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THE VALIDITY OF A SURVEILLANCE TOOL FOR EARLY COMMUNICATION DEVELOPMENT USED IN A PRIMARY HEALTH CARE HOSPITAL IN MPUMALANGA

By

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IN FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
M.COMMUNICATION PATHOLOGY

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"Blessed is the Lord who daily loads us with His benefits". Psalm 68:19

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SUMMARY

TITLE: The validity of a Surveillance Tool for Communication Development used in a Primary Health Care hospital in Mpumalanga

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Early Communication Intervention (ECI) is currently not available to all high risk infants and their families in South Africa. Primary Health Care (PHC) clinics have presented new opportunities for the screening of hearing loss and communication development in infants. Despite the great need, such programs are limited. The dearth of valid surveillance tools for the South African population and the lack of policy and legislation regarding early developmental screening contribute to this clinical problem. Consequently many infants and young children, especially in rural areas, are not benefiting from EI services.

To address this challenge, the aim of this research study was to compile and establish the validity of the Surveillance Tool for Communication Development (STCD) in an early identification program which makes use of developmental surveillance of infants. The study was performed at a clinic at a secondary level public hospital in Mpumalanga Province, South Africa.

The STCD consists of a combination of a parental questionnaire and professional-administrated items. The communication development of 55 infants 0 to 6 months at the clinic was evaluated through the use of the STCD and the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). The latter was used as the gold standard of comparison. Data were collected at two screening intervals, 0 to 3 and 3 to 6 months of age. The results were

compared using descriptive statistics to determine the sensitivity and specificity of the STCD.

The STCD produced high specificity scores for both screening intervals (97.22% and 96.15%). The tool produced a high sensitivity score (84.21%) at the first screening interval (0 to 3 months), but performed poorly (57.14%) for the second screening interval (3 to 6 months). Although individual variation occurred, the overall prevalence of infants identified with developmental delay was high (47%). Among other conditions, two infants with hearing loss were identified. The need for caregiver training on specific issues relating to communication development was identified.

The results validate the use of the STCD in this specific South African context. It is an important, although small step in contributing to the development of surveillance programs for all infants in South Africa.

Key words: *early communication intervention, early identification, developmental surveillance, primary health care, establish validity, screening.*

OPSOMMING

TITEL: Die geldigheid van die Surveillance Tool for Communication Development in ’n primêre gesondheidsorg hospitaal in Mpumalanga.

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Vroeë Kommunikasie Intervensie is tans nie beskikbaar vir alle hoërisiko babas en hulle gesinne in Suid-Afrika nie. Primêre gesondheidsorg (PGS) klinieke het nuwe geleenthede geskep vir die sifting van gehoorverlies en kommunikasie ontwikkeling by babas. Ten spyte van die groot behoefte, is sulke programme beperk. Die skaarste aan geldige waarnemingsinstrumente vir die Suid-Afrikaanse populasie en die leemte aan beleid en wetgewing ten opsigte van sifting vir vroeë ontwikkeling, dra by tot hierdie kliniese probleem. Gevolglik is daar baie babas en jong kinders wat nie baat by Vroeë Kommunikasie Intervensie dienste nie.

Om hierdie uitdaging aan te spreek, was die doel van hierdie navorsingstudie om die Surveillance Tool for Communication Development (STCD) saam te stel en die geldigheid daarvan te bepaal by ’n vroeë identifikasieprogram wat gebruik maak van opeenvolgende waarneming van die ontwikkeling van babas. Die studie is uitgevoer by ’n sekondêre vlak publieke hospitaal in Mpumalanga Provinsie, Suid-Afrika.

Die STCD bestaan uit ’n kombinasie van ’n vraelys aan ouers en items wat professioneel toegepas word. Die kommunikasie ontwikkeling van 55 babas, 0 tot 6 maande oud by die hospitaal, is geëvalueer deur gebruik te maak van die STCD en die *Rossetti Infant-Toddler Language Scale* (Rossetti, 2006). Laasgenoemde is gebruik as die goue standaard vir vergelyking. Data is

ingesamel by twee siftings geleenthede, 0 tot 3 en 3 tot 6 maande. Die resultate is vergelyk deur middel van beskrywende statistiek om vas te stel wat die sensitiwiteit en spesifisiteit van die STCD is.

Die STCD het ‘n hoë spesifisiteits telling behaal vir albei siftings geleenthede (97.22% en 96.15%). Die instrument het ’n hoë sensitiwiteits telling (84.21%) gelewer by die eerste siftings geleentheid (0 tot 3 maande), maar het swak gevaar (57.14%) by die tweede siftings geleentheid (3 tot 6 maande). Alhoewel daar individuele variasie voorgekom het, was die algehele voorkoms van babas met met ’n ontwikkelings agterstand hoog (47%). Behalwe vir ander toestande, is twee babas met gehoorverlies geïdentifiseer. Die behoefte aan oueropleiding in spesifieke aspekte wat verband hou met kommunikasie ontwikkeling, is geïdentifiseer.

Die resultate bevestig die geldigheid van die STCD in hierdie spesifieke Suid-Afrikaanse konteks. Dit is ’n klein, dog belangrike stap in die bydrae tot die ontwikkeling van opeenvolgende waarnemingsprogram vir alle babas in Suid-Afrika.

Sleutelwoorde: *vroeë kommunikasie intervensie, vroeë identifikasie, opeenvolgende waarneming van ontwikkeling, primêre gesondheidsorg, geldigheid, sifting.*

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CHAPTER 1

THE NEED FOR EARLY IDENTIFICATION OF COMMUNICATION DELAYS AND DISORDERS AS AN ENTRY POINT TO EARLY COMMUNICATION INTERVENTION SERVICES IN SOUTH AFRICA

The aim of the chapter is to review the need for early identification as an entry point to early communication intervention services for South African infants and their families. A research question is formulated. The problem statement and the rationale for the study are presented as an introduction to developmental surveillance activities in South Africa.

1.1 INTRODUCTION

Communication is central to the human experience and the emergence of communication skills is an important part of infant development (Hess, Dohrman & Huneck, 1997:111). Infant and preschooler communication development is a complex, dynamic process that begins at birth and evolves as infants interact with their caregivers and the environment (Boyle, Decoufle & Yeargin-Allsopp, 1994: 400). The development of communication skills both influences and is influenced by other areas of development such as cognitive, socioemotional and physical development (Kritzinger, Louw & Hugo, 1995:8). A disorder or delay in communication development will impact negatively on many areas of development, resulting in long-term effects in the child as a whole (Hess *et al.,* 1997:113). The prevention of communication disorders is, therefore, crucial to the promotion of optimal functioning and wellness in many areas of development (ASHA, 1991:31).

Delayed communication development is the most commonly occurring symptom of developmental delay in children under three years of age. Of all childhood behaviours, communication skills provide the highest predictive correlation with school performance and the attainment of intelligence later on in life (Rossetti, 2001:1). The extraordinary importance of communication

skills justifies the provision of Early Communication Intervention (ECI) services for infants displaying delayed communication development. The proven positive impact of ECI on children's development, behaviour, and subsequent school performance, provides strong and compelling justification for all healthcare professionals to search for children with communication difficulties (ASHA, 2008:6; Bang, 2008:1255; Glascoe, 2005:174).

In developed countries such as the United States of America, identification activities are actively incorporated into the ECI process. As an entry point to ECI services in developing countries, formal identification procedures are rarely carried out in health care settings, and few communities have processes for universal screening (Guralnick, 2001:2). The provision of ECI services in developing countries is often limited and fragmented (Kritzinger, 2000:6).

As a means of addressing the limited number of early identification activities for communication delays and disorders within South Africa, it is suggested that the principles for best practice in ECI provided by ASHA (2008) need to be adapted in South Africa. Of special relevance is the principle of community-based service delivery as the use of traditional institution-based models of service delivery in the field of speech-language therapy and audiology in South Africa has proven to be ineffective in reaching the majority of vulnerable and disadvantaged communities of South Africa (Moodley, Louw & Hugo, 2000:26). Services need to be transformed to meet the needs of the broader South African population. The current challenge in South Africa is to incorporate early identification for the infants who need ECI services, within a community-based service delivery model that will serve as the access point for families to ECI services.

1.2 THE NEED FOR EARLY IDENTIFICATION OF COMMUNICATION DELAYS AND DISORDERS IN INFANTS IN SOUTH AFRICA

In order to determine the need for ECI services within the population, speech-language therapists and/or audiologists should familiarise themselves with a

wide variety of issues including the characteristics of populations at risk for communication developmental delay (Rossetti, 2001:8). As a result, an overview is provided of the South African context and characteristics which relate to the need for ECI services.

