol may be the preferred option so as not to exhaust monetary and human resource requirements necessary for follow-up evaluations (Swanepoel, Hugo, & Louw, 2006; Swanepoel, Louw, & Hugo, 2007).

The above EHDI rationale for developed versus developing world settings highlights the need for context specific considerations in order to ensure EHDI efficacy.

2.9 South Africa – EHDI Research Review

South Africa shares many developing world issues (Swanepoel, Delport, & Swart, 2004). It is thus no surprise that in the aftermath of the post-Apartheid era, a paucity of scientific information stretches beyond the absence of true prevalence data to a lack of associated propagation of investigative studies into EHDI implementation with resultant recommendations (Swanepoel, Hugo & Louw, 2006; Swanepoel, Ebrahim, Joseph & Friedland 2007). The previously mentioned lack of specific legislation mandating EHDI

(Swanepoel, Storbeck, & Friedland, 2009) is of concern and renders the process to be primarily passive, where the only alerts to possible hearing loss are the result of caregiver concerns regarding speech-language delays, atypical behaviour or otitis media complications (Swanepoel, Delport, & Swart, 2007). As a result, the average age of diagnosis and intervention exceeds the well-recognised critical periods where average ages of detection from two studies, one in the Western Cape (Swanepoel, Storbeck, & Friedland, 2009; Van der Spuy & Pottas, 2008), and one unpublished report from Gauteng, exceeds 23 months (Venter & Viljoen, 2008 as cited by Swanepoel, Storbeck, & Friedland, 2009, p.784). Delays in diagnosis and intervention of hearing impairment may be markedly worse in other public sector service areas such as rural regions where reduced personnel and equipment resources and awareness of audiology as a profession prevails (Venter & Viljoen, 2008 as cited by Swanepoel, Storbeck, & Friedland, 2009, p.784).

With further reference to public sector services, as of 2008, Theunissen and Swanepoel (2008) reported that 109 of 396 public sector hospitals (28%) offered audiology and speech pathology services, often a combined service – a dual qualification still offered by certain universities and favoured for appointment within the public healthcare system (Swanepoel, 2006). Of their 44 respondents, only 27% of the respondents were found to be conducting some form of hearing screening, but those hospitals without audiology and speech therapy services are not likely to conduct such screening programmes (Theunissen & Swanepoel, 2008). Fortunately, technologies employed in these hospitals were found to comply with HPCSA (2007) and JCIH (2007) recommendations. Nationally, Theunissen and Swanepoel estimate that 7.5% of hospitals with Audiology and Speech Therapy facilities are providing some form of public sector infant hearing screening, with UNHS estimated as being provided at less than one percent of public sector hospitals. A lack of appropriate equipment (34% of respondents reported the availability of one piece of screening equipment), reduced

designated screening areas (5% reported having consistent designated screening areas), and staff shortages were the most frequently reported contributing reasons to reduced implementation of hearing screening programmes. Programmes underway were also found to be mostly non-systematic with inconsistency in target populations and reduced statistical data emanating from implemented programmes. The result of approximately only 10% of infants having possible access to EHDI services is more than significantly below current HPCSA and JCIH benchmark of 95% (HPCSA 2007; JCIH 2007).

Even in the private health care sector, where funds are accessible, neonatal hearing screening is not intrinsic to standard neonatal medical care (Swanepoel, Ebrahim, Joseph, & Friedland, 2007). The one longitudinal retrospective study available, where a formalised UNHS programme was implemented in one private sector hospital, revealed a 75% coverage rate of the targeted population only whilst the hospital birthing package included hearing screening over the first 22 months of the programme. This dropped to 50% in the subsequent 26 months. Important reasons cited for this reduced coverage, when compared to the JCIH (2007) and HPCSA (2007) 95% benchmark, included a general lack of awareness of the prevalence of hearing loss in infants and the marked benefits of early intervention, not only by parents, but revealingly by gatekeeper healthcare professionals as well.

In an effort to improve contextualised EHDI services in South Africa, a pilot project hearing screening programme was implemented at two immunisation clinics in South Africa in 2005 (Swanepoel, Hugo, & Louw, 2006). At this time, reports on hospital versus out-of-hospital births varied, and it was felt that targeting immunisation clinics within the MCWH health service system would provide a platform for achieving the JCIH (2000) and HPCSA (2002) 95% benchmark. This 95% benchmark is acknowledged as the recommended coverage for hearing screening of infants (Swanepoel, Hugo and Louw, 2006). MCWH

clinics form part of the primary healthcare approach aimed at providing services accessible to the entire population, providing extensive coverage of all South African newborn and maternal health services (Swanepoel, Hugo & Louw, 2006; Swanepoel, Louw & Hugo, 2007). The two Hammanskraal rural area clinics, selected via convenience sampling, were deemed to be representative of large sections of the developing South African population (Swanepoel, Hugo & Louw, 2006). Screening was conducted at these two clinics over five months using a combined approach of DPOAE and high frequency tympanometry objective measures. Results revealed coverage of 95% was obtained for unilateral screening, and coverage of 93% was obtained for bilateral screening. Compared to the developed world benchmark of 95%, what was considered a reasonably high coverage rate was obtained. In addition, a poor follow-up return rate of 40% was reported and thought to be attributable to (a) the relatively short time frame in which the screening was conducted, (b)the impermanence of the programme, with associated reduced integration of services and reduced tracking of individuals within the system, [a problem experienced even in first world settings (White, 2006)], as well as (c) fatalistic cultural perceptions with associated acceptance and passivity towards disability, inherent to many African cultures (Louw & Avenant , 2002; De Andrade & Ross, 2005). The promise of utilising immunisation clinics as an appropriate UNHS platform was the ultimate outcome emphasised (Swanepoel, Hugo, & Louw, 2006). This is of particular significance given the recent statistics available as well as where several South African based studies have revealed late diagnosis and intervention of hearing impairment as already highlighted (Van der Spuy & Pottas, 2008; Venter & Viljoen, 2008 as cited by Swanepoel, Storbeck, & Friedland, 2009 p. 784).

Olusanya's recent review (2009) on optimising the use of immunisation clinics as a platform for UNHS in the sub-Saharan milieu reveals statistics that are even more suggestive of the appropriateness of this contextual screening. In Sub-Saharan Africa, despite the 64%

of births that occur out-of-hospital, the uptake for Bacille Calmette-Guerin (BCG) and diphtheria-pertussis-tetanus (DPT1) stands at over 80% [United Nations Children's Fund (UNICEF), 2008]. This high rate presents a major advantage over other screening contexts such as Baby Friendly Hospital Initiatives, Integrated Management of Childhood Illnesses (IMCI) and National Ear Care Programmes, and is reflective of the immunisation programmes' apparent ability to attract infants born outside of hospitals, who ordinarily would not be reached by hospital-based programmes (Olusanya 2009). The uptake of immunisations in South Africa for children under one year of age stands at approximately 84% as per 2006 District Health Information System figures (Day & Gray, 2008). This high uptake of immunisations together with the positive findings of the pilot project already implemented in Hammanskraal (Swanepoel, Hugo & Louw, 2006) herald positive future outcomes from using immunisation clinics as the operational basis for South African UNHS.

The degree to which success is achieved in utilising immunisation clinics as a UNHS platform is dependent upon consideration of specific assets and barriers as delineated by Olusanya (2009) and Swanepoel, Louw and Hugo (2007). Contextual considerations include the specific immunisation programme to be targeted (timing and type and proportion of children to receive the immunisation), and the age at which the immunisations are to be administered where timely detection of hearing loss is paramount for optimal outcomes (Olusanya, 2009). Further deliberation is necessary aspects of the facilities to be utilised such as reducing high levels of external noise which negatively impact the hearing screening process (Swanepoel, Louw, & Hugo, 2007).

Swanepoel, Louw and Hugo (2007) highlight additional aspects to be considered, and these include language barriers, as well as the negative effects of restless infants which worsen post receipt of their injection. Resource integration must also be considered for cost-

effective service delivery, where the same resources are utilised to deliver independent and multiple services to the same population at the same time, which is of particular importance to the developing country specific setting (Olusanya, 2009). This may also result in higher return rates where a single clinic visit allows for additional interventions that may be necessary, particularly in poorer communities (Olusanya, 2009). Care must however be taken not to undermine the immunisation programmes by add-on programme interference. Olusanya (2009) highlights an example of one of these add-ons as invasive blood taking beyond pin prick collection, which may adversely affect clinic attendance. Olusanya further contends that service providers must also not be swayed by their own perceptions of the importance of the different services offered in one sitting, where individual preference for a particular facet of the programme may detract from the overall programme service delivery. Each facet of the programme must receive appropriate emphasis (Olusanya, 2009). This is where formalised policy may exert control against which programme compliance may be measured prescriptively.

The HPCSA's 2007 position statement fills this much needed need for policy formalisation as a first step by defining strategies for countering these omissions pertaining to EHDI and the sectors to be serviced, with specific mention of immunisation clinics as a suggested appropriate platform for implementation of a more universal approach to newborn hearing screening (HPCSA, 2007). The HPCSA as a statutory body is mandated to provide guidance to practitioners (HPCSA, 2009), but the onus for recommendations as to the appropriate fit of suggestions within the South African context is currently placed on parents, persons living with hearing loss, government and professionals working at various levels within the field (Swanepoel, Storbeck, & Friedland, 2009). Notwithstanding the HPCSA's well rationalised recommendations, which may in fact be regarded as a formalised attempt to meet and actualise South Africa's social development doctrines as well as industrialised

world ideals on countering hearing disability, perception and reality can debatably be very different. As already highlighted, the silent nature and social isolation inherent in the epidemic of hearing loss (Swanepoel, Louw, & Hugo, 2007) often relegates hearing impairment to secondary priority status, as hearing impairment, for the most part, is insidiously benign compared to the burden of disease posed by the Sub-Saharan pandemic of HIV/AIDS and other life threatening highly prevalent infectious diseases such as tuberculosis (Olusanya, 2005; Streefland, 2005). Both of these conditions (HIV/AIDS and Tuberculosis) share prominent status because of their high prevalence in the South African context (Day & Gray, 2008).

Nevertheless, because of South Africa's healthcare infrastructure and South Africa's tertiary training of professionals such as audiologists and otorhinolarygologists, South Africa is uniquely positioned to take the lead in Sub-Saharan Africa for implementing systematic and widespread EHDI services (Swanepoel, Storbeck, & Friedland, 2009). It is here that solutions are sought by a well devised compromise between reality and altruism based on expansion of the contextual scientific knowledge already at hand.

The current research has thus aimed to establish with greater academic certainty not only whether and to what extent hearing screening is being conducted within the South African primary health care sector, but whether it is feasible to do so given possible contextual constraints. Such contextual constraints include possible nursing staff and volunteer perceptions of the decreased importance of hearing screening and cultural influences regarding the aetiology of hearing loss, which may negatively influence the perceived need within the community to screen for hearing impairment. These contextual constraints are over and above the logistical constraints imposed by reduced resources such as reduced technology, and reduced personnel (Theunissen & Swanepoel, 2008). The HPCSA's EHDI

position statement encourages such research, and it is in this vain of supportive knowledge that the current research was undertaken, in order to establish the feasibility of implementing the HPCSA's EHDI clinic guidelines within the South African context. Findings will aid in establishing South African specific best suitable practice which will contribute to the provision of evidence-based services. It is here that the thrust of the current research has been placed with exploration of the feasibility of conducting infant hearing screening at immunisation clinics within the South African primary health care context.

Chapter 3: Methodology

3.1 Aims

3.1.1 Primary aim.

To assess the feasibility of implementing the HPCSA's 2007 clinic based guidelines for EHDI in the South African context. This primary aim was realised through the objectives defined below.

3.1.2 Specific objectives.

1. To establish the prevalence of hearing screening conducted at MCWH immunisation clinics in North West and Gauteng provinces.
2. To determine the hearing screening procedures and protocols in use at MCWH immunisation clinics in North West and Gauteng provinces.
3. To determine and explore possible concomitant personnel-associated factors which may influence the implementation of newborn and infant hearing screening programmes at North West and Gauteng provinces immunisation clinics including:
    - Community-based primary healthcare workers' knowledge-base pertaining to hearing impairment
    - Community-based primary healthcare workers' perceptions and attitudes towards hearing impairment
    - Community-based primary healthcare workers' willingness to conduct hearing

screening

4. To determine and explore other factors that may influence implementation of newborn and infant hearing screening at North West and Gauteng immunisation clinics including:
    - Patient return rates for immunisations
    - Clinic logistics
    - Workload pressures associated with burden of disease and possible understaffing
    - Budgetary constraints resulting in hearing screening equipment shortage and poor maintenance
5. To compare any hearing screening procedures and protocols in use to the HPCSA (2007) EHDI position statement clinic guidelines and associated clinic benchmarks.

3.2 Research Questions

1. To what extent is hearing screening being conducted at MCWH immunisation clinics in North West and Gauteng provinces, if at all?
2. What hearing screening procedures and protocols are being implemented in these two regions?
3. Do personnel-associated factors influence the implementation of newborn and infant hearing screening programmes located in these specific provinces? Specific questions include:
    - What is community-based primary healthcare workers' knowledge-base pertaining to hearing impairment?
    - What are community-based primary healthcare workers' perceptions and attitudes towards hearing impairment?
    - Are community-based primary healthcare workers' willing to conduct hearing

screening?

4. What other factors influence implementation of newborn and infant hearing screening in the province populations studied? Specific questions include:
    - What are average patient return rates for immunisations?
    - Does workload pressure(s) associated with understaffing influence newborn and infant hearing screening implementation?
    - Do budgetary constraints resulting in hearing screening equipment shortage and poor maintenance influence newborn and infant hearing screening implementation?
5. How do the hearing screening procedures and protocols in use, if any, compare to the HPCSA (2007) EHDI position statement's suggested clinic guidelines and associated benchmarks?

3.3 Research Design

The design employed in the current study was an exploratory (because of a paucity of existing data) phenomenological qualitative research design with the use of descriptive quantitative data employed to indicate the prevalence of emergent themes. As defined by McMillan and Schumacher (2001), phenomenological research with the use of interviews are used to investigate what participants experienced, how a particular incident was experienced , and the meaning the participants assigned to the experience. It must be acknowledged that the quality of responses is dependent on intra-subject factors (such as the participant's world view, his/her ability and willingness to express him/herself), and other factors such as the quality and scope of questions used in the interview process (McMillan & Schumacker, 2001). The research design was selected to specifically garner qualitative data from participants using face-to-face interviews, thus enabling description, and where possible,

explanation of phenomena emergent from the two sample groups and their sub-groups. Information was obtained to describe variables and their distribution at a particular point in time, through content analysis of answers to closed-ended dichotomous questions as well as open-ended questions. Content analysis is defined as "the study of recorded human communications" (Babbie, 2005, p. 328).

3.4 Description of Participants

3.4.1 The sample.

Primary healthcare nurses were selected as participants for the current study and were recruited from primary healthcare immunisation clinics located within the district MCWH Cluster construct, where all services rendered were and are at a healthcare level one. Within the MCWH cluster, community nurses and lay volunteers provide services including implementation of immunisation programmes, where yield (actual immunisations generated out of the possible population in the area) is reported to be 91.8% in Gauteng and 71.4% in the North West (Day & Gray, 2008). More specifically, these mobile and fixed clinics may be described as predominantly outpatient facilities, which incorporate the specific targeted population of infants requiring immunisations at six, ten and fourteen weeks, nine and eighteen months, and five years (Office of the President, K. Motlanthe, 2009). For the purposes of the current study, in order to facilitate improved control over extraneous variables, as recommended by Maxwell and Satake (2006), only fixed non-mobile clinics were included.

This sample of primary health care nurses was drawn from two provinces in South Africa where PHC clinics in Gauteng and North West provinces were included. Specifically:

Clinics within North West and Gauteng provinces were deemed to be appropriate sample groups for a grass-roots primary health care survey such as the current study, as they were easily accessible to the researcher. These two provinces are considered to generally differ demographically in terms of socio-economic development based on the deprivation index as estimated from the Community Survey (Statistics South Africa, 2007), with the North West population group considered to be more disadvantaged than that of Gauteng province (Day & Gray, 2008). Socio-economic indicators are considered to measure some of the most important health determinants within a primary healthcare approach (Day & Gray, 2008). The overall differences between North West and Gauteng provinces were aimed at facilitating a rural-urban divide, and these were thought to be useful for assessing hearing healthcare outcome determinants within the context of this study by the current researcher. Specific districts within these provinces were selected. As the specific districts were also further sub-divided according to the deprivational index classification scale quintiles with 1 indicating worst through to 5 indicating best (Day & Gray, 2008), the researcher selected similarly classified sub-districts for more reliable and greater depth of comparison. Specifically, within Gauteng Province, the City of Johannesburg (GP-COJ) sub-district was rated at a deprivational quintile level 4. This was the rating supplied for North West Province's Merafong (NW-M) sub-district. Thus these two sub-districts were also compared over and above the overall province to province comparison. Similarly, Gauteng Province's Randfontein/Mogale (GP-R/M) sub-districts were rated at a deprivational index quintile level 5 as was North West Province's Potchefstroom (NW-P) sub-district. These sub-districts were thus also compared.

3.4.2 Sample size, distribution and sampling procedure.

Thirty primary healthcare clinic nurses in charge of primary healthcare immunisation clinics within the North West and Gauteng provinces (15 per province) were recruited according to accessibility and according to the district demographic classification (Day & Gray, 2008). This purposive participant recruitment strategy was adopted to ensure that the deprivation index difference in profile between the two provinces was maintained. Purposive sampling allows for specific selection of paticipants based on criterion the reseacher considers to be appropriate (Mawell & Satake, 2006). These nurses were either officially within the position of Operations Manager or Acting Operations Manager or heading the clinic at that time if the incumbent was unavailable for the interview. In the case of the last mentioned, the researcher was assured by the Operations/Acting Operations Manager that the person in his/her place had the requisite knowledge pertaining to clinic functioning at all levels. The interview location (for all interviews including those conducted for the pilot project) was the participant's immunisation clinic.

Specifically, non-probability purposive sampling was used to select the health districts that met the desired demographic criterion (one of reduced status in North West Province with one of similar standing in Gauteng Province, and one of improved and more urban standing in North West Province with one of similar standing in Gauteng Province (Day & Gray, 2008). This was to ensure the contrast required within the two overall groups was maintained as recommended by (Burns & Grove, 2001), where the researcher purposefully selected the appropriate regions.

Within this appropriately selected demographic location, convenience sampling of appropriate primary health care clinics ensued, where the offering of immunisations to infants at six, ten and fourteen weeks was a prerequisite. Maxwell and Satake (2006) define

convenience sampling as a non-purposive technique where selection is based on convenient accessibility. Due to time constraints, the clinics selected were those in closest in proximity to the researcher's residence. It must be noted that within Gauteng Province, as sufficient participants could not be garnered from the Randfontein sub-district, further participants were selected from the deprivational index similarly classified adjacent Mogale sub-district (Day & Gray, 2008). This constituted four participants from these two sub-districts for ease of comparison to the eight participants from the North West Potchefstroom counterpart. The final sample thus included in the current study constituted seven GP-COJ participants, seven NW-M, eight GP-R/M participants, and eight NW-P participants, with one participant per PHC clinic.

3.4.3 Participants.

3.4.3.1 Participant selection – inclusion/exclusion criteria.

For participants to be included in the current study, the following criteria had to be met:

1. The health care nurse to be interviewed was required to be in charge of the individual clinic's overall functioning. As the study was located within the context of the DoH's MCWH Cluster, specifically the immunisation scheduled programme, the healthcare nurse in charge of the individual clinic's overall functioning (or in the position of acting clinic manager), was recruited for the interview process. A main reason for selecting the clinic manager as interviewee was that being at the helm implies insight as to the detailed workings of the particular clinic in question (S. Mkoka, personal communication, August 11, 2009). In this way, relative control was exerted over confounding variables, where undesirable extraneous variables are recommended to be kept at a minimum so as not to unduly skew results (Maxwell & Satake, 2006). In

this instance, extraneous variables were considered to include a lack of knowledge or familiarity with clinic processes, administration protocols and information, immunisation protocols and information, as well as general clinic logistical information.

2. Health care nurses to be interviewed were required to be located within Gauteng and North West provinces in designated proportions as defined under sample selection.

3. Each participant needed to be to be conversant in English as the interviews were conducted in English.

Due to logistical time and geographical constraints, the participants that were interviewed were of all races, where familiarity with the cultural aspects of the predominant Black communities serviced (Statistics South Africa, 2005a), may have been somewhat reduced, presenting an extraneous variable that could not be controlled. This may be seen to have obscured some results such as those pertaining to interviewees' impressions of patient cultural beliefs as it impacts on health services received. However, as the health care service reality base is one where service providers may not be familiar with the cultural perspectives of the patients they attend to, the overall research milieu was thought to provide an adequate reflection of interviewee perceptions.

In addition, again due to logistical time and geographical constraints, the participants that were interviewed were not required to be within the position of Operational Manager or Acting Operational Manager for a minimum specified time frame. Although this was originally considered important, as this criterion would have reduced the number of eligible participants, it was decided not to include this as a participant selection criterion. This may have obscured some results pertaining to two participants who were within their positions for less than three months. These two participants' answers to questionnaire items may have

reflected reduced insight due to the lack of the participants' familiarity and resultant insight regarding a particular clinic's functioning.

3.5 Test Protocol

3.5.1 Material and apparatus.

The following materials were used to obtain data from the current study:

1. ***Participant information sheets and consent forms.***

   An information sheet(s) describing the purpose of the study and the process involved was presented to each participant prior to initiation of the interview (Appendix A).

2. ***Interview schedule.***

   The interview schedule and questionnaire (Appendix B) used was structured where most questions presented were factual and closed-ended. These were supplemented by several open-ended questions to enable documentation of free thought processes which the researcher transcribed verbatim. The questionnaire was adapted from a self-administered questionnaire previously used in a study conducted in a collaborative effort by EHDI South Africa, the Centre for Deaf Studies and Deaf Education, the University of Pretoria and the University of the Witwatersrand (Theunissen & Swanepoel, 2008). The interview schedule used in the face-to face interviews, consisted of the following sections:

   - Demographic information
   - Work context
   - Hearing screening context
   - Information management and quality control

The following were the adaptations made for collection of information specific to the current study as delineated in the primary aim and specific objectives:

- PHC patient intake processes were included to explore logistics and work burden aspects through potential understaffing as this has been reported as possibly having a negative impact on EHDI implementation (Theunissen & Swanepoel, 2008).
- Questions pertaining to and detailing the most neonatal health conditions and disability issues in children under five in South Africa were added (Day and Gray, 2008; Olusanya, 2005). This was aimed at clarifying factors pertaining to burden of disease and possible associated clinic priorities as they impact on EHDI implementation.
- Questions were added pertaining to interviewee knowledge on hearing impairment in children equal to or under a year, ear infections in children, and attitudes and perceptions towards hearing impairment. This was done as De Andrade and Ross, (2005) and Swanepoel (2006) assert that community based primary health care workers' knowledge and attitudes towards hearing impairment may directly or indirectly influence the EHDI process from an assessment or patient compliance point of view. In addition the levels of awareness of ear issues may directly or indirectly influence the EHDI process from an assessment or patient compliance point of view (Olusanya, 2000). The WHO acknowledges a need to increase knowledge and skill amongst primary healthcare workers in developing world contexts (2010c).

3. Tape recorder.

A digital tape recorder (Sony ICD-UX81F) was used to record interviews to increase the accuracy of the responses documented by cross-checking the verbatim transcription of responses already conducted during the interview. Using a tape

recorder to verify transcriptions improves the quality of the data collection and reliability and validity of the transcription process (Maxwell & Satake, 2006).

3.5.2 Procedures.

Prior to the study being conducted, permission was sought from the University of the Witwatersrand Human Ethics Committee (Medical) and approval to conduct the research (clearance certificate number M091040) was granted in October 2009 (Appendix C). This approval together with a detailed research proposal was then submitted to the Gauteng Province and North West Province Directors: Policy, Planning and Research divisions. Permission was obtained from the respective province directors, specifically, from the Gauteng Province Director: Policy, Planning and Research, Ms Sue Le Roux (Appendix D) as well as from the North West Province Director: Policy, Planning and Research, Mr K. Rabanye's office (Appendix E). Additional levels of written permission (Appendices F, G, and H) as well as verbal permission were obtained from the specific sub-district divisions to ensure ease of access to the respective clinics. Thereafter, permission was obtained from individual immunisation clinic managers or their assigned deputy so as to ensure the participants' autonomy. This was done via telephonic conversation where information regarding the research topic was imparted, and an appointment of mutual convenience for the interview booked. Formal informed consent and participant agreement to partake in the research process was provided prior to the commencement of each interview where permission to proceed was granted by the participant in writing.

Data was collected via verbatim documentation of respondents' answers and audio-taped recordings of interviews which were transcribed. Questions were also asked in numerical order to ensure consistency of format and organisation between interviews. Consistency

within the content analysis process is recommended in order to facilitate improved reliability of results obtained (Neuendorf, 2002).

The time frame for administering the structured interviews spanned a maximum of one hour per interview. The research data collection phase extended over approximately a one month period.

3.5.3 Recruitment of participants.

During the initial telephonic contact, each prospective participant was informed as to whom the interviewer represented, the interview purpose and why the respondent was chosen, what was required of the interviewee, the approximate duration of the interview, and the interviewee's rights (including the rights to confidentiality, anonymity and autonomy). The need for a quiet location where interruptions were to be minimised was expressed. The importance of minimal distractions from interruptions (including telephone, administrative and patient interruptions) to improve focus on the interview questions and answers elicited. Following this telephonic session, participants volunteered to participate in the study.