Poverty in South Africa is viewed to be the primary contributor to the risk status of children (Popich, Louw, Eloff, 2007:65). Eighty percent of the world's disabled population live in low income countries, many of these in Africa (Gladstone *et al.,* 2008:23). In September 2004, 26% of South Africa's economically active population was unemployed (Leatt, 2006:25) and it is estimated that 61% of the 16.3 million children in South Africa are living in poverty (Ebersohn & Eloff, 2002:79). Further, it can be deduced that the recent economic crisis has also caused an increase in the number of infants living in poverty. Poverty creates unhealthy learning environments which place infants at-risk for delayed communication development (Rossetti, 2001:6). Further, limited health literacy is associated with poorer access to health information and knowledge about the long-term benefits of preventative care (Sutton, 2009:1).

Poverty often leads to poor pre-, peri- and postnatal care, which may contribute to the higher prevalence of other risk conditions such as low birth weight, premature birth, cerebral palsy, paediatric HIV/AIDS and foetal alcohol spectrum disorder (Popich *et al.,* 2007:65). Such conditions have a direct one-to-one risk relationship between the diagnosis and a communication delay (Rossetti, 2001:6).

The pandemic of HIV/AIDS poses a significant risk factor for children. South Africa has one of the highest numbers of children living with HIV/AIDS (Department of Health, 2000:5). Infected children as well as children living with infected parents and caregivers frequently suffer from poor nutrition and ill health, exhibiting symptoms of the general failure to thrive (Ebersohn & Eloff, 2002:80). HIV/AIDS also has a pervasive impact on communication development as infected infants and young children may develop encephalopathy and are more likely to exhibit cognitive disorders, delayed

language development, and poor oral motor development (Davis-McFarland, 2000:23).

However, for infants and children with HIV/AIDS, positive developmental outcomes have been observed for those receiving antiretroviral therapy (ART). Reddi *et al.* (2007) recently conducted a study to determine the use of ART on the paediatric population in South Africa. The study suggested that a family-centered paediatric ART program in a resource-limited setting can be both clinically effective and sustainable as demonstrated by positive therapeutic responses while on the drugs in terms of survival, patient retention, and regimen durability. Results from the study indicated that children who received ART for a period of 12 months presented with an increased CD4 count, weight gain and improvement in their general developmental status (Reddi *et al.,* 2007:11). Children receiving ART are therefore expected to perform better developmentally than children who are not receiving ART. While positive evidence of interventions are emerging for some debilitating conditions caused by HIV/AIDS in infants in South Africa, unfortunately the reality is that very few programs exist and very few infants have access to ART treatment (Boulle *et al.*, 2002:814).

Currently, there is a dearth of reliable information on the prevalence of disability in South Africa. Disability statistics were previously not integrated into mainstream governmental statistical processes which resulted in general estimates (White Paper on an Integrated National Disability Strategy, 1997:2). More than half a billion people worldwide are disabled as a result of mental, physical or sensory impairment and approximately 80% of these disabled persons live in developing countries such as South Africa (Statistics South Africa, 2001:14). The estimated prevalence of the different types of disabilities is presented in Table 1.1. Reliable statistics on disability are essential to the planning of service delivery systems. As hearing loss, communication disorders and intellectual disabilities have a far reaching impact on a child's social, emotional, academic and later vocational functioning; these disorders necessitate early identification as an entry point into ECI.

TABLE 1.1: Percentage of disabled persons by type of disability (Prevalence of disability in South Africa: Statistics South Africa, 2001:14)

Type of disability	*Male (percentage)*	*Female (percentage)*	*Average (percentage)*
Sight	28,3	35,6	**32,1**
Hearing	18,4	19,7	**19,1**
Communication	7,2	5,8	**6,5**
Physical	30,7	28,6	**29,6**
Intellectual	13,5	11,3	**12,4**
Emotional	**17,3**	**14,3**	**15,7**

According to the above table, the prevalence of disability due to communication is the lowest (Statistics South Africa, 2001:14). However, people with hearing loss and intellectual disabilities often may also have communication delays and/or disorders. Therefore, the prevalence of communication disorders is much higher than indicated.

Due to the definitions of disability and the difficulty in accurately identifying infants and toddlers with developmental delay, it is suspected that these values are underrepresented. Although epidemiological data for developmental risk conditions in South Africa are incomplete, it is clear that there is an increased prevalence of risk conditions for infants and young children in developing communities (Kritzinger, 2000:13).

Developmental delay in infants and young children is often more pronounced due to additional barriers such as low socio-economic levels, paucity of accessible health care, low literacy levels of parents which limits their information seeking options and inadequate resources (McPherson & Swart, 1997:2). Therefore, many infants and young children in South Africa are at an increased risk for the development of communication disorders owing to a higher prevalence of risk factors such as low birth weight and premature birth, cleft lip and palate, cerebral palsy, Down Syndrome, foetal alcohol spectrum disorder, HIV/AIDS, multilingualism and significant bilateral sensorineural hearing loss (Kritzinger, 2000:48; Pickering *et al.,* 1998:6). As mentioned earlier, in all of these factors, the greatest risk is poverty, which exacerbates all these conditions (Alant & Lloyd, 2005:13). Consequently there may be large numbers of young, unidentified South African children who are at risk,

and yet are denied the opportunity to benefit from early intervention programs that can positively impact their developmental trajectories (Goelman & The CHILD Project, 2008:307).

1.3 ACCESSING EARLY COMMUNICATION INTERVENTION SERVICES IN SOUTH AFRICA

Serving low-income children with special needs effectively constitutes a challenge to both professionals and agencies (Lequerica, 1997:285). In South Africa, the majority of the population (approximately 85%) rely on the public health sector, despite most of the resources for health care being consumed by the private sector (National Treasury Department, Republic of South Africa, 2005:4). In South Africa, tertiary health care is currently inadequate to provide ECI services to infants and their families at risk in small communities because tertiary hospitals are not accessible for all communities (Kritzinger, Louw & Hugo, 1995:9). Services are usually concentrated at tertiary health care institutions as this level of health care provide expertise associated with specialities, subspecialities and less common specialities (Department of Health, 1997:4).

Before the advent of democracy in 1994, the rural areas in South Africa were severely underfunded and disadvantaged as the social and economic services in those regions were limited (Emmett, 2005:12). However, the government of South Africa recognised the health needs of the South African population and has committed itself to bringing health services closer to the people by publishing the *White Paper for the Transformation of the Health System in South Africa* (Department of Health, 1997) which adopted the primary health care (PHC) package (National Rehabilitation Policy, 2000: 1). The PHC package aims to provide integrated essential health care services to the entire population (Department of Health, 2001:5). As part of the PHC approach, services should be restructured and strengthened in order to improve these services for those who did not receive them before (National Rehabilitation Policy, 2000:1).

As a further strategy to improve PHC services, various authors have discussed the provision of ECI, within the South African health care system, to all infants who are at risk for communication disorders (Fair & Louw, 1999:14; Kritzinger, 2000:32; Moodley *et al.,* 2000:26). Although ECI is not yet included in the PHC package, research has indicated that the PHC system could be used to reach rural communities with the aim of improving ECI case finding (van der Linde, 2008:173) as well as screening for hearing loss (Swanepoel, 2004:125). Collaborative partnerships between the PHC personnel and the speech-language therapists are vital within the PHC system in order to improve early identification efforts (Moodley *et al.,* 2000:28). Case finding programs are best provided within PHC clinics, as these stations offer care that is accessible, family centered, comprehensive, and coordinated (McKay, Shannon, Vater & Dworkin, 2006:371).

The identification process of an infant with delayed communication development in South Africa can be improved by collaboration between the speech-language therapist and/or audiologist and the PHC clinics during well-child check-ups (Moodley *et al.,* 2000:30). The well-child check-up encompasses opportunities for a variety of health promotion and disease prevention services. One of the core and often-overlooked components of the well-child check-up is the process of monitoring development and screening for developmental delay (Wagner, Jenkins & Smith, 2006:409). Well-child check-ups can therefore be used for developing and implementing effective identification strategies as an entry point to ECI services, especially in rural areas.

Although collaboration and coordination of services is a desired goal or outcome, what more often prevails is a fragmented, patchwork delivery model based on the medical model of addressing one symptom at a time (Lequercia, 1997:286). The medical model is inadequate in serving populations requiring ECI because communication development is a dynamic process which is influenced by many factors (Lequercia, 1997:286). There is a clear need for an effective model which can be used as a blueprint for the implementation of ECI services within PHC.

1.4 A PROPOSED MODEL FOR EARLY COMMUNICATION INTERVENTION IN SOUTH AFRICA

Implementing ECI within the PHC approach appears to be a relevant and appropriate way of introducing ECI services into the rural communities of South Africa. The acknowledgement of the complex nature of communication development, and therefore the complexity of communication disorders, necessitates the use of an ECI model (Popich *et al.*, 2007:66). The Developmental Systems Model proposed by Guralnick (2001:6) is selected as it provides a comprehensive framework for community-based ECI services and addresses the diversity of risk factors and disability conditions by incorporating conceptual, empirical and practical knowledge available (Guralnick, 2001:1). The Developmental Systems Model (Guralnick, 2001:6) proposes that the ECI process ideally comprises of certain stages through which infants and their families pass, with the aim of achieving suitable and individualised ECI services. The Developmental Systems Model (Guralnick, 2001:6) is suited for use within the PHC system as the identification through screening is the suggested entry point to obtaining ECI services which can be performed at immunisation clinics within the PHC system. The stages included in the Developmental Systems Model (Guralnick, 2001:6) are illustrated in Figure 1.1 based on the description provided by Guralnick (2001:6).

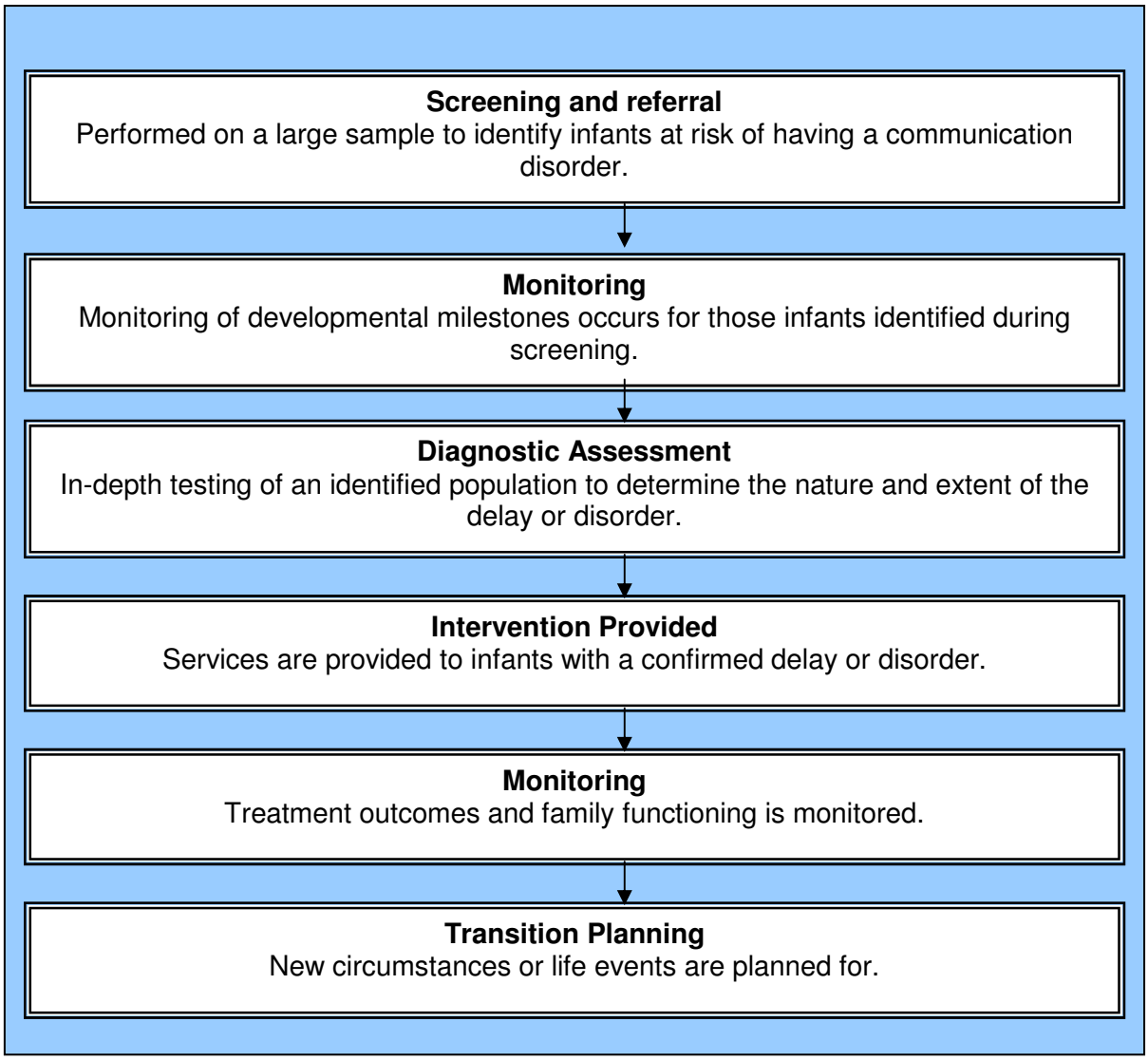

FIGURE 1.1: Stages in the ECI Process according to the Developmental Systems Model (Guralnick, 2001:6)

As proposed in the Developmental Systems Model, infants and their families first access ECI services through the process of screening and/or referral (Guralnick, 2001:7). Screening aids in the identification of infants requiring ECI as it provides a method of determining those who probably do have a communication developmental delay or disorder and who therefore warrant further assessment as compared to those who do not have a communication developmental delay or disorder (Glascoe, 2005:174). Without an effective identification process and successful case finding, early identification as an entry point to the intervention process cannot take place (Kritzinger, 2000:40). As the efficacy of early intervention services is consistently linked to the age

of identification (Rossetti, 2001:15), early identification of risk conditions in infants should be the primary function of ECI (Kritzinger, Louw & Rossetti, 2001:35).

Although ECI services are provided in many government hospitals and clinics in South Africa, not all have a formalised approach to the identification of at-risk and high risk infants and young children (Swanepoel, 2004:137). The limited number of identification programs may be a result of community-based screening programs that tend to be highly variable, and often depending on the interest and leadership of specific disciplines as well as guidelines established by various governmental agencies (Guralnick, 2001:7). ECI services in South Africa are still not meeting the needs of the majority of the at-risk population that are under three years of age due to inadequate and in some instances, lacking methods of identification in spite of major developments in ECI. A more systematic process is clearly required and should begin by identifying existing identification programs (Guralnick, 2001:7). Until early identification strategies are in place, attempts to facilitate early identification of infants at risk will be of little benefit to their long-term development (Logan, 1995:45).

The lack of legislation regarding ECI services in South Africa when compared to developed countries contributes to inadequate and in some cases, porous identification methods. Although developmental screening activities are in line with South African PHC priorities (Fair & Louw, 1999:17), currently, no legislation or mechanisms exist in South Africa to identify and refer young children for ECI services which results in few developmental screening programs.

One of the biggest factors contributing to accurate identification is the existence of a limited number of appropriate screening tools which have been validated for use on the South African population (Kritzinger, 2000:95). Healthcare professionals do not have access to standardized measures to detect developmental delay, forcing them to rely on non-standardised measurement techniques during screening. Such techniques include heavy

reliance on clinical observation and informal checklists that lack validation and distinct cut-offs, or the use of screening tests with limited accuracy (Glascoe, 2005:175). These methods reduce the effectiveness of early identification. In contrast, when a quality instrument is used, detection rates soar, aiding the early identification process (Silverstein, Sand & Glascoe, 2005:177).

Despite the call for speech-language therapists to become involved in preventative efforts and international legislature's support of such programs, this role has frequently been neglected or regarded as a secondary function by most speech-language therapists in South Africa (Kritzinger, 2000:45). The need to establish prevention programs focusing on the prevention of communication disorders and the facilitation of optimal communication development is essential and can no longer be ignored. In order to reach the South African population requiring ECI services, developmental screening tools specific to the population characteristics need to be developed. The following research question is therefore formulated:

Will it be possible to validate a surveillance tool for communication development for implementation in a South African primary health care (PHC) system?

The aim of this study is therefore to determine the validity of a low technology surveillance tool for communication disorders used in a PHC system in Lydenburg, Mpumalanga province. The study will attempt to provide results that would be of value to health institutions for the identification and planning of ECI service delivery as well as for the prevention of later developmental delay in infants.

1.5 RATIONALE FOR THE STUDY

Early identification of communication developmental delay and disorders within ECI is an important function as the far-reaching effects of many communication disorders can be prevented and/or minimalised (Rossetti, 2001:23). Research has indicated that 16% of learning disabilities in children

in South Africa could have been prevented with the use of current practice and existing knowledge (Molteno & Lachman, 1996:143). The prevention of communication disorders is an important role which all speech-language therapists have been called to fulfil (ASHA, 1991:10).

In order to prevent communication delays and disorders, speech-language therapists determine the need for prevention services by surveying the prevalence of factors which place infants at risk for communication delays and disorders in the local area in which the speech-language therapist is working.