3.5.4 Ethical considerations.

All ethical considerations were observed throughout this study starting with securing ethical clearance from the university authority, obtaining permission from the provincial directorates: Policy, Planning and Research, as well as having informed and received written consent from the participants being interviewed. Ethical considerations were based on the Nuremberg Code of Ethics (Office of Human Subjects Research, n.d.) and the Belmont Report on ethical treatment of research participants (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979 as cited by the ASHA,

2008), as well as the World Medical Association (WMA) Declaration of Helsinki (WMA, 2008). Specifically:

The research proposal was submitted to the University's Ethics Committee for Research on Human Participants (medical) in accordance with all associated codes of ethics required (Appendix C). Only once the ethics certificate was received did the research commence.

Once permission had been obtained as per the procedures detailed above, the interview time was scheduled. Once the participants volunteered to participate in the study, the appropriate timing of the interview was emphasised to ensure time was set aside where interruptions were minimal and to ensure the participant was not compromised in anyway, be it from a personal or professional perspective. Interviewees were also informed of their rights to access the study once the dissertation was submitted/results were available. Specific ethical principles adhered to are as follows:

1. ***Confidentiality.***

   Participants were informed that confidentiality would be maintained at all times throughout the research process the participant's names would not be published and their identity would not be disclosed to third parties. Confidentiality was to be further ensured by encoding names and data and by keeping all information secure within the Department of Speech Pathology and Audiology (University of the Witwatersrand).

2. ***Autonomy.***

   It was emphasised that participants were under no obligation to continue with the research process should they decide against it. Their full rights to withdraw from the study at any stage were to be respected without any negative consequences. They were also informed of their right to choose to not answer specific questions during the interview process

3. ***Beneficence and non-maleficence.***

   Any benefits or risks to participants were foreseen to be minimal as it was information that was sought with no active application of any therapeutic techniques or clinic procedures. The maximum risk foreseen was that the participant would be absent from attending directly to patients and staff for approximately forty five minutes while the interview process was underway. This may have resulted in a forty five minute patient and duty delay.

4. ***Justice.***

   The participants were not considered a vulnerable group. They thus did not fall under the principle of justice for special protection of vulnerable group**s**. Distributive justice, although applicable to the population serviced by participants, was not germane to the participants per se.

3.6 Data Analysis and Statistical Procedures

As the research design was specifically qualitative in nature, direct cause-effect relationships could not be inferred (Schiavetti & Metz, 2002) from the attribute variables associated with the different socio-economic demographic variables of the provinces (North West and Gauteng) from which the target participants were derived. No variables were manipulated and the researcher evaluated comparisons and contrasts derived from the data obtained from the sample groups located purposefully in different demographic contexts.

The data obtained was analysed using content analysis (Neuendorf, 2002) where transcriptions were evaluated to determine and code the emerging themes (Burns & Grove, 2001; Neuendorf, 2002). Specifically, themes were not pre-determined but were words were categorised according to common precepts and emergent themes identified. Quantitative data

analysis, through the use of frequency calculations were condensed into tabular format for ease of frequency comparison between regions. This quantitative process was used as a precursor to the descriptive process and this combination of processes was conducted as per the seven areas of investigation described below. Within the seven areas of investigation and their components, comparisons and contrasts were evaluated between the two provincial sample groups and their sub-groups located in the North West and Gauteng. Specific comparisons were made as follows:

1. The first area of evaluation focused on establishing trends of prevalence of newborn and infant hearing screening conducted at primary healthcare immunisation clinics in the North West and Gauteng provinces as possibly influenced by the different demographics as classified according to the deprivational index based on the Community Survey (CS) 2007, where North West Province is considered to be more disadvantaged than Gauteng Province (Day & Gray, 2008). Questionnaire items B18 and B19 addressed this area of evaluation. The specific comparison was the degree of presence or absence of infant hearing screening where frequencies were calculated per province and per sub-district. Further qualitative descriptive analysis was conducted in reference to the socio-economic demographics of the particular region in question positioned against its comparative counterpart as defined on the Community Survey deprivational index (Day & Gray, 2008).
2. The second area of evaluation reflected analysis of trends pertaining to the procedures and protocols of newborn and infant hearing screening conducted in each province, with the added possible influence of differing demographic attributes as classified according to the deprivational index based on the Community Survey (CS) 2007, where North West Province is considered to be more disadvantaged than Gauteng Province (Day & Gray, 2008). Questionnaire items B8, B12, B13 and B28

addressed the specific procedures and protocol in use pertaining to newborn and infant hearing screening with the following areas of focus:

- Otoscope availability
- Otoscope usage
- Evaluative methods/instruments used other than otoscopic evaluation to assess risk for hearing loss
- Referrals emanating from evaluative methods/instruments used other than otoscopic evaluation to assess risk for hearing loss
- Other risk for hearing loss methods and the timing thereof including (a) reviewing medical records, (b) interviewing the infant caregiver, and (d) physically examining the infant

Content analysis was applied to all responses transcribed verbatim where frequencies of emergent themes were calculated per province and per sub-district. Further qualitative descriptive analysis was conducted in reference to the socio-economic demographics of the particular region in question positioned against its comparative counterpart as defined on the Community Survey deprivational index (Day & Gray, 2008).

3. The third area of investigation aimed to determine and explore the possible concomitant personnel associated factors considered to influence the implementation of newborn and infant hearing screening (N/IHS) programmes, as possibly influenced by the different demographics as classified according to the deprivational index based on the Community Survey (CS) 2007 (Day & Gray, 2008). Questionnaire items B5, B6, B7, B9, B10, B11 and aspects of B23 addressed the four personnel associated factors considered to influence N/IHS as follows:

- Community-based primary health care workers' reported knowledge of hearing impairment as documented by Olusanya (2005) to possibly impact EHDI implementation

- Community-based primary health care workers' reported knowledge on ear infections in children: Otitis media and its associated hearing loss is specifically targeted within the Primary Health Care Package's strategic initiative, where the IMCI's key objectives are to reduce mortality and morbidity (inclusive of disability) from the principle causes of childhood illness (WHO, 2008; DoH, 2001). It was thus deemed relevant to specifically pursue investigation of primary healthcare workers' knowledge pertaining to otitis media and its sequellae, where training in IMCI protocols emphasises the importance of detection and management of otitis media (WHO, 2008; DoH, 2001)

- Nursing training: Community-based primary health care workers' perceptions and attitudes towards hearing impairment are thought to possibly affect the efficacy of healthcare procedure implementation (De Andrade & Ross, 2005; Swanepoel, 2006). As inferred from the WHO's recognition that hearing impairment has been a neglected disability in the public health field with the need to educate communities as well as health personnel (2010c), training pertaining to ear related issues within the South African context, may be directly related to interviewee's knowledge on ear related issues. Interviewee reports on their training were thus evaluated pertaining to (a) ears in infants (under a year old), (b) ear problems in infants (under a year old), (c) and hearing problems

in infants (also under a year old) was felt to be of value as a possible influence on the status of interviewee expression of (a) his/her knowledge, perceptions and attitudes towards hearing impairment and (b) willingness to conduct hearing screening in children. Binary questions were posed in this regard

- Community-based primary health care workers' reported willingness to implement newborn/infant hearing screening procedures: Willingness to conduct procedures may have been based on the healthcare workers' attitudes towards hearing impairment, which is thought to possibly affect the efficacy of health care procedure implementation (De Andrade & Ross, 2005; Swanepoel, 2006)

Frequency calculations were immediately conducted on straight-forward binary answers. All non-binary responses were transcribed verbatim where content analysis was applied to identify emergent themes. Frequencies of emergent themes were calculated per province and per sub-district. Further qualitative descriptive analysis was conducted in reference to the socio-economic demographics of the particular region in question positioned against its comparative counterpart as defined on the Community Survey deprivational index (Day & Gray, 2008).

4. The fourth objective of the current study was to determine and explore other factors that may influence implementation of newborn and infant hearing screening at North West and Gauteng primary health care immunisation clinics, as possibly influenced by the different demographics as classified according to the deprivational index based on the Community Survey (CS) 2007 (Day & Gray, 2008). Factors that have been shown to affect EHDI implementation have included patient return rates

for immunisation, clinic logistics, workload pressures associated with understaffing, and budgetary constraints resulting in hearing screening equipment shortage and poor equipment maintenance (Theunissen & Swanepoel, 2008). Such factors were included in questionnaire items B14, B15, B16, B17, B29, B30, B31, B34 and D1 with specific focus on:

- Patient return rates for immunisation versus return rates for appointments other than immunisations
- Logistics inclusive of immunisation days, clinic noise and clinic space, clinic booking systems, infant record documentation, budgetary constraints, workload pressures associated with understaffing inclusive of burden of disease experienced, most common infant medical issues, disability, as burden of disease relates to staffing pressures, parental awareness, willingness and education. Olusanya (2005) has commented on the priority other diseases and their inherent burden take over hearing impairment.

Again, frequency calculations were immediately conducted on simple binary answers. All non-binary responses were transcribed verbatim where content analysis was applied to identify emergent themes. Again, frequencies of emergent themes were calculated per province and per sub-district. Further qualitative descriptive analysis was conducted in reference to the socio-economic demographics of the particular region in question positioned against its comparative counterpart as defined on the Community Survey deprivational index (Day & Gray, 2008).

5. Once the trends pertaining to the procedures and protocols of infant hearing screening as conducted per province were identified, comparison between the hearing screening protocols in use in each province to the HPCSA (2007) EHDI

position statement clinic guidelines and associated benchmarks was conducted. Here thematic content analysis was applied to evaluate the data obtained from open-ended questions where respondents' thoughts and opinions were conducted.

6. Through collective evaluation of all the above, the main aim of the study was addressed through qualitative induction pertaining to the feasibility of implementing the HPCSA 2007 clinic based guidelines for EHDI in the South African context.

Limitations of chosen method of analysis include non-generalisability of results to larger samples of the population under investigation due to the small sample size of participants. Results of smaller groups may not be representative of larger populations (Babbie, 1995; Maxwell & Satake, 2006).

3.7 Reliability and Validity

In qualitative research it is commonly acknowledged that determining validity stems from the project's reliability (Maxwell & Satake, 2006). Validity cannot be presumed without facts that yield consistent results (Maxwell & Satake, 2006). In order to ensure research reliability in the current research study, controls were excercised pertaining to participant variables, parameters pertaining to the questionnaire used to obtain information and the interview procedures employed. The following are the specific measures that were applied to ensure reliability and validity in the current study:

3.7.1 Pilot project.

In order to validate the questionnaire and protocol used, a pilot study was conducted prior to the main research project. Pre-test administration of the research instrument on participants that share target population criteria allows the researcher to determine validity

and reliability by identifying flaws in the research process e.g. ambiguous questions and statements, leading questions, biased questions, timeframes associated with the interview process, and researcher bias (Maxwell & Satake, 2006). This pilot project was conducted through interviewing three nursing immunisation clinic managers who complied with all the participant inclusion criteria from three immunisation clinics in Gauteng. All methodological processes and procedures followed were those of the main study. These pilot study participants were not included in the sample for the main study.

After administration of the interview, where responses were documented and audio-taped, a pilot study questionnaire evaluation was administered to assess respondent impressions of the interview process, inclusive of the contextual appropriateness and clarity of questions posed. From the answers elicited and analysis of the interview process, several adjustments were made as follows:

1. Including additional instructions at the initiation of the interview detailing what was required of the respondent and the constraints that would be imposed on the interview dynamic such as the researcher's attempts to refrain from cueing the interviewee with regard to the open ended questions posed.
2. Merging of several questions into one unit. This was done to increase question clarity and economy in order to improve content validity. This also assisted with questionnaire administration and data collection and evaluation.
3. Adding questions pertaining to immunisation logistics such as days available for immunisation. This was aimed at improving the data obtained from the interview process with regard to immunisation logistics as an appropriate context for hearing screening.

No other adjustments were deemed necessary.

3.7.2 Participants.

As per Maxwell and Satake's recommendations (2006), well defined participant exclusion and inclusion criteria (which decreases random error) were adopted. Well defined participant criteria aims to minimise sampling errors (Maxwell & Satake, 2006). In the current study, possible confounding variables such as participant knowledge base may have been reduced pertaining to immunisation protocols and time frames associated with the immunisation process if a non-manager had been interviewed. This was countered by ensuring the clinic manager or acting manager was the person interviewed where this was the person felt to be most appropriate in terms of having the requisite knowledge regarding the interview questions addressed (S. Mokoka, personal communication, 2009).

3.7.3 The interview and questionnaire.

Although simplified language with minimal use of jargon had already been selected for inclusion in the questionnaire, any issues that emerged from the pilot study such as question ambiguity, jargon, reduced clarity, and inappropriate content were addressed to ensure questionnaire suitability, reliability and validity. This maximised the quality of the questions used and the resultant answers obtained. In so doing, content validity was improved as well as overall internal validity of the design (McMillan & Schumacher, 2001).

Being a structured questionnaire, where closed and open-ended questions were utilised, opportunities were still available from the open-ended questions to obtain more detailed answers as per the individual's free thought process. The use of open-ended questions facilitates a reduction in the chance of missing relevant data (Peat, Mellis, Williams, & Xuan, 2002). Open-ended questions also facilitate a sense of interviewee empowerment where their input is valued (Singleton, Straits, & Straits, 1993).

Besides the verbatim documentation of participant responses, questions were also asked in numerical order to ensure consistency of format and organisation between interviews. The importance of verbatim documentation of respondents' replies for open-ended questions were the procedure of choice to facilitate accuracy of data collected from the outset, which was cross-checked with the audio-taped recordings thereafter. As per Schiavetti and Metz's (2002) recommendations, the researcher took conscious care to clarify aspects of the questionnaire without cueing the respondent in order to ensure answers elicited were not researcher-biased.

Conducting consistent and structured interview sessions, as per the procedures delineated, ensured uniformity between and within interviews. Schiavetti and Metz (2002) state that consistency in methods to collect and evaluate data enhances a study's reliability. Study reliability and replicability for research extension was enhanced through the use of only one researcher who emphasised consistency of methods used to collect and evaluate data.

The questions were limited to 47 items (albeit with subsections) in order to minimise the risk of reduced attention and loss of interest, which is often associated with questionnaires that exceed 125 items in length (Maxwell & Satake, 2006).

Prior to the scheduling of the interview appointments, the interviewer enquired as to convenience and appropriate timing of the interview to ensure time was set aside where interruptions were to be minimal and to ensure the participant was not compromised in anyway, be it from a personal or professional perspective. This also lent itself to improved reliability and validity where more convenient times aimed at reducing distractions may facilitate greater attention to required tasks under investigation (McMillan & Schumacher, 2001).

3.7.4 Method of evaluation.

Triangulation of research methods involves more than one approach to the investigative process which enhances confidence in findings obtained (Bryman, 2001). Although the limitation of non-triangulation of research methods was inherent to the current study's design, where a single method research design was utilised, as per Maxwell and Satake's recommendation (2006), cross-check principles to improve data accuracy were important to apply where possible. To increase data trustworthiness, immediate verbatim documentation of participant responses compared to transcriptions of audio-taped recordings of these responses provided an important cross-check to ensure accuracy of the data for analysis. Intra-observer reliability (McMillan & Schumacher, 2001) between verbatim interviewee answers documented within the session compared to transcriptions from the audio-taped recordings resulted in a score of greater than 97%. Twenty-five percent of these transcriptions were re-transcribed independently by a research assistant as an additional cross-check. Independent re-transcription of this nature is aimed at further improving the accuracy of the data captured (McMillan & Schumacher, 2001). Greater than 99% inter-rater agreement was found to be present.

3.7.5 Threats to reliability and validity.

3.7.5.1 Participants, sample and sampling procedure.

Notwithstanding the methodological attempts to minimise confounding participant variables by relative control of subject variability through the strict selection criteria already detailed, homogeneity of participants could only be limited to demographics and job description to reduce within group variance. The inherent heterogeneous nature of the participants (organismic variability such as biological, physical and psychological variables

that cannot be actively controlled (Maxwell & Satake, 2006)) cannot be ignored in the current research sample. This is a limitation together with the purposive sampling procedure that was used and the smaller sample, where generalisation to the general population within each province is reduced by a smaller sample size (Maxwell & Satake, 2006; McMillan & Schumacher, 2001). In addition, non-probability sampling although usually economical, convenient and time efficient, also limited generalisability of results, as results may prove to be non-representative of larger populations (McMillan & Schumacher, 2001).

Furthermore, subject bias such as the Hawthorne effect where participants heightened awareness that they form part of an evaluation process, may have influenced their performance. It must be acknowledged that participants are not passive partakers in the research process where they may potentially react to the content of the research as well as to the research process itself (Maxwell & Satake, 2006). These factors are seen to have been reduced but only to some extent, by having verbally ensured participant confidentiality with regard to their responses, with the added assurance that their job security could not be affected in any way.

In addition, environmental factors such as time constraints may have negatively influence respondent answers, where interviews were interrupted and the knowledge that their patients were inconvenienced by the delays caused by the interview process (as expressed by 5 respondents) may have caused hurried responses with the possible presence of inaccuracies as a result. As the interview took an average of fifty mintues to complete, fatigue may have also negatively influenced interviewees where accuracy of answers provided may have also decreased.

3.7.5.2 The interview and questionnaire.

In order to improve reliability of responses obtained as well as tool validity, certain cross-check items were included such as additional questions pertaining to interviewing caregivers as well as questions pertaining to physical examination of babies. Consistency across questions was evident as was revealed in evaluation of results.

Interview limitations included unconscious bias on the part of the interviewer as well as respondent, e.g. cultural bias, language barriers where language subtleties remain undetected. Such factors may negatively or positively influence interviewer or respondent's subjectivity (Maxwell & Satake, 2006). This was in particular reference to the open-ended questions posed pertaining to participants' knowledge, perceptions and attitudes towards hearing impairment in children equal to or under a year in age, and their knowledge on ear infections in children. It is felt that more specific questions or question explanation may have provided a richer data set of responses. Question explanation and probing was not applied beyond the methodological protocol in order to ensure consistency between interviews. This was also the case with regard to spontaneous elaborations offered by respondents which were aspects not probed by those respondents who did not offer such elaborations. This occurred in reference to statistical register details provided by some respondents but not by others does not imply that statistics registers are not kept by those respondents who did not provide elaborations. In this way results may have been somewhat skewed despite the researcher having taken cognisance hereof. To maintain consistency between interviews, digression from the interview script beyond pilot project alterations was avoided.

Chapter 4: Results and Discussion

4.1 Introduction

The importance of relevant and effective clinical research in the context of clinical service provision, cannot be underestimated, specifically if the research endeavour is to be ethically responsible (Whiston, 1994 in Uys and Hugo, 1997). In the South African developing world context, conducting relevant, effective and ethical clinical research involves evaluating appropriate fit and effective highest-possible-yield hearing screening systems in aspiring to UNHS goals (Olusanya, Luxon, & Wirz; 2004). Assessing appropriate contextual relevance in the framework of rendering highest possible yield is key to reaching the 85% majority community which is reliant on the less resourced public healthcare sector (ANC Today, 2005; Swanepoel, Storbeck, & Friedland, 2009).

The complexities of EHDI service delivery vary according to different contexts (Olusanya, Luxon, & Wirz; 2004). Immunisation programmes are of major significance as globally, they are often the most established child health intervention vehicle, and through multilateral collaborations, they are often the best supported beyond the individual country's capacity (Olusanya & Okolo, 2006). It is within the above-mentioned primary level MCWH immunisation clinic structure that a contextually relevant hearing screening programme has been suggested by Swanepoel, Louw and Hugo (2007), and the HPCSA's (2007) EHDI guidelines.

This chapter aims to describe the findings obtained from the 30 personal interviews

conducted at MCWH PHCs in Gauteng and North West Provinces. Presentation of results for each sub-aim with associated evaluation and discussion of the specific areas considered to impinge on the hearing screening context follows. Tables were used to depict results and only aspects worthy of discussion were highlighted and elaboration provided. All data was extracted from the transcriptions of the personal interviews where thematic content analysis was performed. In this way the study's main aim was addressed and meaningful conclusions with appropriate recommendations drawn within the South African context put forward.

To reiterate, for each sub-aim the two demographically differing provinces (Gauteng Province versus North West Province) were compared with further evaluation of their sub-districts considered analogous on the Community Survey based deprivation index (Community Survey, 2007). Here the GP-COJ sub-district was classified as similar to NW-M sub-district, and GP-R/M sub-district was classified as similar to NW-P sub-district (Day & Gray, 2008). This was done to add depth to the understanding of results and conclusions drawn (Community Survey, 2007; Day & Gray, 2008).

4.2 Participant Demographics

The 30 primary health care nurses in charge of clinics were located in North West and Gauteng provinces, 15 per province, with a further division per province into two distinctive districts dissimilar in standing on the Community Survey (2007) deprivational index (Day & Gray, 2008). This information is depicted in Table 1 overleaf.

Table 1

Participant Demographics in Relation to District and Deprivational Index Standing

[Community Survey (2007), Day & Gray, (2008)]

Province	**Sub-district**	**Participant number**	**Deprivational Index Quintile Rating** (5 being least deprived, 1 being most deprived)
Gauteng	City of Johannesburg (GP-COJ)	7	4
Gauteng	Randfontein/Mogale (GP-R/M)	8	5
North West	Merafong (NW-M)	7	4
North West	Potchefstroom (NW-P)	8	5

Key: GP-COJ: Gauteng Province, City of Johannesburg District; GP- R/M: Gauteng Province, Randfontein/Mogale District; NW-M North West Province, Merafong District; NW-P: North West Province, Potchefstroom

All the nurses interviewed were either officially in charge of the PHC clinic as Operations Manager, as Acting Operations Manager (as their official title) or as designated Sister in Charge for the day. Figure 1 overleaf depicts the breakdown of interviewees per district according to their formal job title.

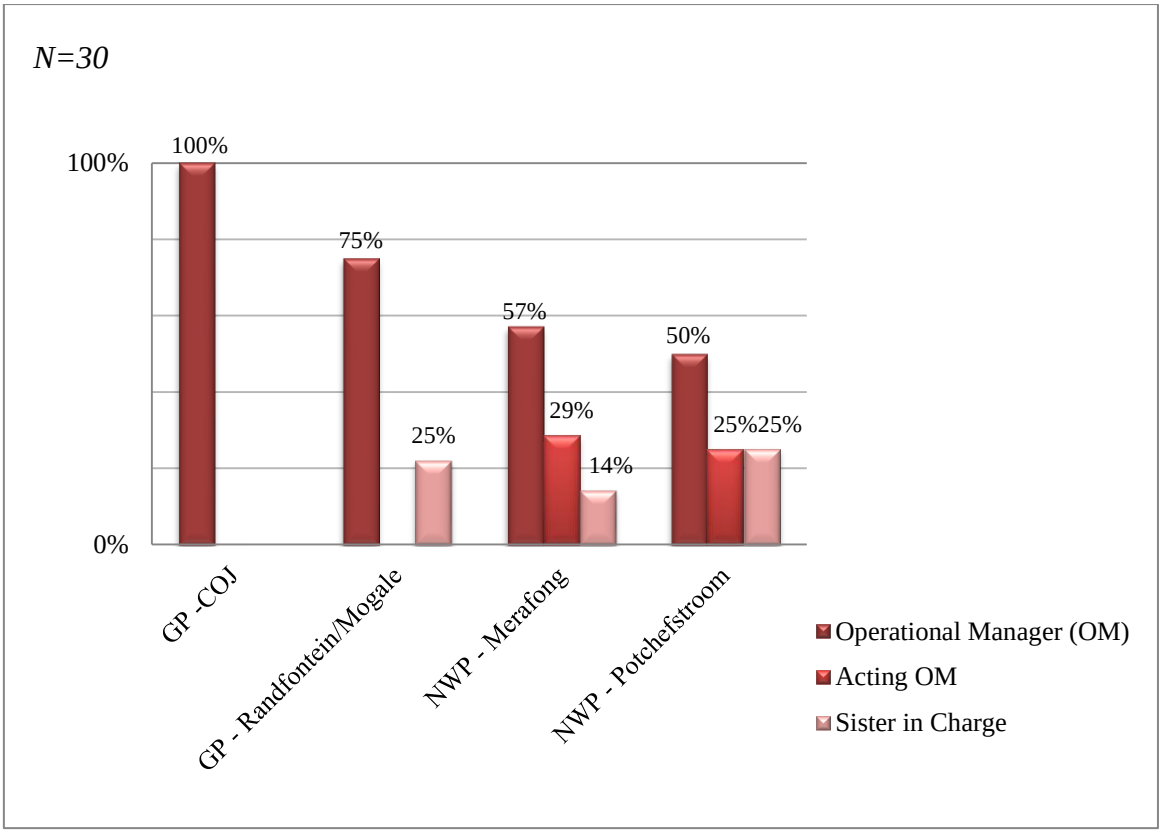


Figure 1. Distribution of interviewees according to official job title per district

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-M): North West Province, Merafong District; (NW-P): North West Province, Potchefstroom District

The distribution of participants depicted in Figure 1 was considered representative of the contrastive demographics in order to ascertain whether socio-economic factors [according to the Community Survey 2007 deprivational index (Day & Gray, 2008)] were of influence on the N/IHS processes and protocols in use. Racially, the sample was made up of 29 Black (Black and Coloured) South Africans and one White South African. The largest number of participants spoke an African language. This is considered representative of the nursing workforce in charge of primary health care clinics. It must however be noted that as the sample size was restricted to 30 participants, generalisability to the population at large was reduced (McMillan & Schumacher, 2001).

4.3 Prevalence of Newborn and Infant Hearing Screening Conducted at Primary Health Care Immunisation Clinics in North West and Gauteng Provinces

The first sub-aim of the study was to describe the prevalence of hearing screening currently being conducted within the MCWH primary healthcare immunisation clinics per specific region and per specific sub-district. Results are reflected in Tables 2 and 3 below.