Risk factors and the under-identification thereof are not only found in infants, but also in their mothers. In Mpumalanga province, less than one third (31.4%) of antenatal clients were tested for HIV/AIDS, the lowest proportion in South Africa (Department of Health, 2005: 152). Of these women, 28% were found to be HIV positive, the third highest prevalence in the country. To prevent HIV transmission to their infants, 52% of mothers identified as being HIV/AIDS positive, were treated with Nevirapine (Department of Health, 2005:153). Currently, there is no data available on the proportion of infants that received treatment for HIV/AIDS in the hospital. Infants born to HIV/AIDS positive mothers are at risk for health and encephalopathy resulting in developmental difficulties, congenital hearing loss or the development of a hearing impairment shortly after birth and are therefore considered to be a population at high risk for communication delays and disorders (Swanepoel, 2004:22).

The statistics of Lydenburg Hospital in Mpumalanga province, where the study took place, are considered in order to identify the need for ECI services. In the period of January 2008 to March 2009, 11.2% of the live births which took place at the hospital were low birth weight babies. Of these, six babies were born weighing less than 1000g (Department of Information, Lydenburg Hospital, 2009). Although the incidence of low birth weight at the hospital during this period is lower than the national incidence of low birth weight in South Africa (15%) (Pattinson, 2003-2005:3), the incidence is much higher than most developing countries (Pattinson, 2003-2005:19). Low birth weight

and premature birth are considered to be a risk for communication developmental delay (Rossetti, 2001:6). Low birth weight and premature birth are often associated with teenage pregnancy, even if adequate prenatal care is provided (Rossetti, 2001:25).

One hundred and four of 1328 (7.83%) of the babies born at the hospital during the period of January 2008 to March 2009 were born to mothers 18 years and younger (Department of Information, Lydenburg Hospital, 2009:3). Adolescent mothers are inexperienced and often without support which results in insufficient stimulation provided to the infants. Limited learning opportunities may result in developmental delay (Owens, 2001:68). Adolescent mothers also have a higher rate for spontaneous abortion, stillbirths, premature births, infants who are mentally retarded, malformations and infants who are developmentally disabled (Rossetti, 2001:26).

The statistics cited indicate the definite need for preventative services for the infant population in the form of ECI in the Lydenburg area. However, preventative services in this area should align with international research and research trends with regard to prevention efforts.

Due to the development of ECI in the 1970's, an increased awareness of the value and effectiveness of tertiary prevention initiatives was created (Rossetti, 2001:11). Currently, the international trend is towards the primary and secondary prevention of disorders which includes the prevention of diseases and the promotion of health (Gerber, 1998:12). There is an urgent need for a shift in attention *from* a focus on tertiary prevention programs, which attempt to reduce the effects of a disorder by restoring effective functioning, *to* an increasing involvement in primary and secondary prevention programs, which focuses on the complete avoidance of disorders or the early rehabilitation thereof such as that found in early identification and ECI services (Gerber, 1998:32). ECI operates mainly on primary and secondary prevention levels.

Although the primary prevention of communication disorders is not always possible, primary as well as secondary prevention strategies are certainly not

being implemented to their full capacity. There are few examples of prevention efforts developed by speech-language therapists internationally and locally, despite the need for such services (Popich *et al.*, 2007:67). Many more prevention efforts are required in order to prevent communication disorders and speech-language therapists have an obligation to become involved in primary, secondary and tertiary prevention efforts (Gerber, 1998:40).

Most research conducted on prevention initiatives such as early identification through screening and surveillance as well as the standardisation of screening tools, has been conducted in developed countries such as the USA and the UK. The global challenge to improve the health status of all people must reach those communities in developing contexts, such as South Africa that most often experience the direst need for services (Kritzinger, 2000:6). It is recognized that there are significant challenges which need to be overcome in implementing and sustaining of ECI services in South Africa. However, according to Olusanya (2000:170), the hurdle has always been how to achieve reasonable balance in priorities in the face of competing needs and limited resources. It is thus the challenge for speech-language therapists and audiologists to participate in all the primary functions of ECI recommended by ASHA (2008:2) especially as prevention and screening have received little attention in South Africa to date. Early interventionists need to become creative in solving these challenges in order to provide effective services to the South African population.

In conclusion, the central arguments posed in the research study are depicted as a flow diagram in Figure 1.2 below.

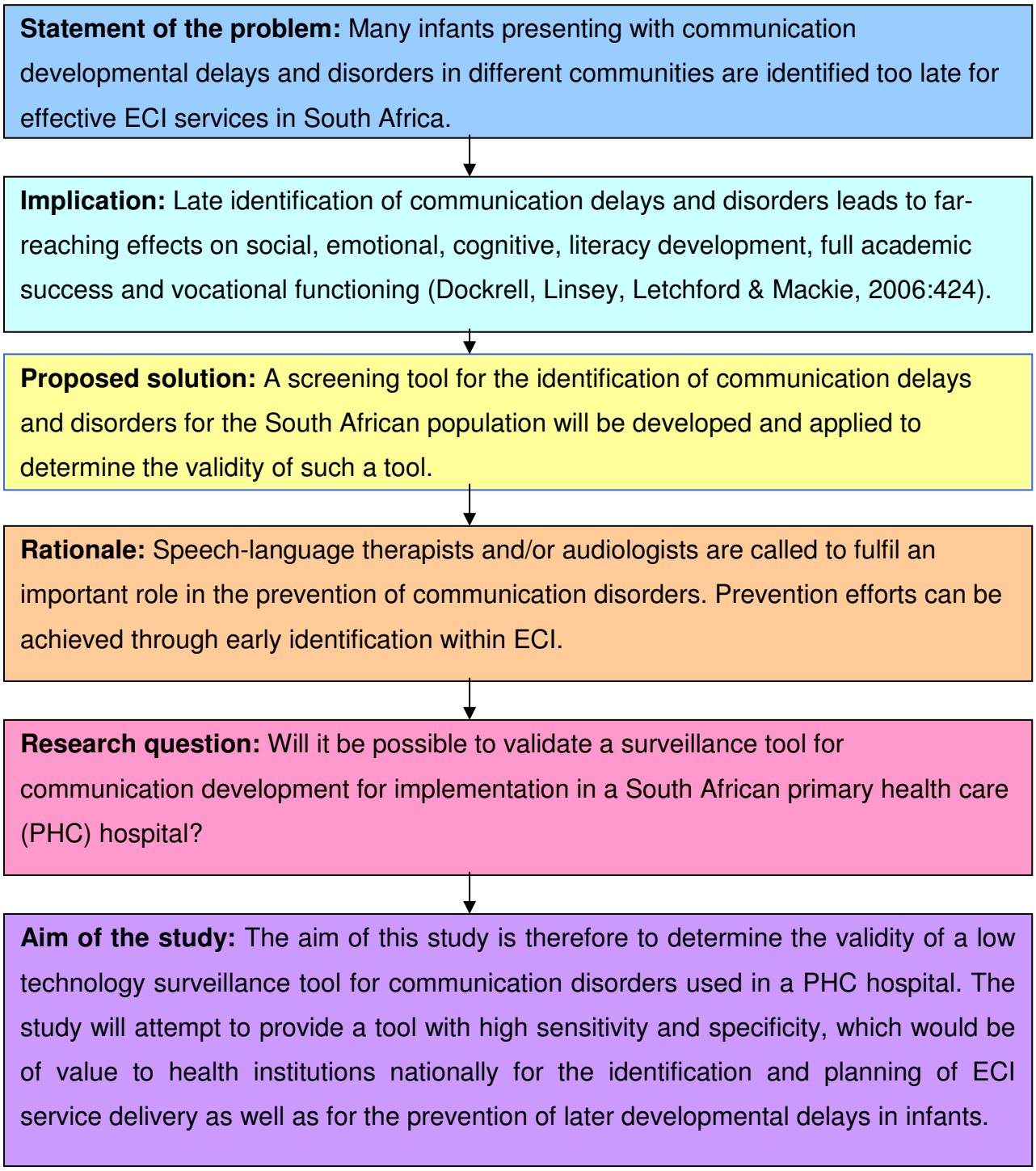

FIGURE 1.2: The central arguments of the study

1.6 CLARIFICATION OF TERMS

The following terms are clarified according to their use in the study:

1.6.1 Developmental delay

Developmental delay is the umbrella term used when a child presents with development which is behind that of the expected path of development and can be present in one or more of the following areas: physical development, cognitive development, communication development, social and emotional development and self-help skills (Brassard & Boehn, 2007:135). Communication development was targeted in the study and a developmental delay was expected to exist within an infant when the infant's communication development did not reach the communication developmental milestones by the expected time frame as indicated on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006).

1.6.2 Developmental surveillance

Developmental surveillance is the optimal method for identifying developmental delay and disorders. The term is used throughout the study as the general process of applying brief evaluations of developmental skills at different time periods in order to determine if the individual child is functioning within the normal limits for his or her age. Developmental surveillance was applied to the total population of children attending the Early Intervention Screening Clinic with the aim to monitor child progress (Kritzinger, 2000:47). Developmental surveillance differs from screening in that developmental surveillance makes use of multiple sources of information by surveying development over time and interpreting the results in the light of the existing risk factors (Pizur-Barnekow *et al.,* 2010:323). Screening tends to be a once-off activity, as in universal newborn hearing screening. Screening is defined under 1.6.7.

1.6.3 Early Communication Intervention (ECI)

ECI refers to services rendered to infants, toddlers and their families from birth to three years of age who display or who are at risk of displaying a delay in communication development (Rossetti, 2001: 1). ECI is an early

intervention initiative where the focus is on enhancing communication skills and interaction between infants and young children and their caregivers. These services aim to minimalise the extent of the communication delay, prevent a communication delay and/or eradicate the communication delay (Rossetti, 2001:4). ECI is practiced by speech-language therapists and/or audiologists and differs from early intervention where a range of professionals are involved. In this study, early identification within the range of ECI services was explored as the entry point to ECI services.

1.6.4 Early identification

Early identification involves identifying children under three years of age who have, or are at risk of having a disability or delay in speech, language or hearing (Rossetti, 2001:10). However, in this study the focus is on the identification of communication developmental delay or disorders within a population of infants between the ages of 0-6 months who are at risk. Although some children will develop normal speech and language skills without treatment by the time they enter school, it is important to identify those who will not do so (Glascoe, 2005:174). There are many ways in which early identification can take place, however in this study early identification of communication developmental delay and/or disorders through developmental surveillance was investigated.

1.6.5 Prevention

Prevention efforts occur in different phases namely; primary prevention, secondary prevention and tertiary prevention (Gerber, 1998:11). Primary prevention is frequently defined as the inhibition or elimination of the onset and development of a communication disorder (ASHA, 2008:2). Secondary prevention refers to the early detection of a problem that has not yet developed obvious symptoms and for which help has not yet been spontaneously sought (Gerber, 1998:11). Developmental surveillance is a method of secondary prevention and was thus targeted in the study. Tertiary prevention refers to the identification and treatment of a problem after

recognizable symptoms have appeared (Brassard & Boehn, 2007:134; Gerber, 1998:1).

1.6.6 Primary Health Care (PHC)

PHC is essential health care based on practical, scientifically sound and socially acceptable methods and technology, which is made universally accessible to individuals and families in the community through their full participation and at a cost that the community and the country can afford to maintain at every stage of their development, in the spirit of self-determination (Primary Health Care Network, 2001:1). PHC promotes health and the prevention of disease by using education as one of the main tools (Van Rensburg, 2004:36). PHC has been identified as the main approach in reconstructing the health care system in South Africa as outlined in the *White Paper for the transformation of the health system in South Africa* (Department of Health, 1997). A PHC approach incorporates the following concepts (Primary Health Care Network, 2001:2):

- challenges the society to address the socio-economic causes of poor health and makes provision for basic health needs
- encourages community empowerment (ensuring that people are fully able to manage resources that are available to them)
- provides comprehensive quality health care including promotive, preventive, curative, rehabilitative and palliative services
- demands concerned and accountable health worker practice
- prioritises the people who are most disadvantaged ensuring that health care is accessible, equitable and affordable to all
- recognises the importance of integrated service provision from primary to tertiary levels of care within a coherent health system
- promotes inter-disciplinary, multi professional and intersectoral collaborative teamwork for development.

1.6.7 Screening

Screening is a brief method for determining those who probably have a disorder and those who probably do not have a disorder and is a once-off activity (Glascoe, 2005:174). Developmental surveillance, by monitoring the development of infants at two screening intervals, was used in the study as opposed to screening at one specific point in time.

1.6.8 Surveillance tool

This term is used throughout the study as the tool which was designed for use within a developmental surveillance program and which aimed to aid the speech-language therapist and/or audiologist in identifying infants 0-6 months that may have communication developmental delay or disorders. Such tools do not provide conclusive evidence of communication developmental delay or disorders and therefore do not result in a diagnosis (Pinto-Martin *et al.,* 2005:1928). Positive results provided by surveillance tools are followed by an assessment which provides a definitive diagnosis from which intervention strategies can be planned. Sensitivity and specificity values (Diamantopulous & Schlegelmilch, 2000:175) are characteristics which can be used to evaluate the effectiveness of the surveillance tool. In this study, the development of a surveillance tool as well as the testing of the tool to determine its accuracy was investigated within a developmental surveillance program.

1.6.9 Validity

For the purpose of this study, the criterion validity of the Surveillance Tool for Communication Development was determined by comparing the results with the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). The validation was conducted by calculating sensitivity and specificity scores. Sensitivity refers to the probability that a test will be positive for a patient with a communication developmental delay (Spitalnic, 2004:27). Specificity refers to the probability that a test will be negative for a patient without a communication developmental delay (Spitalnic, 2004:27). Although no surveillance tool will be entirely accurate, high scores in each of the above-mentioned domains indicates that the tool is a valid measure for identifying

infants with a communication developmental delay and infants without a communication developmental delay. By determining both the sensitivity and specificity values of the instrument, the predictive validity of the instrument was determined.

1.7 LIST OF ABBREVIATIONS

The following abbreviations are used in the text.

AAP: American Academy of Pediatrics
ABR: Auditory Brainstem Response
AOM: Acute Otitis Media
ART: Antiretroviral Therapy
ASHA: American Speech and Hearing Association
ASSR: Auditory Steady State Response
ASD: Autism Spectrum Disorder
ECI: Early Communication Intervention
EI: Early Identification
HIV/AIDS: Human Immune Virus/ Acquired Immuno-Deficiency Syndrome
HPCSA: Health Professionals Council of South Africa
JCIH: Joint Committee on Infant Hearing
KMC: Kangaroo Mother Care
NICU: Neonatal intensive Care Unit
OAE: Otoacoustic Emissions
OME: Otitis Media with Effusion
PHC: Primary Health Care
RTHC: Road to Health Card
SASLHA: South African Speech, Language, Hearing Association
UNHS: Universal Newborn Hearing Screening
WHO: World Health Organisation

1.8 CHAPTER OUTLINE

A brief outline of the five chapters in the dissertation is provided below.

CHAPTER 1: EARLY IDENTIFICATION OF COMMUNICATION DEVELOPMENTAL DELAY AND DISORDERS AS AN ENTRY POINT FOR EARLY COMMUNICATION INTERVENTION SERVICES IN SOUTH AFRICA

Chapter 1 provides the background against which the study originated. The importance of early identification as an entry point to ECI services is highlighted. The specific characteristics of the South African population which indicates the need for early identification procedures is presented. PHC as a vehicle for ECI services and consequently early identification is explored. The developmental systems model (Gularnick, 2001) is discussed as a proposed model for the delivery of ECI services within the PHC apprach. The rationale, statement of the problem and aim of the study is presented. The key concepts to be used throughout the study are defined and an outline of the chapter organisation is given.

CHAPTER 2: METHODS FOR THE EARLY IDENTIFICATION OF COMMUNICATION DELAYS AND DISORDERS IN INFANTS AND YOUNG CHILDREN

Chapter 2 provides a critical review of the literature relating to the different methods for the early identification of communication delays and disorders. A comparison is made between screening for hearing loss and screening for communication delays and disorders due to the rising number of universal newborn hearing screening programs. Available screening tools for use in developmental surveillance programs are discussed in terms of availability, sensitivity and specificity. The need for a screening tool for the South African population is highlighted. The discussion forms the theoretical background to chapter 3.

CHAPTER 3: METHODOLOGY

This chapter describes the methods used to determine the predictive validity of a surveillance tool for communication development in South Africa. The objectives which will aid in achieving the main aim are presented. The chapter

provides a thorough description of the design, hypotheses, research context, ethical considerations, participant selection, material and apparatus, data collection procedures and analysis techniques implemented in the research methodology to acquire the data: the research procedure provides a thorough description of the development of the surveillance tool for communication development, the pilot study and the process used in the implementation of the main study. Steps taken to increase reliability and validity are discussed.