Table 2

Prevalence of Newborn/Infant Hearing Screening (N/IHS) and Rationale (N=30)

Region	Yes	No	Reasons								
			No Equip-ment	General Budgetary issue					Human Resource Issue		
				Yes	No	Maybe	Unsure	District Issue	Yes	No	Unsure
GP – COJ Subtot *n*=7	**0**	**7**	**7**	**5**	**0**	**2**	**0**	**0**	**7**	**0**	**0**
NW – M Subtot *n*=7	**0**	**7**	**7**	**3**	**0**	**0**	**4**	**0**	**5**	**1**	**1**
GP-R/M Subtot *n*=8	**0**	**8**	**8**	**3**	**0**	**3**	**2**	**0**	**8**	**0**	**0**
NW –P Subtot *n*=8	**0**	**8**	**8**	**1**	**1**	**3**	**0**	**3**	**6**	**2**	**0**
GP Subtot *n*=15	**0**	**15**	**15**	**8**	**0**	**5**	**2**	**0**	**15**	**0**	**0**
***n*=15 %**	**0**	**100**	**100**	**53.3**	**0**	**33.3**	**13.3**	**0**	**100**	**0**	**0**
NW Subtot *n*=15	**0**	**15**	**15**	**4**	**1**	**3**	**4**	**3**	**11**	**3**	**1**
***n*=15 %**	**0**	**100**	**100**	**26.7**	**6.7**	**20**	**26.7**	**20**	**73.3**	**20**	**6.7**
TOTAL GP+NW *N*=30	**0**	**30**	**30**	**12**	**1**	**8**	**6**	**3**	**26**	**3**	**1**
***N*=30 %**	**0**	**100**	**100**	**40**	**3.3**	**26.6**	**20**	**10**	**86.7**	**10**	**3.3%**

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

As depicted in Table 2, all PHCs did *not* offer nor provide formalised newborn/infant hearing screening. All participants reported that they did not have the equipment to do so. Of further interest is that 40 percent of all respondents (8 GP and 4 NW respondents) felt that general budgetary issues were plausible reasons for the absence of hearing screening services

at their clinics, with an overwhelming majority of respondents (86.7%) having regarded human resource constraints to be the major contributing factor to the lack of hearing screening services offered. Although only cited by 10% of respondents (by 3 NW-P respondents), district issues (referred to as management decisions made at a district level) were considered to be an influence in rendering N/IHS services. NW-P respondents elaborated that if the matter was not sanctioned at a district level, provision of a hearing screening service would not be taken seriously and would not be implemented.

When comparing the prevalence of N/IHS between the two provinces, findings reflected that all GP respondents related the lack of N/IHS service delivery to human resource issues, with 53.3% of GP respondents having attributed lack of hearing screening services rendered to general budgetary constraints (referred to as general lack of government funding to primary health care service providers). In contrast, 73.3% of NW respondents related the lack of N/IHS service delivery to human resource issues, with 26.7% having cited general budgetary issues to the lack of such services rendered. Similar trends were present at a sub-district level.

Further in-depth analysis of human resource issues revealed the following, as depicted in Table 3 overleaf.

Table 3

Prevalence of Newborn/Infant Hearing Screening (N/IHS) and Rationale – Human Resource Reasons Provided (N=30)

Region	Human Resource Reasons					
	Human Resource Budgetary Issue	Reduced Staff Training	Unspecified General Budgetary Issue	Staff shortage	Space	Unsure
GP – COJ Subtot *n*=7	0	*5*	1	0	0	0
NW – M Subtot *n*=7	0	0	2	2	1	0
GP-R/M Subtot *n*=8	0	*5*	0	2	0	1
NW –P Subtot *n*=8	1	3	0	0	0	0
GP Subtot *n*=15	0	10	1	2	0	1
n=15 %	0%	66.7	6.7	13.3	0	6.7
NW Subtot *n*=15	1	*3*	2	2	1	0
n=15 %	6.7	20	13.3	13.3	6.7	0
TOT GP+NW *N*=30	1	13	3	4	1	1
N=30 %	3.3	43.3	10%	13.3	3.3	3.3

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

Of the total sample (*N*=30), 43.3% of respondents (mainly from GP) considered the lack of appropriate training in newborn or infant hearing screening to be a central reason which influenced the provision of N/IHS services. This was followed by general the staff shortages as mentioned by 13.3% of respondents. NW highlighted a spread of human resource related factors such as (but not limited to) budgetary issues and staff shortages. These responses

show clear differences between the two provinces and their sub-districts in relation to what respondents view to be contributing factors to the lack of N/IHS services in these clinics. In addition, the fact that NW related the lack of N/IHS less readily to budgetary reasons than GP was unexpected, where one would have anticipated the more deprived NW region (Day & Gray, 2008) to have directly and immediately referred to reduced financing as the perceived causal factor behind the absence of N/IHS services rendered.

The unexpected differences between provinces and districts within provinces, with specific mention by NW-P of the important role of district level governance may be related to differences within the specific regional and district management styles and priorities, especially given the greater level of authority the individual district is now able to exercise (DoH, 2009). Within the DoH strategic plan, decentralised management of health districts has been strengthened for improved local accountability (DoH, 2009). The HPCSA Position Statement (2007) recommends inclusion of the responsible DoH agency to jointly facilitate the appropriate hearing screening programme (HPCSA, 2007). In this instance, it would appear that district level direct involvement in recommended hearing screening protocols is paramount in terms of the hearing screening programme's fit and application, where N/IHS may need to be more flexibile than implied by HPCSA 2007 recommended protocols. In addition, not only has inequity in DoH provincial financing been described, but inequality in DoH district financing has also been reported (DoH, 2009). Swanepoel, Storbeck and Friedland (2009) acknowledge that the South African public health sector is often less resourced than the state-of-the-art private health care sector. Theunissen and Swanepoel (2008) refer to a lack of equipment and staff shortages as the major contributing factors to reduced NHS services in the South African context, evidence which is consistent with current findings. What was unexpected was the extent to which the lack of staff training was cited overall as the main contributing reason to the lack of N/IHS service provision at a PHC level.

It is thus recommended that district level DoH financing, participation and autonomy be considered when negotiating inclusion of N/IHS services with varied government level departments. It is suggested that specific DoH district policies and protocols be investigated in depth to ascertain specific levels of district financing and autonomy and how these relate to hearing health care service delivery, either through government collaborative endeavour.

4.4 Hearing Screening Procedures and Protocols in use at Immunisation Clinics in North West and Gauteng Provinces

The second sub-aim of the study was to describe the hearing screening procedures and protocols in use at MCWH cluster primary healthcare immunisation clinics in North West and Gauteng provinces.

4.4.1 Otoscope availability.

All MCWH PHCs had otoscopes readily available at their clinics with one dedicated per consultation room. Twenty four of the 30 respondents (80%; *N*=30) reported these to be working, with the rest having commented that they were unsure if all were in working order. The Primary Health Care Package stipulates that auroscopes with spare batteries and bulbs is the basic equipment requirement in its Integrated Management of Childhood Illnesses (IMCI) protocol, as part of its norms and standards pertaining to prevention of hearing loss due to otitis media (DoH, 2001 and 2005). Thus this adequate supply of working otoscopes was anticipated across regions.

4.4.2 Otoscope usage.

As a first step in the IMCI ear screening process, it was considered important to

understand any variance in otoscope usage application. The majority of respondents (76.7%; *N*=30) stated that they only conduct otoscopic examinations on some babies, with only 2 respondents (one from GP-COJ, and one from NW-M) having stated that they do not conduct otoscopic evaluations on any babies under the age of five years. This is reflected in Figure 2 below.

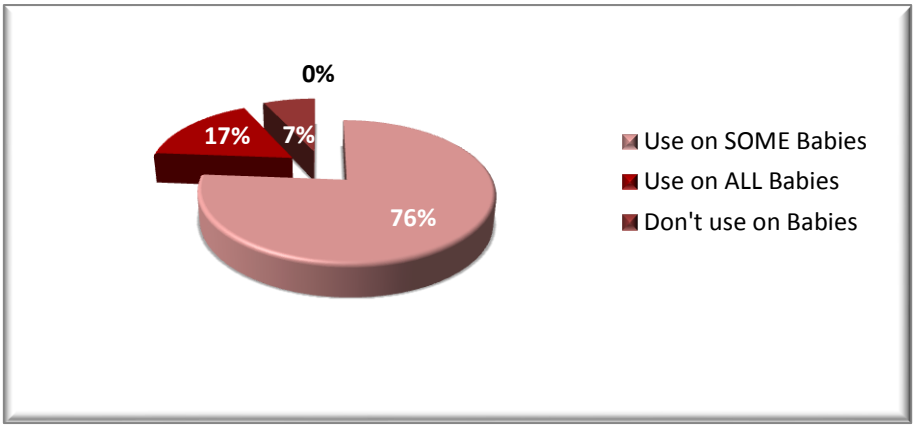


Figure 2. Otoscope Usage on Children below 5 Years of Age

Otoscope usage on some babies was only slightly more prevalent in NW-P than in GP with 11 GP respondents (73.3%; *N*=15) and 12 NW respondents (80%, *N*=15) doing so. Twenty three respondents elaborated on when and why they only evaluated some babies. These were documented and categorized into themes as reflected in Table 4 below.

Table 4

Themes Identified Regarding Otoscope Usage on Some Babies (N=23)

Region	Otoscope Usage on Some Babies – Themes identified				
	At RtHC milestone age	On babies with ear related problems (unspecified)	On babies with ear related problems as reported by the caregiver	On babies with ear related URTI problems	On babies with ear related child behaviour problems
GP – COJ Subtot *n* =4	1	1	2	3	1
NW – M Subtot *n* =6	0	2	2	5	0
GP-R/M Subtot *n* =7	1	1	2	5	1
NW –P Subtot *n*=6	1	4	3	3	2
GP Subtot *n* =11	2	2	4	8	2
n =11 %	18.8%	18.8%	36.4%	72.7%	18.8%
NW Subtot *n* =12	1	6	5	8	2
n=12 %	8.3%	50.0%	41.7%	66.7%	16.7%
TOT GP+NW *N*=23	3	8	9	16	4
N=23 %	13.0%	34.8%	39.1%	69.6%	17.4%

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total o NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

As reflected in Table 4, the identified themes revealed that the majority (69.9%) of otoscopic examinations was performed in accordance with infants' presentation of upper respiratory tract related symptoms. NW-M district was the only region not to conduct

otoscopic examinations on children exhibiting ear related discomfort problems or at DoH (2004) RtHC milestone ages. Such discomfort was specified as ear scratching and/or pulling at ears, and/or crying when ears were touched. In addition, it was predominantly the NW-P region that conducted otoscopic examination on babies that presented with ear related problems, although the nature of these problems remained unspecified. However, NW-P respondents (3; *n*=6) demonstrated only a 50% confirmation that otoscopic examination was conducted on infants presenting with upper respiratory tract infection (URTI) symptoms. In fact 2 NW-P respondents claimed that the IMCI code of conduct only warranted otoscopic evaluation to investigate ear obstruction and ear drainage post medication to assess treatment efficacy. No documentation in support of these claims was accessible to the researcher.

The above results cite URTI as a seemingly important marker of possible negative ear sequellae for PHC health care providers. As otitis media with effusion is a well established complication of URTI (Skoner, 2000), it is not surprising that URTI is reported as the predominant alert to ear related health issues for PHC health care providers, and is so defined by the DoH IMCI protocols and standards (DoH, 2001; DoH 2005). However, these Primary Health care Package IMCI standards specify the use of an otoscope to inspect the external auditory canal and tympanic membrane in specific reference to the detection of otitis media and otitis externa (DoH, 2005). These IMCI protocols also call for caregiver interviews pertaining to child behavior in relation to ear discomfort and hearing (DoH, 2001; DoH, 2005). One would thus have anticipated otoscope usage in diagnosis and treatment of infants to be more prevalent than what was evident in this primary health care setting. The overall impression was one of inconsistent application of otoscopic evaluation, where the IMCI intention is for more vigilant use thereof in the diagnosis of otitis media with effusion and monitoring of its treatment efficacy (DoH, 2005). The observation of compliance gaps within and across sub-districts may be attributable to the relative autonomy now excercised

by districts pertaining to health care management (DoH, 2009).

4.4.3 Evaluative methods/instruments used other than otoscopic evaluation to assess risk for hearing loss.

A key element in the EHDI process is high yield from identification protocols at the earliest age possible (JCIH 2000; JCIH, 2007; HPCSA, 2007). It was thus important not only to evaluate on which babies risk for hearing loss procedures were employed but when these procedures were administered.

Only one respondent, located within the NW-M district, reported to not actively having used methods other than otoscopic evaluation on infants. Predominant themes were identified from 29 interviewees (96.3%, *N*=30) who reported to conduct evaluative methods other than otoscopic examination to assess risk for hearing loss. These included reviewing medical records (named as patient referral letters and RtHC running notes), interviewing caregivers, and conducting examinations of infant responses to environmental sounds incorporating noisemaker and/or verbal stimuli.

4.4.3.1 Environmental sounds incorporating noisemaker and/or verbal stimuli (N=29).

Twenty two respondents (75.9%; *N*=29) revealed that they conducted a hearing screening comprised of presenting environmental sounds to the infant whilst monitoring the infant's behavioural responses, and 11 respondents (37.9%; *N*=29) also commented that they evaluated the infant's behavioural responses to speech. These were reported to be conducted at different times, not necessarily on all babies but either when an ear related problem was indicated or at RtHC milestone assessments. At RtHC immunsations or milestones review,

physically examining babies' responses to noisemakers and/or speech stimuli was conducted by 30% (*N*=30) of respondents (6 GP and 3 NW respondents).

The techniques used to screen infants' behavioural responses to environmental and speech sounds were described as elementary, with environmental sound presentation such as shaking a rattle, knocking the tip of a pen on an object, banging a door, and talking to the baby. Some respondents detailed their stimuli (noisemakers and speech) as being presented loudly from behind the baby while others indicated that this was not always the case, for example where presentation may have occurred within the child's visual field. Furthermore, when comparing these techniques to the more standardised physiological audiological approaches for infant hearing screening, it becomes evident that these techniques require review since they have been proven to lead to false negatives, with their associated reduced sensitivity and specificity (Lutman, 2000).

4.4.3.2 Reviewing medical records and conducting caregiver interviews (n=30).

Reviewing medical records *when a problem was indicated* was conducted mostly (76.7%; *N*=30; BY 13 NW and 10 GP respondents) on babies where a problem was indicated. Similarly, just over half (53.3%; *N*=30) stated they conducted caregiver interviews. At RtHC immunsations or milestones review, reviewing medical records was conducted by 63.3% (*N*=30; by 11 NW and 8 GP respondents) of respondents, interviewing the caregivers was performed by 16.7% (*N*=30) of respondents and physically examining babies' responses to noisemakers and/or speech stimuli was conducted by 30% (*N*=30) of respondents (6 GP and 3 NW respondents).

Regarding all of the above screening processes, what is of concern is that only 20% (*N*=30) of respondents reported to review all babies' medical records, 43.3% (*N*=30) reported

to interview all caregivers, and 26.7% (*N*=30; by 4 NW-P and 2 GP-COJ respondents) stated they performed physical examinations of the babies' responses to noisemakers and/or speech stimuli on all babies.

From a clinical perspective, across districts, the above procedures to screen risk for hearing loss are in agreement with IMCI protocols, particularly as they relate to identification and treatment of otitis media in infants (DoH, 2001; DoH, 2005), as well as RtHC milestone hearing screenings (DoH, 2004). However, it is the IMCI otitis media protocols (DoH, 2001; DoH, 2005) that have been adhered to more consistently with regard to assessment of risk for hearing loss within the PHC setting. The broader approach to assess for conditions other than otitis media has demonstrated less IMCI protocol adherence, with more inconsistency reported in assessing risk for hearing loss at RtHC milestone age (DoH, 2004). Lack of consensus regarding uniform application of techniques to assess for risk of hearing loss marginalises those children who don't present with a history of ear related issues through medical record review, caregiver reporting, or the more obvious presentation of an ear related problem. The silent epidemic of hearing loss, where its effects, particularly in less severe presentation, may not be obvious to the observer (Swanepoel, Hugo & Louw, 2005), necessitates active pursuit in identifying and diagnosing hearing loss as is recommended in both developed and developing world contexts (JCIH, 2007; HPCSA, 2007). In addition, the methods advocated by the JCIH (2007) and HPCSA (2007) for detection of hearing loss are recognized as being more reliable and accurate, inclusive of inherent greater sensitivity and specificity than the rudimentary processes currently described to be in use in the PHC setting. This is cause for concern according to UNHS goals, where targeted yield, through use of a formalised programme with objective physiological measures, is at least 95% of the population at large (HPCSA, 2007; JCIH, 2007). This has significant clinical implications for the need to render an improvement in hearing screening services to infants located within

these districts.

Such improvements may be actualized by revisiting IMCI protocols, where inclusion of other etiologies of hearing loss are patently expressed in documentation and training processes, with less emphasis on otitis media and its possible hearing impairment consequences to the point of exclusion of other etiologies (DoH, 2005). In addition, greater emphasis must also be made of the RtHC hearing assessment protocol where hearing assessments are to be conducted routinely at 3 months, 6 months and over a year of age. In conjunction herewith, the local district authority's role in the variation of application of IMCI and RtHC protocols must be incorporated, especially considering the greater sense of autonomy that districts are now able to exercise (DoH, 2009).

4.4.4 Referrals emanating from evaluative methods/instruments used to assess risk for hearing loss.

Exploration of themes pertaining to the nature and timing of referrals made is paramount to understanding the diagnostic support available should a hearing deficit be suspected. Diagnostic follow-up is a critical ethical marker in the hearing screening process, where diagnostic services are propagated as inherent in any comprehensive and ethical hearing screening process (JCIH, 2000; JCIH, 2007; HPCSA, 2007).

Twenty five of the 30 respondents (83.3%; *N*=30; 13 GP and 12 NW) made referrals to the district's tertiary area specialist as soon as an infant was suspected of having a hearing impairment based on the various assessment techniques in current use. This is encouraging as a first step to early identification and intervention of hearing loss, which is paramount to improving communication outcomes (Northern & Downs, 1991), and associated literacy development and educational outcomes for those with hearing loss (DesJardin, Ambrose,

Martinez, & Eisenberg, 2009). Of the five remaining respondents (16.7%; *N*=30), two NW-M reported that referrals were made at the immediate second clinic assessment or parental report of possible negative hearing repercussions. Three of these remaining five respondents (2 GP-COJ clinics, 1 NW-M clinic), reported a six month delay in referral for further evaluation. Included in the IMCI otitis media and associated hearing loss protocol is the generalized reference to the importance of referrals of "all patients with speech, language and/or auditory perceptual problems" (DoH, 2005; p.18). The immediacy of such referrals is not specified and given that symptoms in infants are not easily observable, and where false negatives are generally increased through subjective behavioural observation techniques (Lutman, 2000), one may anticipate marked referral delays within the PHC system when compared to the systems where more precise objective audiological techniques are used. Late referrals for hearing loss are in direct conflict with JCIH and HPCSA (JCIH, 2000; JCIH, 2007; HPCSA, 2007) recommended guidelines, and are considered problematic because reduced timeous intervention renders hearing loss a severe threat to essential quality of life indicators (Swanepoel, Delport, & Swart, 2004).

The aforementioned referrals of babies suspected of presenting with hearing loss were made either directly by the PHC nurse or the PHC facility doctor. The two sub-districts considered alike on the deprivational index (GP-COJ and NW-M; GP-R/M and NW-P) (Day & Gray, 2008) performed similarly in terms of immediacy of referrals, with the two sub-districts deemed to be more advanced (GP-R/M and NW-P) demonstrating improved referrals as soon as a possible hearing problem was detected. However, differences between the provinces were marked in reference to referral options, where GP demonstrated markedly more referrals (53.3%; *n*=15) to regional audiologists or tertiary level Speech Therapy and Audiology Departments compared to only 2 (13.3%; *n*=15) references made by NW participants to either a sub-district school nurse or an audiologist. This overall reduced

referral rate and use of audiology services may highlight lack of respondent knowledge of services rendered by audiologists and/or may reflect on the regional and district policy. Again, closer examination of policy pertaining to district referrals of infants with hearing loss with consideration of the possible relative district autonomy (now permitted and considered as strategic by the DoH (2009) is required to adequately draw conclusions. This is recommended for future research endeavours.

4.5 Possible Concomitant Personnel-Associated Factors which may Influence the Implementation of Newborn and Infant Hearing Screening Programmes

The third sub-aim of the study was to determine and explore possible concomitant personnel-associated factors which may influence the implementation of newborn and infant hearing screening programmes at North West and Gauteng provinces immunisation clinics.

4.5.1 Community-based primary health care workers' knowledge of hearing impairment.

The most prevalent theme identified by 19 respondents (63.3%; *N*=30) in response to the direct question, "What is your knowledge on hearing impairment in children…", are revealed in Table 5 below.

Table 5

Themes Identified Regarding Participant Knowledge of Hearing Impairment (in infants ≤ 1 year) (N=30)

Region	**Knowledge on Hearing Impairment (in infants ≤ 1 year)**					
Themes	**Causality e.g. ear infections, trauma**	**How to test**	**Interview Caregiver**	**Child neglect**	**How hearing loss shows itself, how children respond to the world**	**Can't think of anything/don't know**
GP – COJ Subtot *n*=7	**1**	**6**	**2**		**1**	**1**
NW – M Subtot *n*=7	**0**	**3**	**2**	**1**	**3**	**2**
GP-R/M Subtot *n*=8	**1**	**6**	**1**	**0**	**0**	**2**
NW –P Subtot *n*=8	**2**	**4**	**1**	**0**	**0**	**2**
GP Subtot *n*=15	**2**	**12**	**3**	**0**	**1**	**3**
N=15 %	**13.3**	**80**	**20**	**0**	**6.7**	**20**
NW Subtot *n*=15	**2**	**7**	**3**	**1**	**3**	**4**
N=15 %	**13.3**	**46.7**	**20**	**6.7**	**20**	**26.7**
TOT GP+NW *N*=30	**4**	**19**	**6**	**1**	**4**	**7**
***N*=30 %**	**13.3**	**63.3**	**20**	**3.3**	**13.3**	**23.3**

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

As depicted in Table 5, consistency with and expansion of details pertaining to how respondents screened for hearing impairment within the PHC setting was evident. Other themes identified included causality of hearing loss, caregiver interviews and how hearing loss manifests

4.5.1.1 Hearing screening protocol details reflective of respondent knowledge base.

Of significance inter and intra provincially was the aforementioned lack of standardization of the current hearing screening protocols in use at PHC clinics. These were itemised as a combination of non-standardised noise-makers such as the use of rattles and/or bells and/or finger clicking and/or clapping and/or cup and spoon knocking and/or pens knocked against a surface. Speech stimuli were sometimes used as an assessment technique. A concomitant varied knowledge base of the role hearing screening plays in overall PHC infant assessment was evident. To re-iterate, these intra-district inconsistencies may reflect ambiguity within the IMCI protocols available such as RtHC protocols versus IMCI otitis media driven protocols (DoH, 20001 and 2005). Because of the relative autonomy districts are now able to exercise (DoH, 2001; DoH, 2005), the non-standardisation of hearing screening approaches highlight the need for consultation with management at district level in order to improve consistency and appropriateness of hearing screening protocols used.

4.5.1.2 Perceived causality of hearing loss reflective of respondent knowledge base.

Three respondents (13.3%; *N*=30) reflected answers detailing hearing impairment to be the possible complication of untreated otitis media, with one NW-P respondent having further specified that untreated otitis media could in turn lead to an inner ear infection with further hearing loss. This respondent and a GP-R/M stated that early intervention was thus paramount in the treatment of otitis media. This reference to otitis media is pertinent as the IMCI protocol frames its references to hearing loss, mainly within the context of otitis media (DoH 2001; DoH, 2005). This is paramount to ensure that more reference to non-otitis media based screening and/or referral for hearing assessment must not merely be mentioned but must be emphasized in IMCI protocols in order to ensure that those children with non-otitis

media-like hearing symptoms are not marginalised. In this way, the aim of ensuring that the greater than 5% of infants with hearing loss (as advocated by the JCIH 2000; JCIH 2007; HPCSA, 2007) do not inadvertently miss the opportunity for early detection and intervention for hearing loss. Early detection and intervention of hearing loss is a key tenet in reducing the negative consequences associated with hearing loss (Northern & Downs, 1991) and a precept in the EHDI process (HPCSA, 2007).

4.5.1.3 Caregiver interviews reflective of respondent knowledge base.

A response of note emerged from NW-M sub-district, where one respondent (14.3%; *n*=7) related the caregiver interview as important from a traditional healing point of view, where certain traditional methods were considered to aggravate ear status, such as insertion of breast milk into the ear canals of infants if an ear problem was suspected by the parent.

4.5.1.4 General factors reflective of respondent knowledge base.

Notwithstanding the above targeted area of investigation into concomitant personnel associated factors, it was interestingly a separate question in reference to perceived barriers to a hearing screening programme that revealed further respondent knowledge about hearing impairment and screening for hearing impairment. Such aspects (reflected in Table 6) were explored at a surface level, where further elaboration of respondent views was not specifically explored due to time constraints.