CHAPTER 4: RESULTS AND DISCUSSION OF RESULTS

In chapter 4 the results are organised, presented and discussed according to the objectives of the study. The results of the study are discussed by integrating information from the current body of knowledge in order to answer the research question. A detailed analysis and discussion of the risk factors for communication development present in the population surveyed, the sensitivity and specificity of the Surveillance Tool for Communication Development and the trends within the data which indicate caregiver information needs is presented.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

Based on the results obtained in the study, chapter 5 presents the general conclusions drawn from the present study. Important clinical and research implications with regard to developmental surveillance and developmental surveillance tools are made. A critical evaluation of the study is provided. A general conclusion is reached and the researcher's final comments are included in this chapter.

1.9 CONCLUSION

Early identification of communication delays and disorders which leads to early intervention is an accepted standard of health care worldwide. In South Africa infants at risk for developmental delay and their families face additional constraints that place them at increased risk for developmental disabilities,

necessitating the need for early identification and intervention (Moodley, 1999: 62). However, early identification is not common practice in South Africa. Furthermore, healthcare professionals tend to rely on clinical observations and checklists during screening as limited reliable early identification tools for the South African population are available. An in-depth study of current early identification methods and their application in early intervention is required to compile an early identification method and tool for the South African population. The aim of this study is to provide much needed empirical evidence regarding the feasibility of using a surveillance tool for communication disorders in a specific PHC context in South Africa.

1.10 SUMMARY

An argument regarding the importance of conducting contextual research concerning the use of an early identification tool in South Africa was presented as an introduction to the dissertation. The importance of early identification of communication developmental delay and disorders in South Africa stems from a high prevalence of risk factors within the population. The Developmental Systems Model (Guralnick, 2001:7) as a proposed model for ECI services within the PHC approach was highlighted. From the discussion, the rationale for the current study as well as the research question was formulated. A list of the terminology and abbreviations used in the study was supplied. Finally, the organisation of the dissertation was provided followed by the conclusion of this chapter.

CHAPTER 2

METHODS FOR THE EARLY IDENTIFICATION OF COMMUNICATION DELAYS AND DISORDERS IN INFANTS AND YOUNG CHILDREN

This chapter presents an overview of the most effective strategies for identifying developmental delay and disorders in infants and young children in order to determine the best practice approach to early identification of communication delays and disorders. This information serves as the underpinnings for the development of an early identification tool for the South African population.

2.1 INTRODUCTION

The first years of life are a period of considerable opportunity for growth, or vulnerability to harm (Bang, 2008:1254). Most healthcare professionals agree that the first years of life constitute a unique opportunity for influencing child development, supporting families, and that this opportunity may well maximise long-term benefits for all concerned (Guralnick, 2001:1). As communication skills provide the highest predictive correlation with later intelligence attainment and school performance, there is an increased interest in the early identification of and intervention for children who display communication delay or who are at risk for doing so (Rossetti, 2001:1).

Early identification and early communication intervention (ECI) services have many benefits for those infants and families who have received such services. Early identification and referral to an ECI program can ameliorate the negative consequences of communication developmental delay or disorders on children, families and the society (Drotar *et al*., 2008: 52). For many children, early diagnosis leads to appropriate treatment that, when initiated during infancy and toddlerhood, facilitates the emergence of many skills that would otherwise lag behind or fail to develop (Scheffer *et al*., 2007:473). Intensive, well-designed and timely intervention can improve the prospects and the quality of life for many children who are considered at risk for cognitive, social,

or emotional impairment (Boyle *et al.,* 1994: 400). The effects of early intervention programs for children with communication disorders may be even more important than formal education programs as well-implemented programs can influence a child's future positively by reducing the impact a communication developmental delay or disorder has on the family (Boyle *et al.,* 1994:400).

A growing body of evidence supports the view that investing in early childhood development has an impact on children's health, their ability to learn and can result in important long-term economic returns which may be higher than investment in formal education (Swanepoel, Delport & Swart, 2007:3). If at all preventable, the most effective investment in ECI is to prevent young children from developing communication disorders. Research in the United States of America has indicated that the prevention of communication disorders is more effective than the treatment thereof (Gerber, 1998:23). Studies have further shown that intervention prior to kindergarten has academic, social and economic benefits including an estimated $30 000 to $100 000 saving per a child in the United States of America (Pinto-Martin *et al*. 2002:1928). If South Africa could replicate this intervention, such savings would be of great advantage as the advent of HIV/AIDS has impacted the South African health care budget to the detriment of other health care issues. Currently, 70% of health resources are now allocated to the management of this pandemic. Therefore, any savings, as in the case of early communication intervention, would be important.

Research has demonstrated that not only are intervention programs cost-effective and have lifelong benefits, but also that developmental potential is maximized when intervention is commenced earlier (Rydz *et al.,* 2006:1180). Identifying communication developmental delay and disorders in children as early as possible and providing effective interventions should therefore be a public health imperative (Pinto-Martin *et al*., 2005:1928). Since differences in development start to widen from a very early age, early childhood development initiatives for all, even those in developing contexts with limited

resources, are central to create more equal opportunities (Swanepoel *et al.*, 2007: 3).

The need for early detection of communication delays and disorders in infants and young children within rural contexts stems from the high prevalence of such problems and the potential of early intervention for the child and the family (Drotar *et al.*, 2008:52). The high and growing incidence of disabilities and delayed communication development which is more pronounced in developing contexts, such as in rural contexts in South Africa, demands greater awareness and improved early identification strategies (Boyle *et al.,* 1994:399).

Unfortunately, within rural settings, children with communication delays and disorders are often identified later on in life or remain undiagnosed. Delays and disorders that go undiagnosed and untreated put children at risk unnecessarily for poor academic, social and vocational progress later on (Scheffer *et al.*, 2007:473). Although communication delays and disorders are not life-threatening conditions, failure to intervene in time renders a severe threat to critical quality of life indicators such as education, employment and social integration (Swanepoel *et al.* 2007:3). Further, compensating for missed opportunities, such as the failure to detect early difficulties or the lack of exposure to environments rich in language, often requires extensive intervention efforts later in life (Pinto-Martin *et al.*, 2002:1928).

Despite the challenges experienced in developing countries such as the rural areas in South Africa, children with communication delays and disorders deserve the chance to develop according to their potential as much as their peers living in more affluent areas (Swanepoel & Storbeck, 2008:S1). Furthermore, the proven benefits of ECI, creates a sense of urgency to identify those infants who display or who are at risk of displaying a communication developmental delay and/or disorder (Rossetti, 2001:21). Early identification of communication delays and disorders is therefore crucial as an entry point to early intervention services (Guralnick, 2001:1). Figure 2.1

summarises the benefits of early identification of communication delays and disorders.

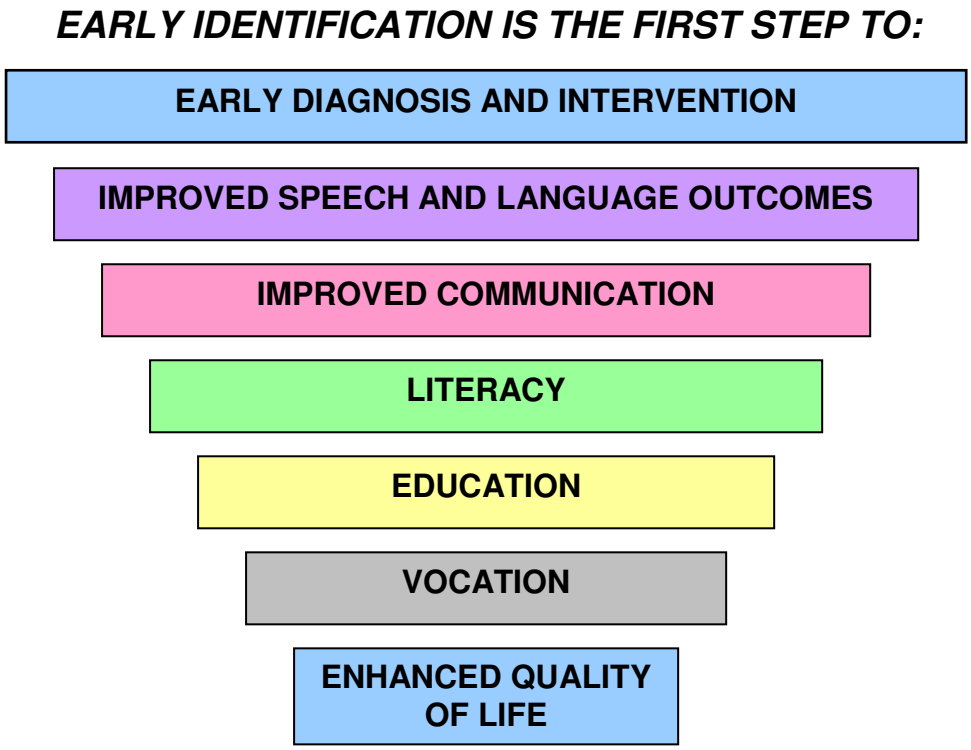

FIGURE 2.1: Benefits of early identification (based on Swanepoel presentation at CHRIB seminar, 2009)

2.2 METHODS OF IDENTIFYING COMMUNICATION DEVELOPMENTAL DELAY AND DISORDERS

Despite the need for and the advantages associated with early identification, early detection of communication developmental delay and disorders is fraught with challenges (Glascoe, 2005:173). The most effective manner to identify children with developmental delay and disorders still remains elusive, although practical methods have been suggested in the literature as early as 1979 (Rydz *et al.,* 2006:1180). Currently, there are a wide range of approaches and instruments which have led to continued discussions and debates among researchers and clinicians regarding the most effective and efficient ways of accurately identifying children with developmental delay and disorders (Goelman & the CHILD project, 2008:307).

In order to standardise common practice relating to early identification methods, the American Academy of Pediatrics (AAP) issued a policy statement in July 2006 regarding the implementation of developmental surveillance and screening activities (Carrey *et al.,* 2006:5). The AAP statement recommends that all well-child visits to paediatricians include developmental surveillance (Carrey *et al.,* 2006:5). Although no such legislation or policies exist in South Africa, methods to identify children with developmental delay and disorders are supported by governmental policies as mentioned earlier. However, due to the lack of identification activities followed within South Africa, a comprehensive and organised approach for early identification of developmental delay and disorders is needed. As an initial step, effective methods for early identification proposed in the literature need to be explored in order to identify the current best approaches to early identification.

Methods indicated in literature include the use of high risk registers, providing a once off screen to the entire population and developmental surveillance of targeted groups over time (Rydz *et al.,* 2006:1181). Each of these strategies, together with their respective advantages and disadvantages, are critically discussed in order to identify the most appropriate means for early identification for South Africa.

The use of high risk registers to screen for developmental delay and disabilities is based on the notion that complex relationships between biological and environmental factors are known to influence developmental courses and outcomes (Bang, 2008:1257). Numerous factors interfere over time with normal environmental interaction and can increase the risk for a developmental delay (Rossetti, 2001:5). However, risk factors should not be considered to be a condition, but rather considered to be indicators of infants with an elevated probability of a disorder occurring (Bryant & Graham, 1993:48). With this method, children are screened using either the Road to Health Card or information provided in the child's medical chart to determine if the factors on the specific high risk register are present (DeConde Johnson, Benson & Seaton, 1997:32). However, in South Africa infants may be

registered late or not at all and may therefore not receive a Road to Health Card. Furthermore, the high number of home birth deliveries in South Africa results in missing and inadequate information filled in on medical charts and the Road to Health Card. This makes it difficult for professionals to monitor weight gain as well as to obtain accurate information relating to pregnancy and birth.

Rossetti (2001:5) states that anything which interferes with a child's ability to interact with the environment in a normal manner is a potential cause of, or contributing factor to developmental delay and has provided a list of at risk conditions. Children may be considered at risk of substantial delay based on the presence of four or more of the risk factors provided in the table (Rossetti, 2001:5). This list is summarised in Table 2.1.

TABLE 2.1: At Risk Categories (Rossetti, 2001:5-6)

At Risk Categories
• Serious concern expressed by a parent, primary caregiver, or professional regarding the child's development.
• Parent or primary caregiver with chronic or acute mental illness/ developmental disability/ mental disability.
• Parent or primary caregiver with drug or alcohol dependence.
• Parent or primary caregiver with a developmental history of loss and/or abuse.
• Family medical/genetic history characteristics.
• Parent or primary caregiver with severe or chronic illness.
• Acute family crisis.
• Chronically disturbed family interaction.
• Parent-child or caregiver-child separation.
• Adolescent mother.
• Parent with four or more preschool-age children.
• The presence of one or more of the following: parental education less than 9th grade, neither parent is employed, single parent.
• Physical or social isolation and/or lack of adequate social support.
• Lack of stable residence, homelessness, or dangerous living conditions.
• Inadequate health care or no health insurance.
• Limited prenatal care
• Maternal prenatal substance abuse/use
• Severe prenatal complications
• Severe perinatal complications
• Very low birth weight (<1 500g)
• Small for gestational age (< 10th percentile)
• Excessive irritability
• Atypical or recurrent accidents on the part of the child
• Chronic otitis media

There is no single risk factor which affects development; it is rather the combination of risk factors that contribute to developmental delay. Of the risk factors listed in Table 2.1, low birth weight, adolescent mothers and parent-child separation are the main risk factors in the South African context. These risk factors have an elevated prevalence in South Africa when compared to developed countries (Pattinson, 2003-2005:23; Poppich *et al.,* 2007:31). The challenge in South Africa is to access the risk factors presented in Table 2.1 for each infant and to determine the presence as well as the impact of these risk factors on infant development.

Although there are known risk factors which contribute to the development of a developmental delay or disorder, the sole use of a high risk register as a method for screening has proven ineffective in identifying all infants with a developmental delay or disorder (DeConde Johnson *et al.*, 1997:32). This is largely due to not all children with a developmental disability presenting with a known risk factor at birth or during their development and many times the cause of delay is unknown (Bang, 2008:1524). Further, the use of a high-risk register is indirect screening as the infant is not evaluated and only the infant's history is considered which could result in inaccurate results. In South Africa, caregivers accompanying infants may not be the mothers of the infants, and may therefore not have all the information needed to complete a high-risk register.

Although development is influenced by many factors, the prediction of those who will develop poorly versus those who will develop optimally based on risk categories is not sufficient. It is therefore recommended that a risk register be used as a component within an assessment battery, to give an indication of causation factors, but it is not effective as a screening tool on its own (Bang, 2008:1524). In her study, van der Linde (2008:132) determined that although PHC personnel are positive about screening infants for communication development, they do not feel that risk registers will be effective within a PHC clinic as caregivers are not educated about the medical histories of their infants and many times a language barrier between the interviewer and the caregiver exists which may result in inaccurate information. The PHC

personnel felt that a more structured developmental screening tool was needed (van der Linde, 2008:132).

A second proposed strategy for identifying infants and children with developmental delay and disabilities is the process of population screening. Screening by itself does not provide a diagnosis, but is the first key step in the diagnostic process and is regarded as the entry point to early intervention services (Guralnick, 2001:1). Population screening is designed to be a quick, low-cost assessment of a child's current behavioural repertoire and can determine whether a child is developing on track or not (Squires *et al.,* 1990: 47). The purpose of population screening is threefold, namely, to identify all children who may have developmental delay or disabilities, to guide decisions about referrals for further evaluation, and, when appropriate, to connect families to resources that may help mitigate or minimize the severity of their child's delay or disability (Carrey *et al*., 2006: 2).

Screening is a method of identifying developmental delay in infants, since screening should help detect developmental delay in their early stages and enable the delay to be treated adequately before it obtains a firm hold on the individual and the community (World Health Organisation, 1998:7). Screening is not an error free identification method but should be as accurate as possible so as to minimise the many expenses associated with both over referrals and under detection (Glascoe, 2005:174).

Although population screening is a means of identifying developmental delay and disorders, screening provides a single point-in-time sample of a child's developmental status. As a child's development is dynamic, this method of identifying developmental delay and disorders can easily miss those individuals who experience a developmental delay after the time at which the screening was conducted (Owens, 2001:69). Population screening can also be a very costly process and is not a viable option for a resource poor country such as areas within South Africa. Screening should therefore be an ongoing process, a key preventive service that parents can expect and anticipate as regularly as immunizations (Carrey *et al*., 2006:5). Developmental surveillance targets the review of development at regular time intervals and is

aimed at a specific population or group, such as infants living in poverty visiting a certain clinic.

Developmental surveillance is an accepted method of identifying developmental delay as a series of snapshots of a child's development across developmental domains is obtained (Carrey *et al.*, 2006:2; Dworkin, 1993:531). Frequent longitudinal contact with young children and their families at critical times affords health care workers with opportunities to detect clinically significant developmental problems and institute early intervention (Drotar *et al.*, 2008:52). Through the use of two-stage developmental surveillance strategies in which infants were screened at two time intervals, research studies have shown that autism spectrum disorders and other developmental disabilities can be detected reliably and with greater validity in young children (Pinto-Martin *et al.,* 2005:1928).

Research findings and expert opinion support the process of surveillance as the optimal approach to developmental monitoring for two essential reasons (Scheffer *et al.,* 2007:472). Firstly, development can change at any point in time as children's language, social and other developmental skills are influenced in positive or negative directions by environmental forces. For example, children develop poorly in the presence of risk factors such as when parents have limited education, when parenting styles dominated by commands and when children are rarely taught new skills (Glascoe, 2005:174). Opportunities for learning must therefore be present in order for the child to develop (Owens, 2001:68). Further, the developmental status can be changed, for better or for worse, as early risk factors can change during childhood (Glascoe, 2005:174). In order to monitor changes in developmental status, repeated follow-ups are necessary.