Table 6

Participant Knowledge of Hearing Impairment (in infants ≤ 1 year) as Reflected in Factors which May Negatively Impact a Hearing Screening Programme (N=30)

Factors	Region																													
	GP COJ *n*=7			NW M *n*=7			GP R/M *n*=8			NW P *n*=8			GP Subtot *n*=15						NW Subtot *n*=15						GP+NW TOT *N*=30					
	Y	N	P	Y	N	P	Y	N	P	Y	N	P	Y	%	N	%	P	%	Y	%	N	%	P	%	Y	%	N	%	P	%
Shortage of personnel involved with direct patient treatment	6	1	0	6	1	0	6	2	0	5	2	1	12	80	3	20	0	0	11	73.3	3	20	1	6.7	23	76.7	6	20	1	3.3
Shortage of administrative personnel	2	5	0	2	5	0	2	6	0	3	5	0	4	26.7	11	73.3	0	0	5	3.3	10	66.7	0	0	9	30	21	70	0	0
Shortage of appropriate equipment/hearing screening equipment	7	0	0	7	0	0	8	0	0	8	0	0	15	100	0	0	0	0	15	100	0	0	0	0	30	100	0	0	0	0
Equipment/hearing screening equipment failure or breakdown	5	1	1	7	0	0	6	1	NR	4	2	2	11	73.3	2	13.3	1 1NR	6.7 6.7	11	73.3	2	13.3	2	13.3	22	73.3	4	13.3	3 1NR	10 3.3
Noise in hearing screening environments and if so would you be able to provide a quiet section of the clinic for hearing screening (delete where appropriate)	7	0	0	5	2	0	6	2	0	6	1	1	13	86.7	2	13.3	0	00	11	73.3	3	20	1	6.7	24	80	5	16.7	1	3.3
Lack of awareness of other medical personnel	4	3	0	6	1	0	6	2	0	4	3	1	10	66.7	5	33.3	0	0	10	66.7	4	26.7	1	6.7	20	66.7	9	30	1	3.3
Lack of awareness in parents	6	0	1	6	1	0	7	0	1	5	3	0	13	86.7	0	0	2	13.3	11	73.3	4	26.7	0	0	24	80	4	13.3	2	6.7
Lack of willingness in parents	4	2	1	4	3	0	4	4	0	3	5	0	8	53.3	6	40	1	6.7	7	46.7	8	53.3	0	0	15	50	14	46.7	1	3.3
Lack of parent education	6	1	0	6	1	0	6	2	0	4	4	0	12	80	3	20	0	0	10	66.7	5	33.3	0	0	22	73.3	8	26.7	0	0
Cultural aspects e.g. cultural beliefs pertaining to disabilities and ancestral influence	2	5	0	6	1	0	5	3	0	3	3	2	7	46.7	8	53.3	0	0	9	60	4	26.7	2	13.3	16	53.3	12	40	2	6.7

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion; NR: No Response; Y: Yes; N: No; P: Perhaps

As depicted in Table 6, similar distribution in responses was noted across the sub-districts in reference to staffing requirements, and environmental noise. The areas where response distribution differed, specifically in reference to knowledge-base aspects are as follows:

It is important to note that 76.7% (*N*=30) of respondents saw the need for additional staffing as necessary to conduct the clinical aspects of a hearing screening programme. This demonstrates relative insight as to the need for increased time required to screen each patient. In addition, 70% (*N*=30) did not foresee the associated administration to unduly tax administrative staff, which may be reflective of reduced insight into effective hearing screening service provision, where strict quality and administrative controls are required (HPCSA, 2007).

All respondents recognised the necessity for hearing screening equipment and just over 73.3% (*N*=30) acknowledged the need for good equipment maintenance. Nonetheless, from the responses elicited pertaining to hearing screening methods currently utilised within these PHC
clinics, where no mention was made of specific audiometric clinic equipment needs such as tympanometers or oto-acoustic screeners, it may be construed that respondent knowledge is generally limited in this regard. The overriding impression appeared to be the respondents' awareness restricted to the use of pure tone testing and noisemakers, possibly within a sound treated area which was raised by 2 GP-COJ respondents.

Another important aspect was where the majority 80% (*N*=30) of respondents regarded noise as problematic to implementation of an effective hearing screening process. In addition, 24 respondents (80%; *N*=30) recognized the need to educate parents, 50% (15; *N*=30) citing the lack of parental willingness as a cause for concern, and 16 (53.3%, *N*=30) citing parental

cultural beliefs such as ancestral influence on the health outcome to be of importance as an obstacle to effective hearing screening.

Surprisingly, most (76.7%; *N*=30) considered issues pertaining to parental willingness, parental education and parental cultural beliefs as surmountable through adequate parental education. This reflects on intrinsic knowledge of the important role parents play in effective hearing screening implementation and where parents are to be included as part of the family-centered approach (HPCSA, 2007; JCIH 2000).

The importance of early referrals to specialists and to whom to refer was also an area considered to be reflective of inherent respondent knowledge with regard to certain aspects more so than others. This is exemplified where the majority (25) of referrals (83.3%; *N*=30) were made on first suspicion of the presence of a hearing loss, and 9 respondents (30%; *N*=30) referred infants to the relevant audiologist/Speech Therapy and Audiology Department. Referrals to audiologists were markedly more prevalent in both GP sub-districts (3 in GP-COJ; 5 in GP-R/M; compared to NW sub-districts (1 in NW-M; 0 in NW-P). Here the importance of early detection of hearing loss (Northern & Downs; 1991) was recognized by most and some knew the precise specialist referral (audiologist) that was required.

Lastly, in response to the question on the respondent's perception of hearing impairment, a respondent mentioned the hearing impaired person's perceived sense of isolation, as not many people are able "to sign". This further links to the respondent's knowledge-base, where hearing impairment, in this instance, appears to be associated with profound hearing loss alone where the milder losses appear to be discounted.

4.5.2 Community-based primary health care workers' knowledge on ear infections in Children.

As otitis media and its associated hearing loss is specifically targeted within the Primary Health Care Package's strategic initiative, where the IMCI's key objectives are to reduce mortality and morbidity (inclusive of disability) from the principle causes of childhood illness (WHO, 2008; DoH, 2001), it was deemed relevant to specifically pursue investigation of primary healthcare worker's knowledge pertaining to otitis media and its sequellae. Results are reflected in Table 7 overleaf.

Specifically, the themes identified included knowledge pertaining to how one observes the child's physical and behavioural manifestations of ear infections, how ear infections occur and how ear infections are treated. The last-mentioned was further categorized into treatment by parental education, drug therapy, a general statement on how to treat ear infections or advise parents regarding management, with the last theme identified as the need for re-assessment.

In overview, with predominantly similar distribution inter and intra provincially, 12 respondents (40%; *N*=30) mentioned how to evaluate the presence of an ear infection, specifying aspects such as observing wet versus dry ear canals, ear discharge, assessment of the presence of foreign bodies, bulging tympanic membranes, detection of a reduced light reflex, and the presence of fever. Six respondents (20%; *N*=30) referred to the importance of infant behavioural observation including the scratching and pulling of ears mentioned by 5 of these 6 respondents, and the importance of differential diagnosis e.g. teething, mentioned by one respondent.

Table 7

Themes Identified Pertaining to Participant Knowledge of Ear Infections in Children (in infants ≤ 1 year) (N=30)

Region	Knowledge on Ear Infections in Children												
	Observations			How ear infections occur			Treatment						
	Ear		Infant's Beha-viour	Disease related and chronic natures of otitis media, opportunistic infections	General compli-cations	Prop-feeding	Parental Education				Antibiotic (Drug therapy Protocol) + specific reference to IMCI detailed separately	Knows how to treat/advise (general statement)	Re-assessment
	Normal	Ab-normal					Prop-feeding/ milk in ears	No ear-bud use/ keep small toys away	Hearing loss and comm-unication	Early Intervention			
GP – COJ Subtot *n*=7	**2**	**4**	**3**	**1**	**0**	**2**	**2**	**3**	**1**	**0**	**1+ 0 IMCI**	**0**	**0**
NW – M Subtot *n*=7	**0**	**3**	**2**	**0**	**0**	**2**	**2**	**0**	**1**	**1**	**2+ 0 IMCI**	**1**	**1**
GP-R/M Subtot *n* =8	**0**	**3**	**1**	**3**	**0**	**1**	**1**	**1**	**0**	**1**	**1+ 2 IMCI**	**0**	**1**
NW –P Subtot *n* =8	**1**	**2**	**0**	**1**	**1**	**1**	**2**	**0**	**0**	**1**	**1 IMCI**	**1**	**0**
GP Subtot *n* =15	**2**	**7**	**4**	**4**	**0**	**3**	**3**	**4**	**1**	**1**	**1+2 IMCI=3**	**0**	**1**
***n* =15 %**	**13.3%**	**%**	**26.7%**	**26.7%**	**0**	**20%**	**20%**	**26.7%**	**6.7%**	**6.7%**	**20%**	**0**	**6.7%**
NW Subtot *n* =15	**1**	**5**	**2**	**1**	**1**	**3**	**4**	**0**	**1**	**2**	**2+1 IMCI=3**	**2**	**1**
***n* =15 %**	**6.7%**	**33.3%**	**13.3%**	**6.7%**	**6.7%**	**20%**	**26.7%**	**0**	**6.7%**	**13.3%**	**20%**	**13.3%**	**6.7%**
TOT GP+NWP *N*=30	**3**	**12**	**6**	**5**	**1**	**6**	**7**	**4**	**2**	**3**	**6**	**2**	**2**
***N*=30 %**	**10%**	**40%**	**20%**	**16.7%**	**6.7%**	**20%**	**23.3%**	**13.3%**	**6.7%**	**10%**	**20%**	**6.7%**	**6.7%**

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

The next category of note was defined as how ear infections occur. Six respondents (20%; *N*=30), defined otitis media having occurred as a consequence of milk having entered the infant's ear whilst in a prone position (referred to as prop-feeding). Further responses pertaining to disease related processes, mentioned by 5 respondents (16.7%, *N*=30) included one respondent specifically having related the infection to HIV/AIDS and one respondent having mentioned ear infections arising from children swimming in contaminated pools. Three respondent (10%; *N*=30) commented on the dangers of the disease occurring through earbud usage.

Where participants' responses referred to otitis media treatment, educating parents against prop-feeding was again considered to be relatively important as a mentioned by 7 respondents (23.3%; *N*=30), and 6 respondents (20%; *N*=30) emphasized the need for caregiver education on the importance of taking the full antibiotic course.

Of specific interest are the similarities between the comparable districts' (Day & Gray, 2008) responses describing adherence to the already mentioned IMCI protocols, where the practice was mentioned in similar proportions in GP-R/M and NW-P clinics and was conspicuously not mentioned in the analogous GP-COJ and NW-M (Day & Gray, 2008). Several respondents referred to specific complications of otitis media such as inner ear secondary infections, mentioned by one GP-R/M participant (12.5%; *n*=8), tympanic membrane perforation mentioned by one GP-R/M respondent (12.5%; *n=8),* with 1 participant (12.5%; *n*=8) in the NW-P area having commented specifically on the chronic manifestation of otitis media with hearing impairment as a complication should treatment be reduced.

4.5.3 Community-based primary health care workers' perceptions and attitudes towards hearing impairment.

Table 8 overleaf is reflective of the themes generated from the open-ended question, "What are your personal views about hearing impairment?".

Twelve interviewees (40%; *N*=30) expressed direct views on the difficulties associated with hearing loss with a discernable overall lack of detail as exhibited in respondents' comments such as, "It's very bad, unbearable", "It's painful and stressful" and "It's heart breaking" as well as "It's not good as it has its own problems", "It's a hard things, it's important to communicate and understand", "It's less recognised and we need to make people aware, the community and health personnel need more education", with another having stated that hearing impairment "is a hard thing, it's important to communicate and understand". Particularly this last mentioned alluded to a deeper understanding of the negative communication consequences of hearing impairment. Most of these comments emanated from GP-R/M and NW-P districts, with GP-COJ and having expressed no personal views directly on hearing loss. One respondent also commented that hearing impairment could make a person feel "paranoid with no direction", suggestive of the difficult psycho-social dynamics of hearing impairment as documented by Northern and Downs (1991) and Hutt and Rhodes (2008).

Further themes elicited, as expressed by a total of 10 respondents (33.3%; *N*=30), related to the importance of early detection with the necessary early referrals to specialists to reduce the negative repercussions associated with hearing impairment. This alludes to the well-expressed silent epidemic of hearing loss, where hearing loss often goes unnoticed in developing countries (Swanepoel, Louw, & Hugo, 2007).

Table 8

Themes Identified Pertaining to Participant Views on Hearing Impairment (N=30)

Region	Personal Views on Hearing Impairment										
	Importance of early referrals/ Diagnosis/avoid problem by early detection	Importance of testing	Importance of including in the immunisation protocol	Personal view/impression of hearing impairment on the individual and its impact		Incidence according to experience		Infants are referred out	How hearing loss occurs	Lack of knowledge of how hearing loss is tested	How hearing loss is tested
				View	Unsure	High	Low				
GP – COJ Subtot *n*=7	3	1	1	0	0	0	2	0	1	2	1
NW – M Subtot *n*=7	2	2	0	2	0	0	0	2	1	0	3
GP-R/M Subtot *n*=8	2			6	1	0	0	1	0	1	0
NW –P Subtot *n*=8	3	0	2	4	0	0	2	2	0	2	0
GP Subtot *n*=15	5	1	1	6	1	0	2	0	1	3	1
n=15 %	33.3%	6.7%	6.7%	40%	6.7%	0	13.3%	0	6.7%	10%	6.7%
NW Subtot *N*=15	5	2	2	6	0	0	2	4	1	2	3
n=15 %	33.3%	13.3%	13.3%	40%	0	0	13.3%	26.7%	6.7%	13.3%	20%
TOT GP+NW *N*=30	10	3	3	12	1	0	4	4	2	5	4
N=30 %	33.3%	10%	10%	40%	3.3%	0%	13.3%	13.3%	6.7%	16.7%	13.3%

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

The WHO (2010b; 2010c) also recognises that hearing impairment has been a neglected disability in the public health field with the need to educate communities as well as health personnel. The acknowledgement that early detection is of importance is a critical marker reflective of the urgency with which EHDI must occur in order not to unnecessarily disadvantage individuals with hearing loss with regard to quality life indicators such as language and educational development (Swanepoel et al, 2006).

The remaining themes reflected answers of a more procedural nature with details pertaining to how hearing loss is tested (13.3%; *N*=30), the importance of testing (10%; *N*=30), and the importance of including such a testing regimen as part of the immunisation protocol (10%; *N*=30). A further 4 (13.3%; *N*=30) attested to the importance of referring such patients to appropriate outside facilities. Five respondents (16.7%; *N*=30) referred to their lack of knowledge on how hearing was tested, one of these specifically having mentioned the need for improved education on how to test for hearing impairment to prevent children slipping through the system through hearing impairment remaining undetected. Four individuals (13.3%; *N*=30) commented as to how little they had personally seen a child with hearing impairment which is of concern given the incidence and prevalence of hearing impairment rated at approximately 17 births per day as extrapolated from Swanepoel, Storbeck, and Friedland (2009).

4.5.4 Community-based primary health care workers' willingness to conduct hearing Screening.

Table 9 is reflective of the themes generated from the open-ended question, "Would you be willing to implement infant hearing screening to coincide with the infant immunisation schedule?".

Table 9

Themes Identified Pertaining to Participant Willingness to Implement Newborn/Infant Hearing Screening (N/HIS), (N=30)

Region	Willing to implement hearing screening programme			Provisions				
	Yes	With Imm. Prog	No	Staff	TR	District Programme/ Directorate	Equipment	Space/ structure
GP – COJ Subtot *n*=7	5	4	2	5 1Aud	0	0	2	0
NW – M Subtot *n*=7	7	7	0	4	3	0	1	0
GP-R/M Subtot *n*=8	8	8	0	2 1Aud	4	0	2	1
NW –P Subtot *n*=8	8	8	0	3	1	1	2	0
GP Subtot *n*=15	12	11	2	6+2 Aud=8	4	0	4	2
n=15 %	80	73.3	13.3	53.3	26.7	%	26.7	13.3
NW Subtot *n*=15	16	16	0	7	4	1	3	0
n=15 %	100	100	0	46.7	26.7	6.7%	20%	0
TOT GP+NW *N*=30	28	27	2	15	8	1	7	2
N=30 %	93.3	93.3	6.7	50	26.7	3.3	23.3	6.7

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion; Imm.: Immunisations; HR: Human Resources; Aud.: Audiologist; TR: Training

A total of 28 respondents (93.3%; *N*=30) were willing to implement hearing screening and 27 of these stated they would be able to do so to coincide with the infant immunisations schedule. Of these, 4 (14.8%; *N*=28) were outright confirmations, mainly from NW-P, with some providing idealistic responses where no provisions for hearing screening were

mentioned. Such idealism prevailed in comments such as "Saving one life is the most important thing, so even if it takes longer, we will do it", "We may be able to prioritise better so we don't do what we are not supposed to be doing", "Even if it takes 10 minutes extra per baby, we'll do it because it's going to help", "Nurses are flexible as far as change is concerned...we are used to extra things being added without extra staff" and "It's good to get to lots of babies", "If it's supposed to be done we'll do it because it's going to help".

In terms of the 2 GP-COJ respondents not willing to implement infant hearing screening as part of their clinic, one response referred to the current staffing not being adequate enough to do so, and the second stated that the tertiary hospital patients were referred to was adequate enough in dealing with such screening. Of note is that one of the 28 respondents (GP-COJ) was willing to implement hearing screening as part of the PHC clinic but not to coincide with immunisations stated that there were too many children to see to and that 2 teams would be required to work with the infants simultaneously, one to conduct immunisations and one to conduct hearing screening. This comment is felt to be realistic and insightful in relation to the logistics involved in hearing screening where high yield is the aim (HPCSA, 2007; JCIH, 2007).

The 27 overall affirmative responses (90; *N*=30) to conduct hearing screening to coincide with the PHC facility's immunisation schedule had added specified provisions, 15 (55.5%; N=27) of which were in reference to increased staffing, 8 of which (29.6%; *N*=27) were in reference to the need for adequate staff training. Such findings are consistent with the WHO data on the need to increase knowledge and skill amongst primary healthcare workers in developing world contexts (WHO,2010b; 2010c). Lastly, seven of the 27 affirmative responses (25.9%; *N*=27) specified provisions in reference to provision of the correct equipment. Just 2 respondents (7.4%; *N*=27) commented on the need for improved facility

structure by provision of (possibly through building) a quieter testing area which was not currently available.

4.5.5 Nursing training

Direct binary questions were posed pertaining to (a) interviewee's training on ears in infants (under a year old), (b) ear problems in infants (under a year old), and (c) hearing problems in infants (also under a year old). These areas were felt to be of value as a possible influence on the status of interviewee expression of his/her (a) knowledge, (b) perceptions and attitudes towards hearing impairment, and (c) willingness to conduct hearing screening in children. Results of respondent perceptions are tabulated with their associated frequency calculations in table 10 overleaf.

The figures in Table 10 reflect a general sense in 23 respondents (76.7% ; *N*=30) that during their training they were taught about the ears in infants equal to or under a year of age, and that they (86.7%, *N*=30) were also informed about ear problems in infants equal to or under a year of age. However, fewer participants (60%; *N*=30) felt they were taught with regard to hearing problems in infants equal to or under a year old. Qualifying responses included "we were not taught specifically about hearing problems in infants" (by one GP-COJ and one GP-R/M respondent), and "we were taught mostly about ear conditions generally", or training was provided on "ailments not hearing loss" (made by one GP-R/M and two NW-P respondents respectively). Four GP-R/M and 2 NW-P respondents mentioned that this training was provided at PHC and/or IMCI training (by 2 GP-R/M and 2 NW-P respondents).

Table 10

Reported Nursing Training Received (N=30)

Region	Taught regarding:					
	Ears in infants ≤ 1year		Ear problems in infants ≤ 1yea		Hearing problems in infants ≤ 1year	
	Yes	No/Not specifically	Yes	No	Yes	No
GP – COJ Subtot *n*=7	4	3	4	3	4	3
NW – M Subtot *n* =7	7	0	7	0	3	4
GP-R/M Subtot *n* =8	7	1	8	0	0	4
NW –P Subtot *n*	6	2	7	1	7	0
GP Subtot *n* =15	11	4	12	3	8	7
N=11 %	73.3	26.7	80	20	53.3	46.7
NW Subtot *N*=15	12	2	14	1	10	5
n =15 %	80	13.3	93.3	6.7	66.7	33.3
TOT GP+NW	23	6	26	4	18	12
N=30 %	76.7	20	86.7	13.3	60	40

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

The majority of respondents felt they were trained in ear and ear problems in infants. Only the majority of NW-P (7; *n*=8) felt trained in hearing problems in infants. One may thus have anticipated NW-P to have demonstrated the greatest confidence in their responses elicited from the question "What is your knowledge on hearing impairment in infants equal to or under a year of age?". Defined confident responses were not obtained as highlighted in a previous section and links between results in general were difficult to establish. Such links were sought in order to draw conclusions regarding the possible influence nursing training

may have exerted on interviewees' expression of his/her knowledge, perceptions and attitudes towards hearing impairment and willingness to conduct hearing screening in infants.

4.6 Other Factors that May Influence Implementation of Newborn and Infant Hearing Screening

The fourth sub-aim of the study was to determine and explore other factors that may influence implementation of newborn and infant hearing screening at North West and Gauteng immunisation clinics rendered at a healthcare level one.

4.6.1 Patient return rates for immunisations versus return rates for appointments other than immunisations.

Olusanya (2009) refers to assessing health care contexts that elicit high yield for hearing screening. In compliance herewith, eliciting information pertaining to the patient return rates for immunisation appointments and appointments other than for immunisations was deemed necessary to ascertain the most appropriate context that would elicit the highest possible yield for hearing screening.

4.6.1.1 Patient return rates for immunisation.

Tables 11 and 12 reflect the results obtained pertaining to patient return rates for immunisations.

Table 11

Estimated Immunisation Return Rates (N=30)

Region	1st visit at 6 weeks unspecified umbers	At 6 weeks, % return from visit before 6 weeks			At 10 weeks				At 14 Weeks			
		80-89	90-100	Other	69-79	80-89	90-100	Other	68-79	80-89	90-100	Other
GP – COJ Subtot *n*=7	**2**	**0**	**5**	**0**	**0**	**0**	**7**	**0**	**1**	**1**	**5**	**0**
NW – M Subtot *n*=7	**1**	**2**	**4**	**0**	**2**	**0**	**4**	**1**	**0**	**2**	**2**	**25% 39% 56%**
GP-R/M Subtot *n*=8	**1**	**1**	**4**	**20% 50%**	**2**	**2**	**3**	**20%**	**2**	**1**	**3**	**20% 44%**
NW –P Subtot *n*=8	**0**	**2**	**6**	**0**	**0**	**2**	**6**	**0**	**3**	**0**	**5**	**0**
GP Subtot *n*=15	**3**	**1**	**9**	**2**	**2**	**2**	**10**	**1**	**3**	**2**	**8**	**2**
***n*=15 %**	**20%**	**6.7%**	**60%**	**13.3%**	**13.3%**	**13.3%**	**66.7%**	**6.7%**	**20%**	**13.3%**	**53.3%**	**13.3%**
NW Subtot *n*=15	**1**	**4**	**10**	**0**	**2**	**2**	**10**	**1**	**3**	**2**	**7**	**3**
***n*=15 %**	**6.7%**	**26.7%**	**66.7%**	**0**	**13.3%**	**13.3%**	**66.7%**	**6.7%**	**20%**	**13.3%**	**46.7%**	**20%**
TOT GP+NWP *N*=30	**4**	**5**	**19**	**2**	**4**	**4**	**20**	**2**	**6**	**4**	**15**	**5**
***N*=30 %**	**13.3%**	**16.7%**	**63.3%**	**6.7%**	**13.3%**	**13.3%**	**66.7%**	**6.7%**	**20%**	**13.3%**	**50%**	**16.7%**

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

As is observable from Table 11 above, 19 respondents (63.3%; *N*=30) approximated return rates to be between 90 and 100% at an infant's 6 week immunisation, with 20 respondents (66.7%; *N*=30) having approximated return rates to also be between 90 to 100%. The reason for such an increase may be based on the estimation process where slight inaccuracies may have been present in participant responses rather than attributable to an actual increase in patients returning. Of note is the reduced number of patient returns for immunisations at 14 weeks (cited by 15 respondents; 50%; *N*=30) with 3 of these respondents (3.3%; *N*=30;) having elaborated that after one year a decline in clinic attendance (referred to as defaulters) are marked. Further reasons as to why patients default on immunisations are depicted in table 12 below.

The predominant reason (40%; *N*=30) provided by all districts is that of the mobile nature of the communities that are serviced such as the reported marked influx of immigrants such as Zimbabweans and Mozambicans, and itinerant workers in seek of employment. This response was most noticeable from the NW-P region where 5 of the 8 respondents (62.5%; *n*=8) named this as the main reason for infant immunisation default rates. Another interesting response was where a NW-P respondent described that caregivers return when they think an injection will be administered, if not the return rate declines. A NW-M respondent commented that specific immunisation campaigns produce an influx of patients, and another commented that the White patients only attend immunisations at the respective immunisation clinics as a cost saving effort. A GP-R/M respondent, whose clinic services a majority Indian population, stated that "The Indians do not come for immunisations". This reported distinction in immunisation clinic attendance by differing South African ethnic groups is arguably reflective of the unexpected complexity of the South African setting, where contexts within contexts may need to be considered for effective EHDI implementation at a clinic level. It must be noted that these elaborations were not probed and further similar or

dissimilar reasons may have been provided by the 36.7% (*N*=30) of respondents who did not actually elaborate spontaneously.

Table 12

Themes Revealed Pertaining to Immunisation Return Rates (N=30)

Region	Themes			
	Late arrivals	Mobile/migrant community incl. farms/ relocation/holiday influx	Transport issues/costs	Immunisation programme nature
GP – COJ Subtot *n*=7	**0**	**2**	**0**	**1 (high default rate at 18m)**
NW – M Subtot *n*=7	**1**	**2**	**1 (Whites come to save money)**	**1 (Campaigns bring in a lot)**
GP-R/M Subtot *n*=8	**1**	**3**	**0**	**0**
NW –P Subtot *n*=8	**0**	**5**	**0**	**2 (Lose after 1 year) 1 (Come for injections)**
GP Subtot *n*=15	**1**	**5**	**0**	**1**
***n*=15 %**	**6.7**	**33.3**	**0**	**6.7**
NW Subtot *n*=15	**1**	**7**	**1**	**4**
***n*=15 %**	**6.7**	**46.7**	**6.7**	**26.7**
TOT GP+NW *N*=30	**2**	**12**	**1**	**5**
***N*=30 %**	**6.7**	**40**	**3.3**	**16.7**

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

Given that migration is inherently related to urbanisation and the division of families (Bradshaw, 2008) the comments by interviewee's related to the mobile nature of the communities PHC clinics service, may be well understood. Moreover, the value of a system,

such as immunisations, that fosters high patient yield despite an itinerant community, cannot be underestimated, particularly within the EHDI context (Olusanya, 2009). The DoH has documented that its EPI targeted strategies and campaigns have boosted immunisation coverage figures with a progressive increase from 78% in 2002 to 84.6% in December 2008 in the numbers of children fully immunised (DoH, 2009).

4.6.1.2 Patient return rates for appointments other than immunisations.

Eleven of all respondents (36.7%; *N*=30) approximated return rates for appointments other than immunisations to be between 90 to 100%. Again, the most common elaboration that of the mobile nature of the community being serviced, where 17 respondents (56.7%; *N*=30) stated that much of the community were from rural areas, some only visiting the region before moving on. The second most common response from 13 respondents (43.3%; *N*=30) was the child's degree of wellness, where a caregiver may not see the necessity of returning to the clinic, especially with the cost and effort to do so, if the child is perceived to be on the mend. One NW-P respondent commented specifically that an infant only returns if the severity of his illness increases.

Additional noteworthy reasons included that non-immunisation appointments lose the momentum of regular monthly bookings, mentioned by 10 respondents (33.3%; *N*=30), mostly those in the GP-R/M district. Work obligations were also mentioned by 9 respondents (30%; *N*=30), mostly mentioned by 4 participants (13.3%; *N*=30) in NW-P district, and transport or cost issues were mentioned by 5 respondents (16.7%; *N*=30), similarly distributed across districts with exception of GP-COJ where this was not a reason provided. A host of further general responses was also offered, some of which alluded to patients trying different clinics in order to avoid waiting in long queues, shopping around for a second

opinion, and that some patients don't return if you give them the reason with which they may not agree. A NW-P respondent stated that the clinic does not provide reasons for the next appointment in the hope that compliance will improve. Another reason on offer for non-compliance with non-immunisation follow-up appointments was the communication barriers that exist between South African's and foreign immigrants who cannot speak the South African languages. Miscommunication was reported to result in these instances.

4.6.2 Logistics.

It was considered important to assess logistics as they impinge on PHC facility running as this may have influenced answers obtained particularly in reference to the perceived feasibility of conducting hearing screening as an adjunct to EPI services. Several aspects were explored as delineated below:

4.6.2.1 Immunisation day.

The most common arrangement organised for immunisations, as reflected in Table 13, and as attested to by 19 respondents (63.3%; *N*=30), was for clinics to offer the service everyday for the entire day. Fairly even distribution across the province districts was evident with exception of NW-P where only 3 of the 8 clinics in this region (37.5%; *n*=8) offered a full-day, everyday service, where the one whole day per week option was favoured. This was in fact the next most common set-up as identified by 40% of respondents (*N*=30), and most prevalent in NW-P. Two clinics (one located in GP-COJ and one in NW-M district) also offered an additional half day option per week.

Table 13

Immunisation Day (N=30)

Region	1 Day		2 Days		3 Days	Everyday
	Whole Day	Half Day	Whole Day	Half Day	Whole Day	Whole Day
GP – COJ Subtot *n*=7	0	0	0	1	1	6
NWP – M Subtot *n*=7	1	1	0	0	0	5
GP-R/M Subtot *n*=8	1	0	1	0	1	5
NWP –P Subtot *n*=8	4	0	1	0	0	3
GP Subtot *n*=15	1	0	1	1	2	11
n=15 %	6.7	0	6.7	6.7	13.3	73.3
NW Subtot *n*=15	5	1	1	0	0	8
n=15 %	33.3	6.7	6.7	0	0	53.3
TOT GP+NW *N*=30	6	1	2	1	2	19
N=30 %	40	3.3	6.7	3.3	6.7	63.3

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

Of note, is that just over 20% (7 respondents; 23.3%; *N*=30;) elaborated spontaneously throughout the districts that they never turned a person away but did emphasise the preferred day for immunisations to be adhered to at their next visit. “No turn-away” is a PHC Package policy that all must adhere to (DoH, 2001). As no cueing was conducted to elicit further information from participants who did not elaborate, it is unclear as to whether all clinics did adhere to this “No turn-away” policy.

4.6.2.2 Clinic noise and clinic space.

Evaluation of noise where noise would preclude appropriate hearing screening conditions (HPCSA, 2007) was considered fundamental in assessing the immunisation clinic milieu as feasible for implementation of universal infant hearing screening. Space issues may be regarded as inherently related to noise factors, where one aims to be able to allocate a designated area with reduced ambient noise levels conducive to generation of reliable hearing screening results (Spivak, 2007). Results are depicted in Table 14 overleaf.

As reflected in Table 14, 7 respondents (23.3%; *N*=30) stated (without provisions) that they would be able to allocate an appropriate clinic area for infant hearing screening. When respondents elaborated, they stated hearing screening would not be possible because of noise generated from patients in the clinic area (26.7%; *N*=30) and because of space issues in the clinic (20%; *N*=30). Most respondents to attribute noise as an issue, were from the GP-R/M district (4 respondents; 50%; *n*=8), and in fact GP was the greatest generator of this rationale compared to its NW counterpart (6 GP respondents; 40%; *n*=15 versus, 2 NW respondents; 13.3%; *n*=15). Space issues were most prevalent in NW-M (3; 42.9%; *n*=7). Space was not raised in GP-COJ as an issue.

Table 14

Themes Revealed Pertaining to Availability of an Appropriate Hearing Screening Area (N=30)

Region	Appropriate Hearing Screening Area - Themes					
	Yes	Yes with provision	Unsure	No – Noise an issue	No – Space an issue	No – Noise & space an issue
GP – COJ Subtot *n*=7	0	0	4	2	0	1
n=7 %	0	0	57.14	28.6	0	14.3
NW – M Subtot *n*=7	3	0	1	0	3	0
n=7 %	42.9	0	14.3	0	42.9	0
GP-R/M Subtot *n*=8	0	1 (testing in current booth necessary)	0	4	2	1
n=8 %	0	12.5	0	50	25	12.5
NW –P Subtot *n*=8	4	1 (testing to be done in afternoon)	0	2	1	0
n=8 %	50	12.5	0	25	12.5	0
GP Subtot *n*=15	0	1	4	6	2	2
n=15 %	0	6.7	26.7	40	13.3	13.3
NW Subtot *n*=15	7	1	1	2	4	0
n=15 %	46.7	6.7	6.7	13.3	26.7	0
TOT GP+NW *N*=30	7	2	5	8	6	2
N=30 %	23.3	6.7	16.7	26.7	20	6.7

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

Of significant interest is the result elicited exclusively from NW, where 7 respondents (46.7%, *n*=15; 3 in NW-M; 4 in NW-P) stated they would be able to allocate an appropriate area for hearing screening. Two respondents stated they would be able to do so but with provisions. Here one GP-R/M respondent stated she would only be able to do so by using the present soundproof booth they have at the clinic, and one NW-P respondent stated that

hearing screening would need to take place during quiet clinic time in the afternoon. The greater sense of reported ability to allocate an appropriate hearing screening area demonstrated by NW also begs the question as to whether this is related to a possible reduced knowledge base of the formalised hearing screening process as was evident on certain knowledge base questionnaire components such as appropriate specialist referrals, and where lack of standardisation of hearing screening procedures in place at clinics was evident. As education within PHC personnel is generally stated to be in need of upgrading (WHO, 2010c), this is a possibility. Another possibility is the improved financial health indicators at district level (Day & Gray,2008) where 2007/2008 expenditure reflected PHC spending per capita uninsured of approximately R289 per person in GP and approximately R349 per capita in NW (Day & Gray, 2008). Thus, despite the overall deprivational index rating where NW is rated as more deprived a region than GP (Day & Gray, 2008), it is perhaps a region like NW which would be more easily able to procure funds for adaptations needed. This is what was possibly reflected in the positive responses from NW. More in-depth investigation into the specifics pertaining to hearing screening knowledge would be useful in defining the educational needs of the PHC health care workers recommended by the HPCSA (2007) to be recruited as hearing screening service providers within the EPI context.

4.6.2.3 Clinic booking system.

As booking an infant for a return hearing screen is paramount to appropriate and ethical follow-up (HPCSA 2007), it was considered important to evaluate the systems currently in place to prompt caregivers to return with infants for such appointments. Results are depicted in Table 15.

Table 15

Prompting Caregivers to Return with Infants for Follow-up (N=30)

Prompting Methods	Region																							
	GP COJ *n*=7		NW M *n*=7				GP R/M *n*=8				NW P *n*=7				GP Subtot *n*=15				NW Subtot *n*=15				TOT *N*=30			
	Y	%	Y	%	N	%	Y	%	N	%	Y	%	N	%	Y	%	N	%	Y	%	N	%	Y	%	N	%
Specific return dates given on RtHC	7	100	7	100	0	0	8	100	0	0	8	100	0	0	15	100	0	0	15	100	0	0	30	100	0	0
General return days given	3	42.9	5	71.4	0	0	4	50	0	0	4	50	0	0	7	46.7	0	0	9	60	0	0	16	53.3	0	0
Booking system with follow-up e.g. text message or telephone call or letter delivery	6	85.7	2	28.6	4	57.2	2	25	1	12.5	2	25	2	25	8	53.3	1	6.7	4	26.7	6	40	10	33.3	7	23.3
Educate caregiver	6	85.7	7	100	0	0	8	100	0	0	8	100	0	0	14	93.3	0	0	15	100	0	0	29	96.7	0	0

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion
RtHC: Road to Health Chart; Y: Yes; N: No

As reflected in Table 15, congruity amongst districts and between provinces was strong in terms of the four main methods described in prompting caregivers to return with the infant for follow-up, i.e. specific return dates provided on the RtHC, provision of general return days for appointments according to clinic facilities and services, use of booking systems and registers to trace defaulters and apply follow-up procedures, and educating caregivers.

Of note is that all respondents were provided with written specific return dates for immunisations by entering these on the patients RtHC. Most respondents (29; 96.7%; *N*=30) attested to educating the caregivers on why it was important to return for immunisations on the specific date given. In addition, the majority of respondents also provided a general return date for specific follow-ups as part of any health education that was being provided by the clinic at the time. Furthermore, it was interesting to observe that 10 clinics (33.3%; *N*=30) took on the responsibility for reminding defaulters to attend the infant's immunisation either through cellular text messaging or calling cellular phones, or through the use of Direct Observation of Treatment (DOT) supporters (used to check patients are actually taking their tuberculosis medication) and/or health promoters who would make home visits with a letter drop requesting the patient's return (DoH, 2000). Whatever system or combination was convenient and applicable, according to staff complement and budgetary constraints, was applied. This was mostly the case in GP-COJ where 6 of these clinics (85.7%; *n*=7) did so with a lower percentage per the remaining districts doing the same.

All methods in prompting caregivers to return with the infants for follow-up appointments were in alignment with Primary Healthcare Package protocols (DoH, 2001) which advocate norms and standards pertaining to (a) patient education, (b) record keeping, (c) clinic-community based communication and collaboration, all in specific reference to prevention of hearing impairment due to otitis media.

4.6.2.4 Infant record documentation.

Intrinsic to a UNHS is accountability for the procurement of prevalence and incidence data in a uniform manner to "facilitate effective communication between screening and intervention services" (HPCSA, 2007, p.31). Inherent in this process are administrative systems that can record infant hearing screening data effectively. As a result, it was felt to be imperative to assess current infant record documentation processes as a possible basis for expansion to include infant hearing screening data. Table 16, overleaf, depicts these results.

As per Table 16, all clinics were reported to document patient results on the infants' Road to Health Charts. A similar paper-based system (usually a Road to Health Card duplicate) was kept on the clinic premises as reported by 29 respondents (*N*=30; 96.7%). The one response, emanating from GP-R/M district, indicated that such a paper-based system was not in place as they have opted for e-filing.

As far as an electronic based system is concerned 21 respondents (70%; *N*=30) stated they do not enter the immunisation data on computer, although computers were informally observed to be present at many of the clinics throughout all 4 districts. Nevertheless, the 9 respondents (30%; *N*=30) who reported to input their data electronically, mostly emanated from NW-P, where 7 of the 8 respondents (87.5%; *n*=8) stated they were doing so. The remaining 2 (28.6%; *n*=8) were respondents from the GP-R/M district. This result complies well with expectations in terms of GP-R/M and NW-P districts being regarded as similarly more advanced than GP-COJ and NW-M on the deprivation index scale (Day & Gray, 2008), but the predominance of NW respondents in

Table 16

Infant Record Documentation (N=30)

Doc Type	Region																											
	GP COJ *n*=7				NW M *n*=7				GP R/M *n*=8				NW P *n*=8				GP Subtot *n*=15				NW Subtot *n*=15				TOT *N*=30			
	Y	%	N	%	Y	%	N	%	Y	%	N	%	Y	%	N	%	Y	%	N	%	Y	%	N	%	Y	%	N	%
Electronic Database	0	0	7	100	0	0	7	100	2	25	6	75	7	87.5	1	12.5	2	13.3	13	86.7	7	46.7	8	53.3	9	30	21	70
Paper Database	7	100	0	0	7	100	0	0	7	87.5	1	12.5	8	100	0	0	15	100	0	0	15	100	0	0	29	96.7	1	3.3
Road to Health Chart	7	100	0	0	7	100	0	0	8	100	0	0	8	100	0	0	15	100	0	0	15	100	0	0	30	100	0	0
Other including Statistics Registers	5	71.4	0	0	3	42.9	0	0	8	100	0	0	8	100	0	0	13	86.7	0	0	11	36.7	0	0	24	80	0	0

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

this regard is surprising nonetheless, where the deprivational provincial comparison clearly indicates NW to be at a clear overall disadvantage when compared to GP (Day & Gray, 2008).

As far as keeping statistical registers are concerned, 24 respondents (80%; *N*=30) spontaneously stated they did so. Of these, again it was the GP-R/M and NW-P district respondents that all did so. It must be noted that as the researcher did not probe further, the GP-COJ and NW-M respondents may have elaborated similarly. Thus the reduced numbers in these 2 districts, 5 in GP-COJ (71.4%; *n*=7) and 3 in NW-M (42.9%; *n*=7) may not be a true reflection of the statistical documentation occurring in these regions. What is however noteworthy is the fact that NW, the province defined as more disadvantaged according to the deprivational index (Day 7 Gray, 2008), is the area where these statistical record keeping results were most reduced, where the average was brought down by NW-M significantly reduced numbers (3, 42.9%; *n*=7). These numbers reflect non-compliance with the Primary Healthcare Package advocated norms and

4.6.3 Workload pressures associated with understaffing.

4.6.3.1 Burden of disease.

To best address the aspect of workload pressures as experienced by staff, it was felt that the perceived burden of disease as experienced by these facilities should be addressed first, in order to best comprehend how reduced staff complement may be experienced. Developing world contexts are weighted by the extremes associated with diseases that proliferate because of poverty where service delivery is often hampered by lack of funding and access to health services (Olusanya, 2005). The loss of health from causes of illness and death referred to as

the burden of disease (WHO, 2008) becomes even weightier with reduced numbers of health workers under these strains (WHO, 2010c). South Africa is deemed to have a quadruple burden of disease which includes diseases and conditions, such as tuberculosis, considered to be linked to poverty and under-development, chronic diseases, injuries and HIV/AIDS (Bradshaw, 2008). Hearing impairment in the face of these more burdensome life threatening diseases can only be viewed as relatively non-threatening, demoted to less important as a health care priority (Olusanya, 2005), where hearing impairment poses a threat to lifestyle rather than to life. In most developing countries, external support would be required to assist in managing the additional burden of disabling but non-fatal disorders such as hearing impairment (olusanya & Newton, 2007).

4.6.3.2 Most common reported infant medical issues.

Childhood diseases considered to be most common in children under 5 in South Africa are defined as HIV/AIDS, tuberculosis, diarrhoeal diseases, respiratory infections, malnutrition and ear infections (Day & Gray, 2008). These were thus specifically included in the questionnaire.

Results are depicted overleaf in Tables 17 (regarding non-ear related medical health issues) and Table 18 (regarding ear related medical health issues).

As reflected in Table 17, the most common medical health issues were rated as Respiratory Infections (not associated with HIV/AIDS), where 10 respondents (33.3%; *N*=30; mostly by 5 GP-COJ district respondents) rated between 60 to 100% of their clinic infants to have presented with such respiratory conditions. Eight respondents (26.7%; *N*=30; by 2 GP-COJ respondents; 4 NW-M respondents and 2 per GP-R/M and 2 NW-P respondents) stated that 25 to 50% of their clinic infants presented with such respiratory infections. It is

important to note that for the rest of the disease categories, 13 respondents (43%; *N*=30; 5 per GP-COJ and R/M districts) stated that less than one percent of clinic infants presented with HIV/AIDS, 16 respondents (53.3%; *N*=30; relatively evenly spread across the 4 districts) stated that less than one percent of clinic infants presented with tuberculosis, and 8 respondents stated that 10 to 15% of

Table17

PHC Most Common Infant Medical Health Issues (excluding Ear Infections) Estimate (N=30)

Region	HIV/AIDS						Tuberculosis					Diarrhoea Diseases					Respiratory Infections					Malnutrition					Health Issues - Other Skin Measles Fever unknown Oral thrush Worms Tonsillitis Impetigo				
	Un-sure	< 1	2-5	10-20	30-40	50-60	< 1	2-5	10	20-30	50	< 1	2-5	10-15	30-40	50-70	< 2	2-5	5-20	25-50	60-100	< 1	2-5	10-20	25-50	90	< 2	2-5	10-25	50-60	80-90
GP – COJ *n*=7	0	5	1	0	0	1	3	2	1	0	1	1	1	3	0	2	2	0	0	0	5	4	1	0	2	0	1	1 1	0	2 1	1
NW – M *n*=7	1	2	0	2	1	1	4	1	1	1	0	0	1	2	1	3	0	1	0	4	2	3	3	0	1	0	0	2 1	1	0	0
GP-R/M *n*=8	0	5	1	2	0	0	5	2	1	0	0	4	2	1	1	0	0	1	4	2	1	7	0	1	0	0	3	3 1	1	0	0
NW –P *n*=8	1	1	5	0	1	0	4	2	0	2	0	1	1	2	3	1	2	1	1	2	2	1	2	2	2	1	4	3	1 1	1	0
GP Subtot	0	10	2	2	0	1	8	4	2	0	1	5	3	4	1	2	2	1	4	2	6	11	1	1	2	0	4	6	1	3	1
n=15 %	0	66.7	13.3	13.3	0	6.7	53.3	26.7	13.3	0	6.7	33.3	20	26.7	6.7	13.3	13.3	6.7	26.7	13.3	40	73.3	6.7	6.7	13.3		26.7	40	6.7	20	6.7
NW Subtot	2	3	5	2	2	1	8	3	1	3		1	2	4	4	4	2	2	1	6	4	4	5	2	3	1	4	6	3	1	0
n=15 %	13.3	20	33.3	13.3	13.3	6.7	53.3	20	6.7	20		6.7	13.3	26.7	26.7	26.7	13.3	13.3	6.7	40	26.7	26.7	33.3	13.3	20	6.7	26.7	40	20	6.7	0
TOT GP+ NW	2	13	7	4	2	2	16	7	3	3	1	6	5	8	5	6	4	3	5	8	10	15	6	3	5	1	8	12	4	4	1
N=30 %	6.7	43.3	23.3	13.3	6.7	6.7	53.3	23.3	10	10	3.3	20	16.7	26.7	16.7	20	13.3	10	16.7	26.7	33.3	50	20	10	16.7	3.3	26.7	40	13.3	13.3	3.3

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

clinic infants presented with diarrhoea diseases (26.7%; *N*=30; with relatively even spread across all districts with exception of GP-R/M where it was only one respondent who rated it as such, rating it to occur more often at less than one percent).

Fifteen respondents (50%; *N*=30) commented that malnutrition presented in less than one percent of clinic infants and 8 respondents (26.7%; *N*=30) claimed that other diseases presented in less than 2% of their infant clinic population. For the last mentioned, where diseases were named, they included skin lesions, measles, oral thrush, tonsillitis, worms, and impetigo. These results (excluding those relating to respiratory infections in GP-COJ) were somewhat unexpected, where higher prevalence rates were expected across the districts according to deprivational index ratings (Day & Gray, 2008).

As depicted in Table 18 overleaf, with regard to ear related medical health issues, 11 respondents (36.7%; *N*=30; with relatively even spread across districts with exception of GP-R/M where the numbers were slightly higher) stated that between 2 to 5% of infants presented with ear infections. Nine respondents (30%; *N*=30) rated otitis media to most commonly occur in infants (over otitis externa and other presentations such as foreign bodies in ear canals) between 2 to 6% of the time. Five GP-R/M respondents rated otitis media to occur in 2 to 6% of their infant clinic attendees, with NW-P stating most of their otitis media cases to be present in less than one percent of their population. In addition, most otitis externa presentation was rated as occurring in less than one percent of the population, mostly by GP-COJ respondents (4; 57.1%; *n*=7).

Table 18

PHC Most Common Infant Ear Related Medical Health Issues Estimates (N=30)

Region	Ear Infections Total						Otitis Externa						Otitis Media						Other e.g. blocked ears
Estimated Percentage	?	< 2	2-5	15-25	30-40	50-90	?	< 1	2-5	10-20	30-40	50-60	?	< 1	2-6	10-20	25-40	70-100	2- 5
GP – COJ Subtot *n*=7	1	2	2	0	0	2	2	4	0	1	0	0	2	1	2	0	1	1	1
NWP – M Subtot *n*=7	0	1	2	2	1	1	0	2	1	4	0	0	0	1	2	1	2	1	0
GP-R/M Subtot *n*=8	0	0	4	3	1	0	0	0	0	0	0	0	0	0	5	2	1	0	0
NWP –P Subtot *n*=8	0	2	3	2	1	4	0	1	1	0	1	2	0	3	0	1	0	0	0
GP Subtot *n*=15	1	2	6	3	1	2	2	4	0	1	0	0	2	1	7	2	2	1	1
n=15 %	6.7	13.3	40	20	6.7	13.3	13.3	26.7	0	6.7	0	0	13.3	6.7	46.7	13.3	13.3	6.7	6.7
NW Subtot *n*=15	0	3	5	4	2	5	0	3	2	4	1	2	0	4	2	2	2	1	0
n=7%	0	20	33.3	26.7	13.3	33.3	0	20	13.3	26.7	6.7	13.3	0	26.7	13.3	13.3	13.3	6.7	0
TOT GP+NW *N*=30	1	5	11	7	3	7	2	7	2	5	1	2	2	5	9	4	4	2	1
N=30 %	3.3	16.7	36.7	23.3	10	23.3	6.7	23.3	6.7	16.7	3.3	6.7	6.7	16.7	30	13.3	13.3	6.7	3.3

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

From the above findings, given that most ear infections occur as a complication of URTI (Skoner, 2000) and given that respiratory infections are one of the most common childhood diseases in children under 5 in South Africa (Day & Gray, 2008), the potential exists for increased incidence of otitis media with associated hearing loss, the need for standardised hearing screening protocols at a PHC level is emphasised.

4.6.3.3 Disability.

The WHO (2008), in its 10 facts of the global burden of disease, refers to sight, hearing and mental disorders as the most common cause of disability. The disabilities listed i.e. Physical, Intellectual, Emotional, Multiple, Other Disability, Sight, Hearing, and Communication are documented to be those most commonly occurring in children under 5 years of age in the South African context (Day & Gray, 2008). Results are reflected in Tables 19 and 20 overleaf.

The vast majority of disabilities reported to be observed (excluding sight, hearing, and communication) within the GP and NW facilities, were estimated as occurring in less than or equal to one percent as well as in zero percent of infants assessed. The most common disability noted was physical disability where 11 respondents (36.7%; *N*=30) stated this to be observed in less than or equal to one percent of their infant clinic attendees, with the highest prevalence rated by NW-P (4; 50%; *n*=8). When elaborated upon, disabilities were reported to have occurred as a once-observed occurrence, such as one infant with hydrocephalus in GP-R/M.

Table 19

PHC Most Common Infant Disability Issues (excluding Sight, Hearing and Communication) Estimates (N=30)

Region	Physical Disabilities				Intellectual Disabilities				Emotional Disabilities				Multiple Disabilities		Other Disabilities	
	0	≤1	≤2	≤5	0	≤1	≤2	≤10	0	≤1	≤5	≤10	0	≤1	0	≤1
GP – COJ *n*=7	5	2	0	0	6	1	0	0	6	0	0	1	7	0	6	1
NW – M *n*=7	4	2	1	0	6	1	0	0	5	2	0	0	5	2	7	0
GP-R/M *n*=8	4	3	1	0	3	2	1	0	7	0	0	0	4	2	0	0
NW –P *n*=8	3	4	0	1	3	4	0	1	4	3	1	0	3	5	0	0
GP Subtot	9	5	1	0	9	3	1	0	13	0	0	1	11	2	6	1
n=15 %	60	33.3	6.7	0	60	20	6.7	0	86.7	0	0	0	73.3	13.3	40	6.7
NW Subtot	7	6	1	1	9	5	0	1	9	5	1	0	8	7	7	0
n=15 %	46.7	40	6.7	6.7	60	33.3	0	6.7	60	33.3	6.7	0	53.3	46.7	46.7	0
TOT GP+NW	16	11	2	1	18	8	1	1	22	5	1	1	19	9	13	1
N=30 %	53.3	36.7	6.7	3.3	60	26.7	3.3	3.3	73.3	16.7	3.3	3.3	63.3	30	43.3	3.3

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

What is remarkable is the relatively small amount of disabilities that have presented in infants at these PHC clinics. The reason is perhaps reflected in a NW-P participant's elaboration who stated that "to notice a problem, a child should be older than one year. After one year we expect the child to be talking. It's easier to see problems after a year and then you refer". In addition another NW-P resident stated that disabilities are usually handled "at Potchefstroom hospital" which is the regional tertiary level hospital.

With regard to Table 20 overleaf, as far as hearing disability and communication disability is concerned, all categories were rated highest as not occurring (0%) by the majority of respondents (22, 73.3%; *N*=30), with a similar spread across the 4 districts. With regard to the statistics on hand, where approximately 17 children are being born a day with hearing impairment (Swanepoel, Storbeck, & Friedland, 2009), this non-occurrence estimation by the clinic respondents most likely reflects that hearing impairment exists in this milieu but is going undetected. This demonstrates the urgency for implementation of a hearing screening programme as per JCIH (2007) and HPCSA (2007) recommendations where children with hearing loss should be identified by a maximum of 4 months of age.

Table 20

PHC Most Common Infant Sight, Hearing, Communication Disability Issues Estimates (N=30)

Region	Sight				Hearing					Communication			
	0	≤1	≤10	≤20	0	≤1	≤2	≤5	≤10	0	≤1	≤2	≤5
GP – COJ Subtot *n*=7	6	1	0	0	6	1	0	0	0	5	0	0	0
NW – M Subtot *n*=7	5	2	0	0	5	1	0	1	0	6	1	0	0
GP-R/M Subtot *n*=7	4	3	1	0	6	1	1	0	0	5	2	1	0
NW –P Subtot *n*=7	5	2	0	1	5	2	0	0	1	4	3	0	1
GP Subtot *n*=15	10	4	1	0	12	2	1	0	0	10	2	1	0
n=15 %	66.7	26.6	6.7	0	80	13.3	6.7	0	0	66.7	13.3	6.7	0
NW Subtot *n*=15	10	4	0	1	10	3	0	1	1	10	4	0	1
n=15 %	66.7	26.6	0	6.7	66.7	20	0	6.7	6.7	66.7	26.6	0	6.7
TOT GP+NW	20	8	1	1	22	5	1	1	1	20	6	1	1
N=30 %	66.7	26.6	3.3	3.3	73.3	16.7	3.3	3.3	3.3	66.7	20	3.3	3.3

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion

4.6.3.4 As burden of disease relates to staffing pressures.

As logistics and work burden through possible understaffing has been reported to possibly have a negative impact on EHDI implementation (Theunissen & Swanepoel, 2008), assessing staff workload pressures were considered critical in evaluating whether additional activities like N/IHS are a realistic goal within the present PHC context.

Staff workload was evaluated by examining staff complement inclusive of staff qualifications and duty analysis in terms of how much time is spent directly with patients (patient assessment and/or education) and how much time is spent directly on clinic administration (an inherent component of a structured hearing screening programme).

Staff qualifications were deemed to be an appropriate area of evaluation in order to assess clinic staff capability and capacity to conduct hearing screening, as recommended by the HPCSA clinic guidelines (2007). In addition, the ability for staff to take breaks and details offered by participants pertaining to overtime were also evaluated.

With regard to ***staff complement***, all Operations Managers or Acting/appointed clinic managers interviewed were reported by 22 respondents (73.3%; *N*=30) to be fully qualified with mostly a diploma, less often a degree as reported by 7 respondents (23.3%; *N*=30), and in one case, with both a degree and diploma as per a GP-COJ respondent's comment. The spread was similar throughout the 4 districts.

In terms of the total of the remaining qualified nursing sisters employed (as reported by the 30 respondents at their 30 sites), a total of 62 were qualified with diplomas and 66 were qualified with degrees. Most GP respondents (60; 96.8%; *N*=62) had obtained diploma certification. NW presented with a higher quota of degrees (9; 13.7%; *N*=66). The spread of qualified nursing sisters was relatively evenly spread across the 4 districts.

Furthermore, medical doctors were available either on a rotational basis or as a permanent staff member at all clinics with exception of GP-COJ where 4 clinics (57.1%; *n*=7) did not have these dedicated services, and where referrals were then made to the regional district tertiary facility.

As far as auxiliary nurses, enrolled nurses and nursing assistants, similar distribution was evident across 3 districts with the exception of NW-P district where at least 8 more staff members formed part of the facilities' staff complement (GP-COJ total was 11; GP-R/M total was 9; NW-M total was 12; NW-P total was 20). It was emphasised that these staff members did not need a matriculation qualification as an employment prerequisite, but rather the relevant certificate and training. With regard to Voluntary Counselling Trained staff (VCT's), staff employed for provision of HIV/AIDS counselling (DoH, 2009), similar distribution across the districts was evident with exception of GP-COJ where a marked decrease in such services was evident (GP-COJ total was 9; GP-R/M total was 23; NW-M total was 20; NW-P total was 19). Greater NGO support was evident in NW where 2 VCT were supplied by an NGO in NW-M, and 4 VCT were supplied by 2 NGOs in NW-P. It was emphasised that VCT's did not need a matriculation certificate as a prerequisite qualification but rather the necessary training. Community Health Workers demonstrated similar distribution across the districts with exception of NW-P where a marked decrease in such services was evident (GP-COJ total was 11; GP-R/M total was 10; NW-M total was 9; NW-P total was 5). Again it was emphasised that Community Health Workers did not need a matriculation certificate as a prerequisite qualification but rather the necessary training.

With regard to support staff, clerks were in good supply in GP compared to NW where similar distribution per province was evident (11 in GP-COJ; 12 in GP-R/M; 7 in NW-M; 9 in NW-P). Again, clerks did not need to have matriculated but rather the necessary training.

General workers, comprising cleaners and security guards, were also in good supply, more so in GP than in NW (25 in GP-COJ; 40 in GP-R/M; 15 in NW-M; 16 in NW-P).

From the above, conclusions may be drawn that GP, GP-R/M in particular has an overall more comprehensive staff complement than NW as far as her supply of doctors, Community Health Workers, clerks and general workers. This was anticipated in terms of the deprivational index scale where GP and in particular the GP-R/M district is reported to be more advanced than her NW counterparts. However, NW appears to be better staffed in terms of her supply of auxiliary, enrolled and staff nurses as well as VCTs, with additional NGO support, than her GP counterparts. A similar distribution across provinces with regard to nursing sisters' services was evident but GP-R/M and NW-P were significantly better staffed than their provincial district counterparts. This was anticipated according to the deprivational index (Community Survey 2007). However, overall it was NW (NW-P in particular) that was better staffed in this regard than her GP counterparts. In terms of comparison of service district provision spending, as previously mentioned, approximately R289 is spent per person (uninsured, PHC setting) in GP versus approximately R349 per person (uninsured, PHC setting) in NW (Day & Gray, 2008). In light of this last mentioned factor, it would appear that improved staffing in NW-P is not surprising.

In terms of ***staff time management and associated work pressures***, the majority of all respondents across all districts described their staff's time (with exception of clinic clerks and general workers) to be allocated to between 80 to 90% on patient orientated activities (inclusive of treatment, education and home visits dependent upon their job description and responsibilities) with between zero to 20% of respondents' staff complement allocated to administration, inclusive of entering notes into patient records and daily statistics. Clerks and general workers were all described to be involved with clinic administrative and

cleaning/security duties respectively, with exception of one GP-COJ clerk who was also qualified as a nursing assistant who's help was often requested in the event of staff shortages for activities such as weighing babies.

As far as the clinic operational or acting clinic manager's workload is concerned, a variety of work-spread was evident. Specifically, in GP-COJ, the majority of respondents were split in their responses where three respondents classified their time to be divided between 30 to 50 % on patient care with the rest on administrative tasks, and two described the majority of their duties to be between zero to 25% administrative in nature, with the remainder of tasks to be patient directed. In GP-R/M district the majority of respondents were split in their responses where three respondents classified their time to be divided between 80 to 100 % on patient care with the rest on administrative tasks, and two described the majority of their duties to be between zero to 20% administrative in nature with the remainder of tasks to be patient directed. In NW-M, the majority of respondents were also split in their responses where 7 respondents classified their time to be divided between 80 to 100 % on administrative tasks with the rest spent on direct patient treatment. In NW-P the majority of respondents were split in their responses where 4 respondents classified their time to be divided between 80 to 100 % on patient care with the rest on administrative tasks, and 3 described the majority of their duties to be between 55 to 75% directly patient treatment related with the remainder of tasks spent on administration.

All clinics were described as being very busy with the exception of one GP-COJ clinic and 2 GP-R/M clinics described as "we are not busy", with similar descriptions by one GP-M clinic respondent. Nevertheless, all clinics described the ability for them to take breaks (often staggered, some with an extended lunch instead of taking a tea break). Of note was the one GP-R/M respondent who claimed her breaks were mostly working breaks, with one GP-COJ

and one NW-M respondent having elaborated that they often have had to take to take administrative tasks home to complete.

From the above, it would appear that clinics are usually intensely busy, some obviously more so than others (as described by 4 GP-COJ, 4 GP-R/M, 4 NW-M and 5 NW-P respondents) and despite staff absence as a result of courses being attended (described by all to be a regular occurrence), staff were described as being able to take allotted breaks. Despite the general heavy patient loads described, all patients were reportedly attended to on a daily basis, without having to turn anyone away. Despite the occurrence of respiratory tract infections rated by respondents as highest in terms of infant presentation, followed by diarrhoea diseases and then by otitis media (Day & Gray, 2008), where the argument follows (as presented above) that hearing screening should, as a result, be prioritised for inclusion as a clinic infant protocol, it appears that, generally, adding the task of hearing screening to clinic duties would not be realistic in terms of the time available within the clinic day to do so. This appears to be in agreement with Lehmann (2008) who purports that compared to the mid 1990s, the overall health workforce of today appears to be substantially weaker. Lehmann (2008) clarifies that as production has fallen behind compared to population growth, increased care needs, and attrition, there are fewer doctors and nurses available to attend to the vast majority of public sector dependant population. Given the nature and time frames usually involved in hearing screening, where patient evaluation and administration are inherent processes (HPCSA, 2007), the need for alternative/additional PHC staffing for hearing screening service provision is highlighted.

4.6.4 Parental awareness, willingness, and education.

Although caregivers were not the focus of this research, it was felt to be appropriate to

gauge respondent views on parental willingness to partake in infant hearing screening as fatalistic cultural perceptions with associated acceptance and passivity towards disability, inherent to many African cultures (Louw & Avenant, 2002; De Andrade & Ross, 2005) may prove to be a significant obstacle in EHDI implementation. Results are reflected in Table 21 overleaf.

Eighty percent of respondents (24; N=30) recognized the need to educate parents, 50% (15; *N*=30) citing the lack of parental willingness as a cause for concern with relatively even spread across the sub-district regions, and 53.3% (16, *N*=30) citing parental cultural beliefs such as ancestral influence on the health outcome to be of importance as an obstacle to effective hearing screening. This was referred to mostly by 6 NW-M (85.7; *n*=7) and 5 GP-R/M (62.5%; *n*=8) compared to 2 GP-COJ (28.6%; *n*=7) and 3 NW-P (37.5%; *n*=7) respondents. Surprisingly most, (23; 76.7%; *N*=30) with similar spread across the provinces, considered issues pertaining to parental willingness, parental education and parental cultural beliefs as surmountable through adequate parental education. This may again be reflective of an overall lack of knowledge as to the extent to which the hearing screening process is formalised, where otoacoustic emissions is the advocated technique of choice in the assessment of infants at a clinic level (JCIH 2000; HPCSA, 2007). Noisemakers and free-field informal speech testing were described as the instruments predominantly used to screen for hearing impairment in the clinic context of this research. One must consider that otoacoustic emissions may indeed be regarded by parents as being invasive where as one NW-P expressed, sometimes otoscope insertion to examine an infant's tympanic membrane and ear status can be blamed by the parent to have caused the hearing loss.

Table 21

Perceived Caregiver Factors which May Negatively Impact a Hearing Screening Programme (N=30)

Factors	Region																											
	GP COJ *n*=7			NW M *n*=7			GP R/M *n*=8			NW P *n*=8			GP Subtot *n*=15						NW Subtot *n*=15						GP+NW TOT *N*=30					
	Y	N	P	Y	N	P	Y	N	P	Y	N	P	Y	%	N	%	P	%	Y	%	N	%	P	%	Y	%	N	%	P	%
Lack of awareness in parents	6	0	1	6	1	0	7	0	1	5	3	0	13	86.7	0	0	2	13.3	11	73.3	4	26.7	0	0	24	80	4	13.3	2	6.7
Lack of willingness in parents	4	2	1	4	3	0	4	4	0	3	5	0	8	53.3	6	40	1	6.7	7	46.7	8	53.3	0	0	15	50	14	46.7	1	3.3
Lack of parent education	6	1	0	6	1	0	6	2	0	5	3	0	12	80	3	20	0	0	11	73.3	4	26.7	0	0	23	76.7	8	26.7	0	0
Cultural aspects e.g. cultural beliefs pertaining to disabilities and ancestral influence	2	5	0	6	1	0	5	3	0	3	3	2	7	46.7	8	53.3	0	0	9	60	4	26.7	2	13.3	16	53.3	12	40	2	6.7

Note. As respondents may not have elaborated spontaneously, or may have offered more than one alternative, frequency calculations may not be equal to *n*

Key: (GP- COJ): Gauteng Province, City of Johannesburg District; (NW-M): North West Province, Merafong District; (GP-R/M): Gauteng Province, Randfontein/Mogale District; (NW-P): North West Province, Potchefstroom District; Total of GP (Gauteng Province); Total of NW (North West Province); Total of GP (Gauteng Province) added to Total of NW (North West Province); Under discussion below

4.7 Comparison of Hearing Screening Procedures and Protocols in use to the HPCSA (2007) EHDI Position Statement Guidelines and Associated Clinic Benchmarks

Through the above evaluation of sub-aims, it is felt that comparison of hearing screening procedures and protocols currently in use at the respective GP and NW PHC clinics to the HPCSA (2007) EHDI position statement guidelines and associated benchmarks can now be appropriately addressed with the prerequisite insight necessary to discuss any approximations to these suggested guidelines. In overview, current PHC ear and hearing health protocols were defined as follows in Gauteng and North West province immunisation clinics:

1. ***None of the 30 clinics within the scope of this study had formalised hearing screening equipment such as OAE screeners***. Forty percent of respondents felt that this was attributable to general budgetary issues, and 43.3% considered the lack of training in N/IHS to be central in this regard.

2. All clinic respondents had ***otoscopes*** readily available at their clinics, including spares.

3. In terms of ***otoscope usage,*** the majority of respondents (76.7%; *N*=30) only used otoscopes with some babies, mostly on those presenting with URTI symptomatology (53.3%; *N*=30). Only 10% of respondents (*N*=30) conducted otoscopic examinations at RtHC (DoH, 2004) milestone age. The overall impression created by respondent answers was one of inconsistent application of otoscopic examination, even in the presence of otitis media.

4. In terms of ***other methods used to assess for risk of hearing loss***, most respondents described the use of environmental sound presentation to the child (73.3%; *N*=30),

with less respondents doing do with free-field speech presentation (36.7%; *N*=30) and even fewer interviewing caregivers (30%; *N*=30). NW-M was the area least involved in assessing risk for hearing loss. Many inconsistencies inter and intra provincially were evident. Most techniques were reportedly used in connection with assessment and prevention of otitis media, over and above the RtHC milestone hearing screening protocols at three, six months and over a year of age.

5. In terms of ***referrals*** emanating from assessments, where infants are considered at risk for hearing loss, most referrals (83.3%; *N*=30) were made immediately when suspicion was raised, with 33.3% *(N*=30) of these referrals having been made directly to an audiologist or rehabilitation specialist, with GP demonstrating the most of such referrals. However, these first suspicions may already be late in terms of EHDI recommendations (JCIH 2000; JCIH, 2007; HPCSA, 2007) where marked time delays of approximately six months to a year were reported by two GP-COJ respondents and one NW-M respondent.

6. As far as ***methods for prompting patients to return for appointments***, congruity amongst districts and between provinces was strong in terms of the 4 main methods described in prompting caregivers to return with the infant for follow-up, i.e. specific return dates provided on the RtHC, provision of general return days for appointments according to clinic facilities and services, use of booking systems and registers to trace defaulters and apply follow-up procedures, and educating caregivers. All are in alignment with Primary Healthcare Package protocols (DoH, 2001).

7. With regard to ***infant record documentation***, all clinics document patient results on the infants' Road to Health Charts. A similar paper-based system (usually a Road to Health Card duplicate) predominated with 29 respondents (96.7%; *N*=30) having

stated this was the system of choice. One response emanated from the GP-R/M district which indicated that such a paper-based system was not in place as they have opted for e-filing.

8. As far as an ***electronic based system*** is concerned 70% (*N*=30) of respondents stated they do not enter the immunisation data on computer. The 30% (*N*=30) who reported to input their data electronically, mostly emanated from NW-P, where 7 of the 8 respondents stated they were doing so. The remaining two were respondents from the GP-R/M district.

9. As far as keeping ***statistical registers*** are concerned, 80% of respondents spontaneously stated they did so. Of these, again it was the GP-R/M and NW-P district respondents that all did so. NW, the province defined as more disadvantaged according to the deprivational index (Day 7 Gray, 2008), is the area where these statistical record keeping results were most reduced. These numbers reflect non-compliance with the Primary Healthcare Package advocated norms and standards in reference to prevention of hearing impairment due to otitis media (DoH, 2001).

In overview, the IMCI norms and standards (DoH, 2001; DoH, 2005) in its attempt to screen hearing, emphasises hearing loss as a direct link with otitis media, where the RtHC hearing screening milestones (DoH, 2004) appear to have become secondary. Inconsistencies described are possibly attributable to district autonomy which is now more prevalent (DoH, 2009), where different districts may emphasise different protocols of infant health care. This may manifest in digressions from protocols delineated at a central management level. In addition, inequity in terms of provincial and district financing (DoH, 2009) may have affected outcomes in terms of health services rendered. This may very well impinge on prospects for formalised hearing screening implementation and highlight the need for

engagement with government health directorates in order to standardize hearing screening approaches.

In an attempt to standardise and formalised EHDI protocols, the HPCSA (2007) has formulated its EHDI position statement based on the JCIH (2000 and 2007) guidelines but with the unique contextual considerations required, based on scientific rationale. In specific reference to the primary health care clinic milieu, none of the HPCSA EHDI guidelines and benchmark criteria have been met or are being approximated on any level in the 30 primary health care Gauteng Province and North West Province facilities included as participants in this research project. Hearing screening procedures and protocols in use, as described above, in comparison to formalised EHDI protocols (JCIH 2000, HPCSA, 2007), may at best be regarded as basic with large margin for error where patent manifestations of hearing loss are more likely to be detected. In this way, the silent epidemic of hearing loss (Swanoepel, Delport, & Swart, 2004) may unintentionally be perpetuated, where the less obvious presentation of a hearing impairment is more likely to be missed.

There is no doubt that positive aspects for utilising the PHC immunisation clinic milieu do exist and it is encouraging that hearing assessment forms part of infants' wellness assessment, even though this is mostly in relation to otitis media (DoH, 2001; DoH, 2004/5). However adjustments at various levels within this context are necessary in order to actualise formalised hearing screening implementation as advocated by the HPCSA 2007 position statement. These favourable aspects as well as the gaps present pertaining to the HPCSA (2007) clinic hearing screening guidelines are defined in Table 22 and 23 below. Highlighting the assets and barriers provides clarity in establishing the way forward within the context of four key areas including (a) Department of Health policy, (b) Department of Health funding, (c) logistics and (d) other factors.

Table 22

Assets for Implementation of HPCSA (2007) EHDI Clinic Hearing Screening Protocols

DoH Policy	DoH Funding	Logistics	Other Factors
Assets	Assets	Assets	Assets
• ***PHC immunisation policies and strategies*** • ***Infant record documentation*** • ***Referrals***	• ***Otoscope supply***	• ***Patient return rates for immunisations*** • ***Immunisation days available*** • ***Methods prompting infant returns for follow-up appointments*** • ***Infant record documentation systems***	• ***Parental awareness, education, and willingness, regarded as mostly surmountable through education*** • ***Ongoing surveillance by caregivers*** • ***Disability policy***

Pertaining to assets to current HPCSA (2007) hearing screening implementation in PHC (level 1), specific areas in need of elaboration are as follows:

1. With regard to ***PHC immunisation policies,*** EPI targeted strategies include guidelines for ***immunisation days available***, with no turn-aways for infants presenting on a non-immunisation day, and ***methods prompting infant return for follow-up immunisations*** (DoH, 2001). EPI strategies pertaining to ***patient return rates for immunisations***, which also include campaigns, have indicated a progressive increase of children fully immunised from 78% in 2002 to 84.6% in December 2008 (DoH,

2009). The HPCSA 2007 recommendation to conduct infant hearing screening at the 6 weeks of age immunisation, with a follow-up at 10 and 14 weeks respectively, is considered appropriate in terms of achieving high yield, given the feedback of overall return rates of between 90% and 100% reported by most respondents for immunisations at 6 weeks and 10 weeks. A decline was reported at 14 weeks. The above mentioned health indicators, where a steady increase in patients fully immunised has been documented (Day & Gray, 2008; DoH, 2009), further supports this immunisation setting to be appropriate for generating high yield with regard to patients that may be "captured" for a hearing screen with opportunity for follow-up.

2. Generalised accountable ***infant record documentation systems*** with associated statistic generation and documentation, and some electronic data bases (30%, *N*=30), are already in place. Such systems are promulgated by Department of Health policies, with specific reference to recording cases of otitis media (DoH, 2005).

3. Generally adequate ***referral resources***. Most contexts (with exception of NW-M where reduced specialist referrals to an audiologist were evident) revealed, at the very least, adequate provision of the ethically important referral resources for diagnosis and follow-up, such as tertiary level audiology services for infants where follow-up or hearing loss diagnosis is recommended. GP-R/M in fact had the services of a dedicated regional audiologist who would rotate amongst various clinics. It is unsure as to this audiologists work burden although she does have tertiary level audiology back-up at certain institutions such as Leratong Hospital. In this way, it is foreseen that diagnosis by maximum of four months of age may be actualised with intervention by a maximum of eight months, although this would be dependent on tertiary level resources and patient to audiologist ratios.

4. As programmes for health education of parents are already being provided with regard to specific health areas such as vitamin A intake (DoH, 2001), it is felt that the importance of ***ongoing surveillance by caregivers*** for infants at risk of delayed onset for progressive hearing loss may relatively easily be included as part of the immunisation and associated hearing screening programme.

5. ***Disability Policy:*** The firm basis of equal opportunity for all children, regardless of disability, as promulgated by the Department of Social Development (2006), with support from the then Deputy President, Thabo Mbeki in his statement defining that steps were to be taken to enable people with disability "to access the same fundamental rights and responsibilities as other South Africans" (Office of the Deputy President T. M. Mbeki, 1997, p.5), sets the stage for positive change where gaps exist [such as formalised disability legislation (DoH, 2009)] in actualising these ideals.

Table 23

Barriers to Implementation of HPCSA (2007) EHDI Clinic Hearing Screening Protocols

DoH Policy	DoH Funding	Logistics	Other Factors
Liabilities	Liabilities	Liabilities	Liabilities
The nursing scope of practice delineates rudimentary hearing screening techniques such as: • ***PHC package protocols including:*** ○ ***RtHC assessments*** • ***IMCI protocols including:*** ○ ***Hearing assessments framed predominantly within the context of otitis media***	• ***Inconsistent otoscope usage*** • ***Lack of formal equipment*** • ***Clinic infrastructure e.g. lack of space available for hearing screening*** • ***Staff complement and work distribution*** • ***Funding inequity between districts*** • ***Staff training, where:*** ○ ***IMCI protocols are emphasised*** ○ ***Funding needs assessment in terms of added hearing screening specific training***		• ***Burden of disease*** • ***Staff currently working at capacity*** • ***Staff knowledge base pertaining to hearing loss in general***

Pertaining to barriers to current HPCSA (2007) hearing screening implementation in PHC (level 1), specific areas in need of consideration are:

1. ***No specialised hearing screening equipment*** was evident in the PHC clinic setting in Gauteng and North West provinces. Such equipment, e.g. OAE screeners, is promulgated by the HPCSA (2007) for use in this clinic setting.

2. The nursing scope of practice delineates rudimentary hearing screening techniques. Furthermore, apparent inconsistent adherence to clinic protocols may be the result of ambiguity between protocols promulgated at a central level. Such protocols encompass hearing screening at RtHC milestone ages (DoH, 2004) versus IMCI protocols pertaining mainly to otitis media (DoH, 2001; DoH, 2005). Inconsistency in protocol adherence may also be the result of district autonomy (DoH, 2009) and inequities in provincial and district funding (Day & Gray, 2008; DoH, 2010). Funding issues may underlie the fundamental logistic barriers such as reduced clinic infrastructure and resources, reduced staff complement and training, all of which are pivotal to HPCSA (2007) recommended formalised EHDI programme implementation.

3. Other factors such as burden of disease, may also seen to impinge on the priority given to hearing screening, where the urgency of other diseases and their socio-economic sequellae take precedence over hearing impairment and its consequences (Olusanya, 2005).

The above highlights the need to fine tune aspects regarded as assets and the need to address barriers which override assets in order to prime the HPCSA (2007) clinic based platform to actualise formalized EHDI. The current study has revealed that as the situation stands, HPCSA (2007) implementation of clinic hearing screening protocols at PHC immunization clinics (level one) does not appear to be feasible.

4.8 Summary

In its aim to evaluate the feasibility of implementing the HPCSA (2007) guidelines in the South African primary health level 1 immunisation clinic milieu, the current study has revealed the complexities of EHDI service delivery. The results were presented and discussed according to the five sub-aims defined specifically to tackle the main aim of the study. These results are summarised in Table 24 overleaf.

Table 24

Summary of Results according to Specific Objectives

Results within the Specific Objectives					
Objective 1 – Sub-aim #1	**Objective 2 – Sub-aim #2**	**Objective 3 – Sub-aim #3**	**Objective 4 – Sub-aim #4**	**Objective 5 – Sub-aim #5**	**Main Objective – Main Aim**
Prevalence of Newborn and Infant Hearing Screening at MCWH PHC Immunisation Clinics in North West and Gauteng Provinces	**Hearing Screening Procedures and Protocols in Use** at MCWH immunisation Clinics in North West and Gauteng Provinces	**Possible Concomitant Personnel-Associated Factors** which May Influence the Implementation of Hearing Screening Programmes in North West and Gauteng Provinces Immunisation Clinics	**Other Factors** that May Influence Implementation of Newborn and Infant Hearing Screening at North West and Gauteng Immunisation Clinics	**Comparison of any Hearing Screening Procedures and Protocols in Use to HPCSA (2007) EHDI Position Statement Guidelines and Associated Clinic Benchmarks**	**The Feasibility of Implementing the HPCSA (2007) Guidelines for EHDI in the South African Context in a Primary Level 1 Clinic Milieu: PHC Immunisation Visits**
• ***100% (N=30) MCWH PHCs did not offer nor provide formalised newborn/infant hearing***	• ***Otoscopes*** readily ***available*** at all clinics, including	***Knowledge regarding hearing impairment in infants under a year of age:*** • 63.3% (***N***=30) described the rudimentary methods with a	***Patient return rates*** were favourable ***for immunisations*** in comparison to return rates for appointments other than immunisations. • 63.3% (*N*=30) approximated return rates at 6 weeks to be between 90 and 100%	***No prototocols for hearing screening complied with HPCSA (2007) clinic guidelines.*** Methods for detecting	HPCSA (2007) implementation of clinic hearing screening protocols at PHC immunization clinics (level one) appears to not be feasible. The current research highlights the need to fine-tune assets and address overriding

screening • 100% (N=30) did not have ***formalised equipment*** to do so. • 40% (*N*=30) of respondents felt that this was attributable to ***general budgetary issues.*** • 43.3% (*N*=30) considered the ***lack of training*** in N/IHS to be central in this regard. • 13.3% (*N*=30) cited ***staff shortages*** as the next reason for lack of N/IHS services • NW-P respondents mentioned ***district level involvement*** in reference to general ***budgetary***	spares. • ***Otoscope usage***, 76.7% (N=30) only used otoscopes with ***some babies***, mostly on those presenting with URTI, (53.3%), more so in GP-R/M and NW-M districts. Only 10% (*N*=30) conducted otoscopic examinations ***at RtHC milestone age***, despite the defined ***Primary Health Care Package protocol***, where *otoscopic examination, parental interview, and infant behavioural observation is specified* (DoH, 2005). *The overall impression was one of* ***loose application of***	lack of standardized protocols used to assess hearing. • A relatively *even spread* was evident *across* ***sub-districts***, with exception of NW-M where knowledge was expressed as reduced. ***No reference*** by name of any ***specialised equipment*** needed for hearing screening • Most respondents did however recognize ***potential barriers*** to hearing screening programme implementation e.g. ***budgetary and human resource*** requirements, with a need for a ***structurally dedicated less noisy area*** for appropriate screening, and the need for ***adequate equipment maintenance.*** • This improved display of insight together with their awareness (66.7%) for ***improved education in hearing screening*** implementation (of ***professionals and caregivers***) as well as their use of ***tertiary level facilities and referrals to audiologist/rehabilitation specialists*** did inspire improved confidence in the respondents' overall knowledge pertaining to hearing impairment and its	• 66.7% (*N*=30)having approximated return rates at 10 weeks to be between 90 and 100%, • 50% stating the same return rate for immunisations at 14 weeks. • 36.7% (*N*=30) rated infant return rates for non-immunisation health services to be between 90 and 100%. • The mobile nature of the community was cited as the main reason for defaulters of immunisations o immigrants from neighbouring countries o visitors to the area from neighbouring districts. • 5 of 8 NW-P named mobility as the main reasons. • Non-immunisation return rates were also affected by community mobility AND the child's improvement in health. • The importance the immunisation programme plays in getting patients to return was emphasised, where NW highlighted the fact that when ***campaigns*** are undertaken, return rates markedly increase. EPI targeted strategies and campaigns have improved immunisation coverage from 78% in 2002 to 84.6% in December 2008 in the numbers of children fully immunised (DoH, 2009). • With regard to ***overall logistics***, 19 (*N*=30) clinics offered immunisations everyday for the entire day. Fairly even distribution across the province districts was evident with exception of NW-P where only 3 of the 8 clinics offered a full-day, everyday service. They offered the 1 whole day per week option instead. This was in fact	hearing loss were in ***alignment*** mostly with ***IMCI protocols within the context of otitis media*** (DoH, 2001). Less protocol adherence to DoH RtHC hearing detection compliance was evident (DoH, 2004) • ***Protocols in use, see column 2*** for: o ***Otoscope usage*** o ***Environmental sound presentation*** o ***Ambiguity and lack of congruity in protocol adherence*** o ***Referrals*** • ***Other factors***: ***See column 4*** for: o ***Patient return rates*** o ***Overall logistics***	barriers in order to actualize EHDI according to HPCSA (2007) clinic protocol . The current research defines assets and barriers to N/IHS HPCSA (2007) clinic guideline implementation as follows:	
					Assets: **DoH Policy** • *PHC immunisation policies and strategies* • *Infant record documentation* • *Referrals* **DoH Funding** • *Otoscope*	**Barriers:** **DoH Policy** • *PHC package protocols including:* *RtHC assessments* • *IMCI protocols including:* *The Nursing scope of practice delineates rudimentary hearing screening techniques framed predominantly within the context of otitis media* **DoH Funding**

issues. • GP-COJ and NW-P mentioned ***district involvement*** in reference to ***HR issues.*** • ***District differences:*** o What stands out was NW's reduced responses citing general budgetary issues as a cause for reduced N/IHS services. o NW's reduced responses citing lack of staff training as a cause for reduced N/IHS services. • For consideration is	***otoscopic examination,*** *even in the presence of otitis media.* • In terms of ***other methods*** used to assess for risk of hearing loss, 73.3% (*N*=30) of respondents described the use of ***environmental sound presentation*** to the child, with less respondents doing so with free-field speech presentation (36.7%) and even fewer interviewing caregivers (30%). • ***District differences:*** o NW-M was the area least involved in assessing risk for hearing loss.	assessment. • ***Knowledge regarding ear infections in children***, an overall greater depth of knowledge appeared evident : o the layered answers elicited from NW-P and GP-R/M sub-districts with overall levelling out between provinces o This aligns with the ***IMCI protocol*** where ***otitis media is emphasized*** in reference to its consequences such as hearing loss (DoH, 2005). It appears that this is the protocol that is more understood and adhered to and more relied upon as a reference compared to the ***greater inconsistencies with regard to RtHC hearing screening milestone assessments*** (DoH, 2004). • ***Perceptions and attitudes towards hearing impairment***, reduced depth of information was exhibited generally in respondents' comments. o Most were ***tangential responses***, lacking in resonant insight, with	the next most common set-up. • Just over 20% elaborated spontaneously throughout the districts that they never turned a person away but did emphasise the preferred day for immunisations to be adhered to at their next visit. ***"No turn-away"*** is a PHC Package ***policy*** that all must adhere to (DoH, 2001). No cueing to elicit further information from participants who did not elaborate renders it unclear as to whether all clinics did adhere to this "No turn-away" policy. Furthur research is advocated to assess whether ***district autonomy*** may result in different ***policy adherence.*** • 70% (*N*=70) stated that they would not be able to allocate an appropriate ***area for infant hearing screening***, mainly because of ***structural space issues*** and ***noise generated*** within the clinic. o Greater sense of reported ability to allocate an appropriate hearing screening area demonstrated by NW. This begs the question as to whether this is related to lack of knowledge of the formalised hearing screening process as was evident on certain aspects of knowledge base e.g. appropriate specialist referrals, and where lack of standardisation of hearing screening procedures in place a clinics was evident. As awareness within PHC personnel is generally stated to be in need of upgrading (WHO, 2010), this is a possibility. Another possibility is the improved financial health service provision indicators at district level in NW (Day & Gray, 2008) Thus, despite the overall deprivational index rating where NW is rated as more deprived a region at a municipal/socio-economic level than GP (Day & Gray, 2008), it is perhaps a region like NW which would be more easily able to procure funds for adaptations needed.	including: ▪ ***Structural space issues*** ▪ ***Methods for prompting patients to return for appointment*** ▪ ***Infant record documentation*** ▪ ***Burden of disease from disability issues,*** ▪ ***Parental awareness, education and willingness***	*supply* **Logistics** • *Patient return rates for immunisations* • *Immunisation days available* • *Methods prompting*	• *Otoscope usage* • *Equipment* • *Clinic infrastructure* • *Staff complement and work distribution* • *Staff training, where:* o *IMCI protocols are emphasised* o *Funding needs assessment in terms of added hearing screening specific training* **Logistics** • *DoH policies and funding underpin logistic outcomes*

the ***greater autonomy now excercised at a district level*** (DoH, 2009) which may affect adherence to protocols delineated at a central level. • ***Inequity in terms of provincial and district financing*** (DoH, 2009) may affect hearing screening services outcomes.	○ Many inconsisten-cies inter and intra provincially with most techniques reportedly used in connection with assessment and prevention of otitis media, where the RtHC milestone hearing screening protocols at 3, 6 months and over a year of age should be conducted. • This alludes to ***ambiguity and lack of congruity in protocol adherence*** especially as it pertains to ***district autonomy*** (DoH, 2009).	reliance on procedural knowledge. GP-R/M and NW-P produced responses with greater insight. ○ But, the overriding impression was that hearing impairment was at the very least ***severe in nature*** to the exclusion of milder and less obvious losses. • ***Willingness to implement a hearing screening programme to coincide with infant immunisation schedules***, 93.3% of respondents were willing to do so, with only GP-COJ respondents having declined: ○ 50% (***N***=30) based this willingness on the ***provision of adequate staffing*** and by 26.7% based willingness on the ***provision of adequate staff training*** and others to a lesser extent on ***the provision of equipment***. ○ Two GP respondents stated that their willingness related to ***adequate provision of space*** within the clinic. ○ On the whole, NW-P respondents appeared to be	• ***Methods for prompting patients to return for appointment*** reflected, congruity amongst districts and between provinces in terms of the ***4 main methods*** described in ***prompting caregivers to return*** with the infant for follow-up, i.e. ***specific return dates*** provided on the RtHC, provision of ***general return days*** for appointments according to clinic facilities and services, use of ***booking systems*** and ***registers to trace defaulters*** and apply follow-up procedures, and educating caregivers. All are in alignment with Primary Healthcare Package protocols (DoH, 2001) • With regard to ***infant record documentation***, all clinics document patient results on the infants' ***Road to Health Charts***. A ***similar paper-based system*** (usually a Road to Health Card duplicate) predominated with 29 respondents (*N*=30; 96.7%) having stated this was the system of choice. One GP-R/M district indicated that such a paper-based system was not in place as they have opted for e-filing. • With regard to ***electronic based system*** is concerned 70% (*N*=30) stated they do not enter the immunisation data on computer, although computers were informally observed to be present at many of the clinics throughout all 4 districts. • 30% (*N*=30) who reported to input their data electronically, emanated mostly from NW-P, where 7 of the 8 respondents stated they were doing so. • In reference t**o *statistical registers***, 80% *(N*=30) spontaneously stated they kept such registers. Of these, it was the GP-R/M and NW-P district respondents that all did so. ○ NW demonstrated the most reduced spontaneous reports of statistical record keeping possibly		*infant returns for follow-up appointments* • *Infant record documentation systems* **Other Factors** • *Parental awareness, education, and willingness* • *Ongoing surveillance by caregivers* • *Disability policy and the lack of formalised disability legislation*	**Other Factors** • *Parental awareness, education, and willingness* • *Burden of disease* • *Staff knowledge base pertaining to hearing loss in general*

	• In terms of ***referrals***, 83.3% (*N*=30) were made immediately when suspicion was raised, with 33.3% (*N*=30) of these made directly to an audiologist or rehabilitation specialist, with GP demonstrating the most of such referrals. • However, these first suspicions may already be late in terms of EHDI recommendations (JCIH 2000; JCIH, 2007; HPCSA, 2007) where marked ***time delays*** of approximately 6 months to a year were reported by 3 respondents.	slightly more willing to implement hearing screening as part of their immunization schedule with 2 outright affirmations expressed *without* provisions. This may relate to ***district infrastructural and budgetary allowance differences*** where NW-P appears to be better supported (Day & Gray, 2008; DoH, 2009). ○ ***Interviewee's training*** was explored as a possible influence on expressed knowledge base on hearing impairment in infants, ear infections in children, perceptions and attitudes towards hearing impairment and willingness to conduct hearing screening: ○ 23 (76.7%; *N*=30) felt that during their training they were ***taught about the ears in infants;*** 26 (86.7%, *N*=30) felt they were also ***informed about ear problems in infants***. However, ***fewer*** participants (60%; N=30) felt they were taught with regard to ***hearing problems in infants equal to or under a year old***.	reflecting non-compliance with the Primary Healthcare Package advocated norms and standards in reference to prevention of hearing impairment due to otitis media (DoH, 2001). • The ***most common medical health issues*** were rated as ***Respiratory Infections (***not associated with HIV/AIDS), then ***diarrhoea diseases***, and then ***otitis media***. • As far as the ***burden of disease from disability issues*** experienced within this PHC context, the vast majority of disabilities observed within the GP and NW facilities, as reported by respondents, were estimated as ***occurring in less than or equal to 1% as well as in 0%*** of infants assessed at the clinics. ○ The most common disability noted was ***physical disability*** where 36.7% respondents (*N*=30) stated this to be observed in less than or equal to 1% of their infant clinic attendees. ○ 73.3% (*N*=30) rated ***hearing disability and communication disability*** as not occurring 0% with a similar spread across the 4 districts although this was observed to be slightly higher in GP-COJ area. With regard to the incidence prevalence statistics on hand, where approximately 17 children are being born a day with hearing impairment (Swanepoel, Storbeck, & Friedland, 2009), this non-occurrence estimation by the clinic respondents most likely reflects that hearing impairment exists in this milieu but is going undetected. This demonstrates the urgency for implementation of a hearing screening programme as per JCIH (2007) and HPCSA (2007) recommendations where children with hearing loss should be identified by a maximum of 4 months of age.			

		○ GP-COJ respondents felt they were ***least prepared*** by their training pertaining to 2 of the 3 specific areas i.e. pertaining to *ears* and *hearing problems* in infants, whereas NW-M felt the ***least prepared i***n their training pertaining to hearing problems in infants. ○ In addition, NW-P participants reflected ***confidence*** that 7 of their 8 participants (N=8; 87.5%) were informed regarding hearing problems in infants. Actual knowledge base was not assessed formally. ○ General sense generated as supported by WHO (2010) recommendations that ***improved education is a core long-term strategy*** for improved hearing services at a primary health care service provision level.	• With regard to ***staff complement and work distribution***, although intense, staff was able to attend to all patients that presented at the clinic. But, as most clinics were described as extremely busy it would appear that adding the task of hearing screening to clinic duties would not be realistic at present. ***Alternatives should be sought*** such as the provision of additional supportive staff (with the necessary training) whose tasks are geared specifically towards conducting hearing screening activities. ○ With regard to ***parental awareness, education and willingness***, 80% (*N*=30) recognised the need to educate parents, 50% having cited the lack of parental willingness as a cause for concern with relatively even spread across the sub-district regions, and 53.3% having cited parental cultural beliefs such as ancestral influence on the health outcome to be of importance as an obstacle to effective hearing screening. This was referred to mostly by NW-M and GP-R/M respondents. Surprisingly 76.7% of respondents, with similar spread across the provinces, considered issues pertaining to parental willingness, parental education and parental cultural beliefs as surmountable through adequate parental education. This may be reflective of an overall lack of knowledge as to the extent to which the hearing screening process is formalised, where otoacoustic emissions is the advocated technique of choice in the assessment of infants at a clinic level (JCIH 2000; HPCSA, 2007) and may be considered by parents to be invasive, which may in turn be considered by the caregiver to be the cause of the hearing loss as expressed by one NW-P respondent.			

Chapter 5: Conclusions and Implications

The WHO defines health to not only encompass the absence of infirmity or disease but to include the individual's complete physical, mental, and social well-being (WHO, 2003). This reflects a tenet beyond the concept of survival and emphasises the urgent need for EHDI to improve life outcomes beyond existence for those infants with hearing loss. Early hearing intervention services, inclusive of early identification, are considered the foundation for attaining most favourable results in infants with hearing loss (Swanepoel, Storbeck, & Friedland, 2009). Unfortunately, the generally less resourced public health care sector within South Africa's developing world context, is the option upon which 85% of the population relies (Swanepoel, Storbeck, & Friedland, 2009). Globally, South Africa has one of the highest burden of tuberculosis and HIV/AIDS (Matjila, Hoosen, Stoltz & Cameron, 2008) and it is these diseases that continue to receive precedance over non life threatening conditions such as hearing loss (Olusanya, 2005).

EHDI services within the South African context, are in their infancy with very little evidence for their efficacy and applicability (Swanepoel, Delport, & Swart, 2004). A paucity of scientific data as well as a lack of investigative studies into EHDI implementation in the South African context prevails (Swanepoel, Hugo & Louw, 2006; Swanepoel, Ebrahim, Joseph & Friedland, 2007). In addition, the responsibility of legislation mandating EHDI is lacking (Swanepoel, Storbeck, & Friedland, 2009), where primary alerts to possible hearing loss lie with the caregiver, where their concerns may relate to speech-language delays, atypical behaviour or otitis media

complications (Swanepoel, Delport, & Swart, 2007).

As per the HPCSA recommendations (HPCSA, 2007), the current study aimed to provide supportive contextual evidence as input to concretely guide the South African EHDI actualisation process. Fundamental to the current study was specific consideration to theoretical constructs and clinical outcomes in the South African primary health care immunisation clinic context. The main objective of the current study was to assess the feasibility of implementing the HPCSA's 2007 clinic guidelines for EHDI implementation. Based on the emergent findings, it was determined that implementing the HPCSA's EHDI clinic guidelines did not appear feasible at this point in time because of the overriding barriers revealed, although assets within the PHC immunisation context were identified. These central barriers, which included reduced clinic infrastructure and resources and reduced staff complement and training, preclude successful HPCSA (2007) EHDI implementation despite the present assets identified. Such assets included overall respondent willingness to implement formalised hearing screening as part of the PHC immunisation schedule. Other assets included patient return rates for immunisation, highlighting the favourable context the immunisation programme offers in terms of high patient yield, regarded as fundamental in a UHS programme (Olusanya & Okolo, 2006). Specific conclusions and implications of the current study are detailed below.

Specifically, no PHC clinics within the North West and Gauteng provinces were conducting formalized hearing screening as promulgated by the HPCSA (2007) EHDI programmes in South Africa position statement. Budgetary and human resource issues (mainly staff training and staff shortages) were highlighted as the main reasons for this lack of formalized hearing screening implementation. It appeared that economic indicators may have impinged on logistical and operational factors such as the clinic's physical structure, staff training, equipment availability, and

staff complement. The reported inequities in district finance distribution (DoH, 2009) may have contributed to the differences in responses obtained between provinces. Further investigation into provincial and district inequities as they impinge on current hearing screening protocols in use, may be considered a core issue in affecting hearing screening outcomes. Before HPCSA 2007 protocol implementation is considered, available funding should be investigated to establish the financial support that will be required for HPCSA EHDI implementation at a clinic level.

Despite IMCI (DoH, 2001; DoH 2005) and RtHC (DoH, 2004) milestone hearing screening protocols having been defined for endorsement at a central government directorate level, protocols for hearing screening applied at the clinics under investigation were varied and characterised by a lack of consistency. Such variation was noted in terms of hearing screening timing as well as the hearing screening administered. Although regional and sub-district differences and the importance of district involvement in leading clinic protocol adherence were mentioned by respondents only several times, it is acknowledged by the DoH, that autonomy is now excercised at a district level (DoH, 2009). Specific differences in adherence to current centralised hearing screening IMCI and RtHC milestone protocols were present intra and inter provincially. It is thus recommended that these differences be investigated according to (a) in terms of policies recommended centrally versus actual district applications, specifically as they impact on the hearing screening protocols currently in use in the PHC clinic setting, and (b) other contributing factors, such as possible ambiguity in terms of appropriate protocols to be applied. Within the last-mentioned, although the IMCI and RtHC protocols appear adjunctive, where RtHC protocols appear to be an attempt to capture the population inclusive of babies that do not have URTI or otitis media type symptoms, DoH rationale appears scant with little detail accessible in describing whether this is an adjunctive method to infant health care. Further exploration into the possible adjunctive nature of the IMCI and RtHC processes is thus recommended as a basis to fine-tune and render more effective the

DoH hearing screening processes currently in place

The possible concomitant personnel associated factors that may influence hearing screening in North West and Gauteng provinces, revealed some regional differences in terms of respondent willingness to conduct hearing screening as part of the PHC clinic immunisation programme. These differences may again relate to district infrastructural and budgetary support inequities (DoH, 2009). Exploration on whether such differences in financial and infrastructural support influence staff morale and emergent attitudes in PHC staff is recommended as staff willingness to implement hearing screening directly impinges on hearing screening programme implementation and its associated outcomes.

As staff training may also impinge on PHC staff attitude and willingness to conduct hearing screening as part of the immunisation programme, especially with regard to gaps in knowledge as it pertains to hearing impairment in general detected across the sample, further exploration of staff training on hearing impairment is recommended. Such exploration is recommended of undergraduate training prior to diploma or degree qualification, compared to PHC in-service training. In this way, the well recognised need to provide staff improvement in health care education (WHO, 2010c) may be addressed in a defined and structured manner, where knowledge base gaps can be systematically addressed to effect improvement in PHC hearing service delivery outcomes.

The above-mentioned district level autonomy may indeed affect other factors that may influence implementation of N/IHS at North West and Gauteng immunisation clinics. It is thus recommended that further exploration of EPI policies that may affect hearing screening outcomes be conducted to determine any intra and inter provincial differences. Such policies include the "No turn-away" rule which forms part of the PHC Package that all must adhere to (DoH, 2001).

Within the current study, it was unclear as to whether all clinics did adhere to this "No turn-away" policy. Furthur research is advocated to assess whether district autonomy may result in different policy adherence in this regard, which would in turn effect population capture rates for hearing screening where 95% yield is recommended (HPCSA, 2007). As infant record keeping was found to differ between districts and as this impinges on hearing screening programme quality control and assurance, further research into centrally versus district generated differences in administrative processes inherent to hearing screening is recommended, such as differences in statistical register keeping and e-filing.

Although parental lack of awareness and lack of education with regard to hearing screening in general was highlighted by two thirds of respondents to be of concern, most respondents felt that education would overcome any parental obstruction to the hearing screening process. Although promising, formal investigation into caregiver attitudes is recommended, particularly in reference to caregiver perceptions of specific hearing screening procedures such as the HPCSA recommended OAE screening, with associated probe insertion, which may be considered to be an invasive procedure. Such investigation is recommended to shed light on how these procedures may affect caregiver consent to conducting hearing screening and return rates for follow-up hearing screens.

Finally a cost to benefit ratio projection would prove useful in calculating the burden inherent in late or non-identification and non-intervention of infants with hearing loss. It is recommended that a component in this costing exercise include a cost comparison of HPCSA (2007) recommeneded guidelines for clinic based hearing screening to the current hearing screening process in use. Aspects for costing consideration and exploration include:

1. ***Equipment***, inclusive of provision of an ***appropriate quiet area*** for infant hearing

screening.

2. ***Infant record documentation, statistical registers*** inclusive of ***electronic based systems***.

3. ***Staff complement, training, and work distribution.*** The current study revealed that adding the task of hearing screening to current clinic duties would not be realistic in terms of the time available within the clinic day to do so. It is thus suggested that given the nature and time frames usually involved in hearing screening, alternatives should be investigated such as the provision of additional supportive staff (with the necessary training) who's tasks are geared specifically towards conducting hearing screening activities. The specific scope of this research did not explore whether all staff are employed full-time and perhaps expansion of current posts from a part-time to a full-time position could be viewed as a cost-saving endeavour.

Further to the above recommended areas of future research, because of the qualitative nature of this research with its reduced sample size, it is recommended that the current study be replicated in other provinces from a quantitative perspective, perhaps as a national self-administered survey in collaboration with DoH research directorates. This will facilitate better scientific generalisability, with increased ability to draw causal inferences to scientifically ascertain more definitive correlations

The findings of the current study, inclusive of the aforementioned assets and overriding barriers identified, and together with the above recommended investigative efforts, enable projection of the collaborative way forward with the HPCSA (2007) clinic guidelines as basis, as follows:

1. As per the HPCSA 2007 recommendations, ***partnership through negotiation and collaboration between significant role players*** at a non-governmental level (such as tertiary level training institution audiology representatives such as lecturers and clinical supervisors) and at a government level inclusive of DoH's MCWH Directorate, Social Development's Disabilities and Early Childhood Development unit and Education, and Provincial Directorates of Finance, and Private stakeholder and non-government organisation representatives where appropriate.

2. Matters to be tabled in the conceptualisation, regulation and implementation process (HPCSA, 2007), should include appropriate ***allocation of funds*** to enable hearing screening implementation with appropriate ***staff allocation*** and ***training*** (as a follow-on from the above knowledge-bases concerns examined) as well as appropriate ***use of technology***. In the interest of reducing overall expenditure, the cost-saving hearing screening minimal criterion of a unilateral pass on universal hearing screening endeavours is thought to be realistic until more funds become available. A further cost saver is suggested through maximal utislisation of current staff but may not be realistic in terms of room for increased work allocation inherent in the additional hearing screening duties advocated. It is imperative that district management be included as close to inception as possible to ensure relevant operational input from the hearing screening activity's focal point. Only then may the following be addressed:

3. ***Revisiting the hearing screening protocols as defined by the Primary Health Care Package norms and standards*** inclusive of IMCI protocols and RtHC milestone assessments with eventual substitution of more formalised hearing screening

procedures (inclusive of hearing screening criterion, associated benchmarks and quality indicators) as defined specifically by the HPCSA position statement (2007). Fine-tuning hearing screening protocols and data capturing techniques as well as ethical issues pertaining to caregiver consent for the infant to have his/her hearing screened (Department for Children Schools and Families , 2010). Again collaboration between the significant role players is necessary to ensure final operationalisation.

The main emphasis is recommended to be of EHDI as an integrated part of infant health care service provision (Swanepoel, Delport & Swart, 2004) where coverage is optimised such as within the PHC immunization programme (Olusanya & Okolo, 2006), identified as an appropriate context.

5.1 Critical Evaluation of the Study

5.1.2 Study Limitations.

Notwithstanding the methodological attempts to minimise threats to reliability and validity already highlighted in Chapter 3, some of these attempts to control variables, may have in fact reduced the overall quality of answers obtained, where probing may have in fact elicited a richer data set (such as probing pertaining to district management structures and autonomy), and may have in fact answered some of the questions that have been recommended for investigation for future research endeavours. This was in particular reference to the open-ended questions posed pertaining to participants' knowledge, perceptions and attitudes towards hearing impairment in children equal to or under a year in age, and their knowledge on ear infections in children. It is felt that more specific questions or question explanation may have provided less tangential responses.

As previously mentioned, to ensure consistency between interviews, probing of respondent answers was not applied beyond the methodological protocol. This was also the case with regard to spontaneous elaborations offered by respondents which were aspects not probed of those respondents who did not offer such elaborations. As a result, findings may have been somewhat skewed despite the researcher having taken cognisance hereof. Any future research replications should include such adjustments.

Lastly, the aforementioned reduced sample size of thirty participants cannot be ignored, where generalisability to similar samples cannot be made (McMillan & Schumacher, 2001). In order to arrive at more holistic conclusions, future research endeavours must take cognisance of the need to explore similar research questions within larger sample sizes.

5.1.2 Study Strengths.

As immunisation programmes have been specifically recommended by the HPCSA (2007) as an appropriate setting for EHDI implementation, specifically because of their potential high infant capture rates (HPCSA, 2007), in the interest of expediting hearing service delivery at a grass-roots level, this research effort aimed to provide tangible information as to whether HPCSA (2007) guidelines within this immunisation setting were being applied, if so to what extent, and if not why not. Notwithstanding the study's limitations, the strengths of this research endeavour lie in the fact that these questions were specifically addressed and answered. The qualitative design allowed for exploration of a more personal nature through open-ended questions which yielded sufficient qualitative information for a comprehensive description of the services offered.

5.2 Final Comments

Assessment of a hearing screening programme's viability in its original and natural environment is a vital determinant regarding the feasibility of HPCSA EHDI guidelines and the associated UNHS benchmarks in the South African context. This study has revealed specific South African core issues such as existing gaps in government policy, health care management policy and structure, hearing assessment protocols and logistics currently in use in the research sample as they impact on the EHDI programme implementation within the primary health care clinic (PHC) setting highlighted by the HPCSA (HPCSA, 2007).

Implications of the results of this research have included guiding HPCSA protocols for more effective implementation of EHDI principles to maximize yield and facilitate early identification and intervention of hearing loss. In light of the South African disability strategy, where few specifics pertaining to hearing loss exist (Office of the Deputy President T. M. Mbeki, 1997; Swanepoel, Storbeck, & Friedland, 2009), it is time the hearing impaired are no longer disadvantaged by circumstance, ignorance and lack of resources. Until EHDI is formalised as an integrated nationalised healthcare strategy, a significant portion of South African hearing impaired children's rights will be negated. Health care practitioners bear the moral obligation to facilitate actualisation of the hearing impaired individuals' rights to achieve their potential through EHDI, which must not be further delayed. It is sincerely hoped that the suggestions made within this research scope will expedite processes in the actualisation of universal EHDI implementation at a grass-roots level.

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References

American Speech-Language-Hearing Association (ASHA). (2007). *Guidelines for audiologists providing informational and adjustment counseling to families of infants and young children with hearing loss birth to 5 years of age*. Retrieved from http://www.asha.org/docs/pdf/GL2008-00289.pdf

American Speech-Language-Hearing Association (ASHA). (2008). *Ethics in research and scholarly activity (Issues in Ethics)*. Retrieved from http://www.asha.org/docs/html/ET2008-00299.html

ANC Today. (2005). *Responding better to healthcare needs of communities*, 5 (43). Retrieved from http:www.anc.org.za/ancdocs/anctoady/2005/at43.htm#art1

Babbie, E. (1995). *The practice of social research* (7th ed.). San Diego, CA: Wadsworth.

Bamford, J., Uus, K., & Davis, A. (2005). Screening for hearing loss in childhood: issues, evidence and current approaches in the UK. *Journal of Medical Screening, 12* (3), 119-124.

Berman, S. (1995). Otitis media in developing countries. *Paediatrics, 96,* 126-131.

Bradshaw, D. (2008). Primary health care: In context: Determinants of health and their trends. In *South African Health Review 2008.* (Chapter 4). Durban, South Africa: Health Systems Trust.

Bryman, A.E. (2001). *Triangulation.* Retrieved from www.referenceworld.com/sage/socialscience/**triangulation**.pdf

Burns, N., & Grove, S. (2001). *The practice of nursing research: Conduct, critique and utilisation* (4th ed.). Philadelphia: W.B. Saunders Co.

Canale, A., Favero, E., Lacilla, M., Recchia, E., Schindler, A., Roggero, N., et al. (2006). Age at diagnosis of deaf babies: A retrospective analysis highlighting the advantage of newborn hearing screening. *International Journal of Pediatric Otorhinolarygology, 70, 12*83-1289.

Cao-Nguyen, M., Kos, M., & Guyot, J. (2007). Benefits and costs of universal hearing screening. *International Journal of Pediatric Otorhinolaryngology, 71*, 1591-1595.

Coates, H. & Gifkins, K. (2003). Newborn hearing screening. *Australian Prescriber, 26, 82-84*

Davis, A., & Hind, S. (2003). The newborn hearing screening programme in England. *International Congress Series*, *1254*, pp. 335-339.

Day, C., & Gray, A. (2008). Indicators: Health and related indicators. In *South African Health Review 2008.* (Chapter 16). Durban, South Africa: The Health Systems Trust.

De Andrade, V., & Ross, E. (2005). Beliefs and practices of Black South African traditional healers regarding hearing impairment. *International Journal of Audiology , 44*, 489-499.

De Capua, B., Costantini, D., Martufi, C., Latini, G., Gentile, M., & De Felic, C. (2007). Universal neonatal hearing screening: The Siena (Italy) experience on 19,700 newborns. *Early Human Development, 83*, 601-606.

Department for Children Schools and Families. (2010). *Every child matters*. Retrieved from http://www.dcsf.gov.uk/everychildmatters/healthandwellbeing/ahdc/earlysupport/resources/downloads/downloads.html

Department of Health (DoH). (2001). *The primary health care package for South Africa: a set of norms and standards.* Retrieved from

http://ww.doh.gov.za/docs/policy/norms/full-norms.html.

Department of Health (DoH). (2004). *Health chart guidelines.* Retrieved from http://www.doh.gov.za/docs/factsheets/guidelines/health/healthchart.htm

Department of Health (DoH). (2005, December 1). *Hearing guidelines.* Retrieved from www.doh.gov.za: http://www.doh.gov.za/docs/factsheets/guidelines/hearing.pdf

Department of Health (DoH). (2007). *Speech by Minister Manto Tshabalala-Msimang at the 1st African National Conference on early childhood deafness*. Retrieved from http://www.doh.gov.za/docs/sp/2007/sp0813.html

Department of Health (DoH). (2008, February). *The revised expanded programme on immunisation in South Africa (EPI-SA) schedule*. Retrieved from http://www.doh.gov.za/search/index.html

Department of Health (DoH). (2009, March 10). *Strategic plan 2009/10-2011/12.* Retrieved from http://www.doh.gov.za/department/strategic%20plan.html

Department of Social Development. (2006). *Guidelines for early childhood development.* Retrieved from http://www.socdev.gov.za/documents/2006/earlychd.pdf

DesJardin, J., Ambrose, S., Martinez, A., & Eisenberg, L. (2009). Relationships between speech perception abilities and spoken language skills in young children with hearing loss. *International Journal of Audiology, 48,* 248-259.

Fukushima, K., Mimaki, N., Fukuda, S., & Nishizaki, K. (2008). Pilot study of universal newborn hearing screening in Japan: District-based screening program in Okayama. *Annals of Otology,Rhinology and Laryngology, 117* (3), 166-171.

Health Professions Council of South Africa (HPCSA). (2002). *Screening position statement year 2002*. Professional Board for Speech, Language and Hearing Professions. 2002: 1-8.

Health Professions Council of South Africa (HPCSA). (2007). *Early hearing detection and intervention programmes in South Africa position statement year 2007.* Retrieved from http://www.hpcsa.co.za/hpcsa/UserFiles/Files/Speech%20language%20and%20hearing/EHDI5position%20statement%20(HPCSA%2007).pdf.

Health Professions Council of South Africa (HPCSA). (2009). *About the HPCSA*. Retrieved from http://wwwhpcsa.co.za/hpcsa/default.aspx?id=51

Hollenbeck, L. (2008). Advocating for universal newborn hearing screening. *Creative Nursing, 14* (2), 75-81.

Hutt, N., & Rhodes, C. (2008). Post-natal hearing loss in universal neonatal hearing screening communities: Current limitations and future directions. *Journal of Pediatrics and Child Health, 44*, 87-91.

Joint Committee on Infant Hearing (JCIH). (2000). Year 2000 position statement: Principles and guidelines for early hearing detection and intervention programs. *Pediatrics, 106* (4), 798-817.

Joint Committee on Infant Hearing Screening (JCIH). (2007). Year 2007 position statement: principles and guidelines for early hearing detection and intervention programs. *Pediatrics, 120*, 898-921.

Kanji, A., Khoza-Shangase, K., & Ballot, D. (2010). Hearing screening follow-up return rate in a very low birth weight project: A retrospective record review. *South African Journal of Communication Health, 4* (4), 95-99.

Lasisi, O., & Ajuwon, J. (2002). Beliefs and perception of ear, nose and throat-related conditions among residents of a traditional community in Ibadan, Nigeria. *African Journal of Medicine and Medical Science, 31*, 45- 48.

Lasisi, O., Ayodele, J., & Ijaduola, G. (2006). Challenges in management of childhood sensorineural hearing loss in sub-Saharan Africa. *International Journal of Pediatric Otorhinolaryngology, 70*, 625-629.

Lehmann, U. (2008). Primary health care systems support: Strengthening human resources for primary health care. In *South African Health Review 2008.* (Chapter 11). Durban, South Africa: The Health Systems Trust.

Lin, C., Huang, C., Lin, C., lin, Y. & Wu, J. (2004). Community-based newborn hearing screening program in Taiwan. *International Journal of Pediatric Otorhinolaryngology, 68,* 185-189.

Louw, B., & Avenant, C. (2002). Culture as context for intervention: Developing a culturally congruent early intervention program. *International Pediatrics, 17* (3), 145-150.

Lutman, M.E. (2000). Techniques for neonatal hearing screening. *Seminars in Hearing Screening, 21*, 367-378

Maxwell, D., & Satake, E. (2006). *Research and statistical methods in communication sciences and disorders.* New York, NY: Thomson Delmar Learning.

McMillan, J.M., Schumacher, S. (2001). Research in Education: A Conceptual Introduction (5th Ed.) New York, NY: Addison Wesley Longman Inc.

Mehl, A., & Thomson, V. (2002). The Colarado newborn hearing screening project, 1992-1999: on the threshold of effective population-based universal newborn hearing screening.

Pediatrics, 109 (1), E7.

Moeller, M. P. (2000). Early intervention and language development in children who are deaf and hard of hearing. *Pediatrics*, 106: 1-9.

National Institute on Deafness and Other Communication Disorders (NIDCD). (1993). *Health consensus statement: Early identification of hearing impairment in infants and young children.* Retrieved from http://www.cdc.gov/ncbddd/ehdi/documents/history.pdf

Neuendorf, K. (2002). *The content analysis guidebook.* London, England: Sage Publications, Inc.

Neuman, W.L. (1997). *Social research methods. Qualitative and quantitative approaches* (3rd ed.). Boston, MA: Allyn and Bacon.

Northern, J. L., & Downs, M. P. (1991). *Hearing in children* (4th ed.). Baltimore: Williams and Wilkins.

Northern, J., & Downs, M. (2002). Hearing in children. In J. Northern, & M. Downs, *Hearing in Children* (5th ed.). Baltimore: Lippincott Williams & Wilkins.

Office of Human Subjects Research. (n.d.). *Regulations and ethical guidelines*. Retrieved July from http://ohsr.od.nih.gov/index.html

Office of the Deputy President T. M. Mbeki. (1997). *White paper on an integrated national disability strategy*. Cape Town, South Africa: Rustica Press. Retrieved from ww.polity.org.za/htmlgovdocs/white_papers/disability1.html?rebookmark=1

Office of the President, K. Motlanthe. (2009). S.A. yearbook 2008/2009 health chapter 12. In D. Burger (Ed.), *S.A. Yearbook 2008/2009* (16th ed)., pp. 310-331). Pretoria, South Africa:

GCIS.

Olusanya, B. (2000). Hearing impairment prevention in developing countries: making things happen. *International Journal of Pediatric Otorhinolaryngology, 55*, 167-171.

Olusanya, B. (2005). Can the world's infants with hearing loss wait?. *International Journal of Pediatric Otorhinolaryngology, 69*, 735-738.

Olusanya, B. (2007). Addressing the Global Neglect of Childhood Hearing Impairment in Developing Countries. *PLoS Medicine*, 626-630.

Olusanya, B. (2009). Optimising the use of routine immunisation clinics for early childhood development in sub-Saharan Africa. *Vaccine*, doi:10.1016/j.vaccine.2009.04.017.

Olusanya, B., Luxon, L., & Wirz, S. (2005). Screening for early childhood hearing loss in Nigeria. *Journal of Medical Screening, 12*, 115-118.

Olusanya, B., Luxon, L., & Wirz, S. (2006). Maternal views on infant hearing loss in a developing country. *International Journal of Pediatric Otorhinolaryngology*, 70 (4): 619-23.

Olusanya, B., & Newton, V. (2007). Global burden of childhood hearing impairment and disease control priorities for developing countries. *Lancet, 369*, 1314-1317.

Olusanya, B., & Okolo, A. (2006). Early hearing detection at immunization clinics in developing countries. *International Journal of Pediatric Otorhinolaryngology, 70*, 1495-1498.

Olusanya, B., Ruben, R., & Parving, A. (2006). Reducing the burden of communication disorders in the developing world: an opportunity for the millenium development project. *Journal of the American Medical Association, 296*, 441-444.

Olusanya, B., Somefun, A., & Swanepoel, D. (2008). The need for standardisation of methods for worldwide infant hearing screening: a systematic review. *Laryngoscope, 118,* 1830-1836.

Olusanya, B., Wirz, S., & Luxon, L., (2004). Benefits and challenges of newborn hearing screening for developing countries. *International Journal of Pediatric Otorhinolaryngology, 68,* 287-305.

Olusanya, B., Wirz, S. & Luxon, L. (2008). Hospital-based universal newborn hearing screening for early detection of permanent congenital hearing loss in Lagos, Nigeria. *International Journal of Pediatric Otorhinolaryngology, 72*, 991-1001.

Peat, J., Mellis, C., Williams, K., & Xuan, W. (2002). *Health science research: A handbook of quantitative methods.* London, England: SAGE Publications.

Rehm, H.L., & Madore, R., (2008). Genetics of hearing loss. In J. Madell, & C. Flexer (Eds.), *Pediatric Audiology: Diagnosis, Technology and Management* (pp. 3-12). New York, NY: Thieme Medical Publishers Inc.

Schiavetti, N., & Metz, D. (2002). *Evaluating research in communicative disorders.* Boston, MA: Allyn and Bacon.

Singleton, R., Straits, B., & Straits, M. (1993). *Approaches to social research.* New York, NY: Oxford University Press.

Skoner, D.P., (2000). Complications of Allergic Rhinitis. *Journal of Allergic Clinical Immunology, 105(6), S605-S609*

Spivak, L. (2007). Neonatal hearing screening, follow-up and diagnosis. In R.J. Roeser, M. Valente & H. Hosford-Dunn (Eds.), *Audiology Diagnosis* (pp. 497-513). New York, NY: Thieme Medical Publishers Inc.

Stach, B. A., & Ramachandran, V.S. (2008). Hearing disorders in children. In J. Madell, & C. Flexer (Eds.), *Pediatric Audiology: Diagnosis, Technology and Management* (pp. 3-12). New York, NY: Thieme Medical Publishers Inc.

Streefland, P. (2005). Public health care under pressure in Sub-Saharan Africa. *Health Policy, 71*, 375-382

Statistics South Africa. (2005a). *Census 2001 primary tables: South Africa.* Pretoria: Statistics South Africa. Retrieved from www.statssa.gov.za: http://www.statssa.gov.za/census01/html/RSAPrimary.pdf

Statistics South Africa. (2005b). *Census 2001 prevalence of disability.* Pretoria: Statistics South Africa. Retrieved from www.statssa.gov.za: http://www.statssa.gov.za/PublicationsHTML/Report-03-02-44/html/Report-03-02-44.html

Statistics South Africa. (2007). *Community Survey 2007 (revised version).* (Statistical release P30301). Pretoria: Statistics South Africa. Retrieved from http://www.statssa.gov.za/PublicationsHTML/P03112997/html/P030112007.html

Swanepoel, D. (2006). Audiology in South Africa. *International Journal of Audiology, 45*, 262-266.

Swanepoel, D., & Almec, N. (2008). Maternal views on infant hearing loss and early intervention in a South African community. *International Journal of Audiology, 47* (supplement 1), S44-S48.

Swanepoel, D., Delport, S., & Swart, J. (2004). Universal newborn hearing screening in South

Africa - a First-World dream? *SAMJ , 94* (8), 634-635.

Swanepoel, D., Delport, S., & Swart, J. (2007). Equal opportunities for children with hearing loss by means of early identification. *South African Family Practice, 49,* 3.

Swanepoel, D., Ebrahim, S., Joseph, A., & Friedland, P. (2007). Newborn hearing screening in a South African private health care hospital. *International Journal of Pediatric Otorhinolaryngology, 71* (6), 881-887.

Swanepoel, D., Hugo, R., & Louw, B. (2005). Infant hearing loss - silent epidemic of the developing world. *Audiology Today, 17* (4), 12-16.

Swanepoel, D., Hugo, R., & Louw, B. (2006). Infant hearing screening at immunisation clinics in South Africa. *International Journal of Pediatric Otorhinolaryngology, 70* (7), 1241-1249.

Swanepoel, D., Louw, B., & Hugo, R. (2007). A novel service delivery model for infant hearing screening in developing countries. *International Journal of Audiology, 46,* 321-327.

Swanepoel, D., Storbeck, C., & Friedland, P. (2009). Early hearing detection and intervention in South Africa. *International Journal of Pediatric Otorhinolaryngology, 73,* 783-786.

Szyfter, W., Wro´bel, M., Radziszewska-Konopka, M., Szyfter-Harris, J. c., & Karlik, M. (2008). Polish Universal Neonatal Hearing Screening Program-4-year experience (2003-2006). *International Journal of Pediatric Otorhinolaryngology, 72,* 1783-1787.

The Irish Deaf Society (2008). *Education Policy for Deaf and Hard of Hearing People in Ireland.* Retrieved from http://www.cidp.ie/downloads/Education_Policy.pdf

Theunissen, M., & Swanepoel, D. (2008). Early hearing detection and intervention services in

the public health sector in South Africa. *International Journal of Audiology, 47* (Supplement 1), S23-S29.

United Nations Children's Fund (UNICEF). (2003, June-August). *Disability world: A bimonthly web-zine of international disability news and views*. Retrieved from http://www.disabilityworld.org http://www.disabilityworld.org/06-08_03/children/unicef.shtml

United Nations Children's Fund (UNICEF). (2005). *The state of the world's children 2006. Excluded and invisible.* New York: UNICEF.

United Nations Children's Fund UNICEF. (2008). *The State of the World's Children 2008.* New York: UNICEF. Retrieved from http://www.unicef.org/sowc08/report/report.php

United Nations Children's Fund UNICEF. (2009). *The State of the World's Children 2009, Maternal and Newborn Health*. Retrieved from http://www.unicef.org/sowc09/docs/SOWC09_Table_3.pdf

United Nations Development Programme. (2007). *Human development report 2007/2008.* (Electronic version). United Nations. New York: Palgrave Macmillan.

Van der Spuy, T., & Pottas, L. (2008). Infant hearing loss in South Africa: Age of intervention and parental needs for support. *International Journal of Audiology, 47* (Supplementary 1), S30-S35.

Weicbold, V. Nekahm-Heis, D. & Welzl-Mueller, K. (2006). Ten-Year outcome of newborn hearing screening in Austria. *International Journal of Pediatric Otorhinolaryngology, 70,* 25-240

White, K. (2006). Early intervention for children with permanent hearing loss: Finishing the EHDI Revolution. *The Volta Review, 106* (3), 237-258.

World Bank. (2005). *World development report 2006 equity and development.* (Electronic version). The World Bank and Oxford University Press. New York: The World Bank and Oxford University Press.

World Bank. (2008). *Africa Development Indicators 2007.* (Electronic version). Washington D.C.: World Bank Publications.

World Bank. (2009). *South Africa county brief*. Retrieved from http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/SOUTHAFRICAEXTN/0,,menuPK:368086~pagePK:141132~piPK:141107~theSitePK:368057,00.html

World Health Organisation (WHO). (2003). *WHO definition of health.* Retrieved from http://who.int/about/definition/en/print.html

World Health Organisation (WHO). (2006). *Deafness and hearing impairment fact sheet no. 300 March 2006.* Retrieved from http://www.who.int/mediacentre/factsheets/fs300/en/index.html

World Health Organisation. (WHO). (2008, October). *10 facts on the global burden of disease*. Retrieved from http://www.who.int/features/factfiles/global_burden/en/index.html

World Health Organisation (WHO). (2009). *Prevention of blindness and deafness, grades of hearing impairment*. Retrieved from http://www.who.int/pbd/deafness/hearing_impairment_grades/en/index.html

World Health Organisation (WHO). (2010a). *Bacterial meningitis.* Retrieved from http://www.who.int/nuvi/meningitis/en/

World Health Organisation (WHO). (2010b). *Deafness activities and awareness.* Retrieved from http://www.who.int/pbd/deafness/activities/awareness/en/index.html

World Health Organisation (WHO). (2010c). *The global shortage of health workers and its impact*. Retrieved from http://www.who.int/pbd/gobal/shortage/healthworkers/en/index.html

World Medical Association (WMA). (2008). *World Medical Association declaration of Helsinki: Ethical principles for medical research involving human subjects.* Retrieved from http://www.wma.net/en/30publications/10policies/b3/17c.pdf

Yee-Arellano, H., Leal-Garza, F., & Pauli-Muller, K. (2006). Universal newborn hearing screening in Mexico: Results of the first two years. *Journal of Pediatric Otorhinolaryngology, 70,* 1863-1870. Yoshinaga-Itano, C. (2003). Universal newborn hearing screening programmes and developmental outcomes. *Audiological Medicine, 1*, 199-206.

Yoshinaga-Itano. (2004). Levels of evidence: universal newborn hearing screening (UNHS) and early hearing detection and intervention systems(EHDI). *Journal of Communication Disorders, 37*, 451-465.

Yoshinaga-Itano, C., & Gravel, J. (2001). The evidence for universal newborn hearing screening. *American Journal of Audiology, 10,* 62-64.

Yoshinango-Itano, C., & Sedey, A. C. (1998). Language of early and later identified children with hearing loss. *Pediatrics,* 102: 1161-71.