Secondly, development manifests with age as developmental problems arise when children develop. In general, children attain certain skills or abilities at predictable ages (Owens, 2001:68). Children whose skills appear typical at one age may demonstrate problems later on in life (Glascoe, 2005:174), such as late onset autism spectrum disorder and auditory neuropathy spectrum

disorder. A delay in a skill only becomes evident when a specific developmental milestone is expected (Committee on Children with Disabilities, 2001:193). The concept of age-related developmental manifestations implies that every child has an increasing risk of delay and disability as a child becomes older (Glascoe, 2005:174). This is reflected in the findings of Newacheck and Halfon (1998), in that only 1 to 2% of children between 0 to 24 months of age had developmental problems, while the prevalence of developmental delay increased to 6% when children up to the age of 6 years were added. The effects of poverty on a child's development typically start to influence development after 12 months or after breastfeeding has been stopped (Escalona, 1982:675). Environmental stresses impair early cognitive and psychosocial development for both full-term and premature infants, but premature infants are more vulnerable to environmental stressors than are full-term infants (Escalona, 1982:675).

Due to the age-related manifestations of development, there is a clear need for developmental surveillance, but the need is also for services following developmental surveillance (Glascoe, 2005:174). Developmental surveillance may result in one of three outcomes: the child may pass the screening, require additional follow-up or need more comprehensive assessment and specific intervention (Lequerica, 1997:291). In the last two scenarios, results of developmental surveillance are just the beginning of an ongoing process of follow-up, co-ordination with primary professionals, the family and the agency to which the child is referred for further evaluation (Lequerica, 1997:291). In addition, families whose children are identified as having a developmental or delay during developmental surveillance, should receive a second screen and be counselled. A follow-up plan should then be created and case management should be provided to help the family navigate the health care system to obtain appropriate services (Pinto-Martin *et al.,* 2005:1930). Before the second screen, information should be provided to them.

The AAP (2007:2) recently published guidelines which recommend that certain components be included in the process of developmental surveillance. Firstly, it is recommended that the findings of surveillance and screening be

documented. Secondly, no tool will have served its purpose to the children positively identified as having a developmental delay if results are not accompanied by an action plan. Not providing assessment and intervention following identification is unethical clinical practice and therefore best practice solutions need to be found. The guidelines recommend that positive results should be accompanied by a referral for further evaluation that may include medical, developmental and/or early intervention. Thirdly, some children are clearly significantly developmentally delayed and would not be appropriate for developmental surveillance. The guidelines indicate that there is a system for identifying these children in the practice as children with special health care needs (Wagner *et al.,* 2006:410). Such children fall within the established risk category of disability. Infants with established risks can be identified at birth, but those conditions of which the full expression is not apparent prenatally or at birth, or present with at-risk conditions, where developmental delay progresses gradually, should be the targets of developmental surveillance as these children are often not identified (Rossetti, 2001:6).

A factor which influences the outcome of ECI services is the time lapse between early identification and intervention, which is often prolonged. Best practice requires that ECI services are provided to families as soon as possible, without a time lapse between identification and the commencement of treatment (Rossetti, 2001:45; Yoshinago-Itano *et al.*, 1998:163).

As indicated, early identification is seen to be the initiation for further assessment and intervention strategies and therefore early identification activities, such as developmental surveillance, cannot be performed in isolation. To meet all the requirements listed above, developmental surveillance needs to be incorporated into an early intervention system. Such a system allows infants and their families to transition smoothly from developmental surveillance to assessment and to intervention services. Moreover, case management and care coordination systems for children and their families are developed to link the monitoring efforts of health providers to early intervention services (McKay *et al.,* 2006:372). Parents are provided with continuous support which allows them the opportunity to come to terms

with the emotional aspects associated with an infant who is not developing appropriately through supportive counselling. King-Thomas & Hacker (1989:7) illustrate the components of a system of developmental surveillance in Figure 2.2.

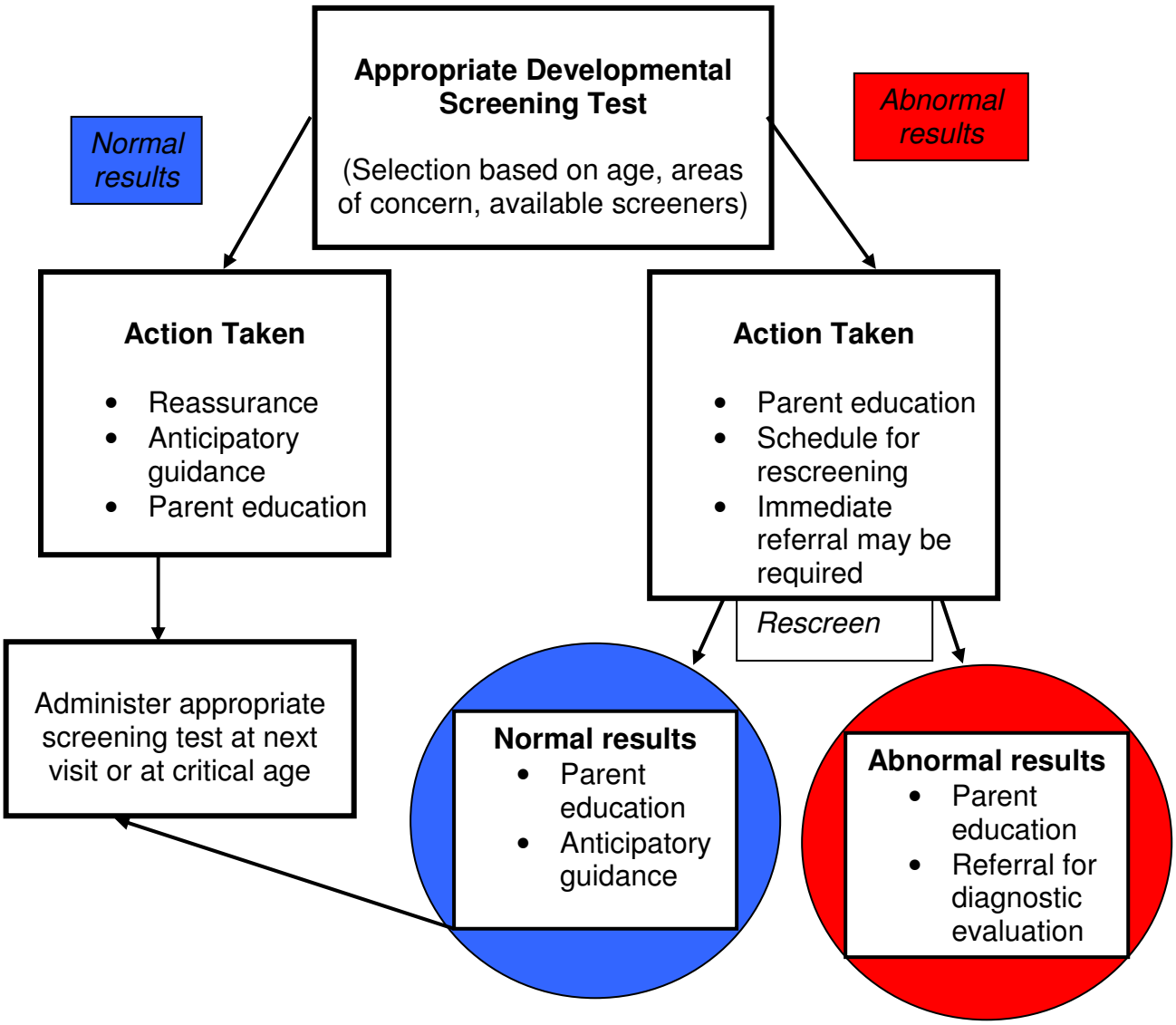

FIGURE 2.2: Components of the system of developmental surveillance

The primary function of developmental surveillance systems are to minimize the possibility that a child has not been properly identified for further evaluation through monitoring or to maintain contact with children who remain at risk for subsequent developmental problems (Guralnick, 2001:9). This is also an important strategy for children with mild developmental delay as mild delays and disorders are often difficult to detect as children grow in spurts,

and at times, discontinually (Committee on Children with Disabilities, 2001:193).

Many families have inconsistent access to health care or use health care only when a child is sick (Carrey *et al.,* 2008:5). Parents who access services regularly, believe that their children are being screened by the physician. However, physicians often do not perform developmental surveillance due to time constraints. Even when children are screened during well-child visits, it is often not with an objective tool (Carrey *et al.,* 2008:5). In South Africa, developmental surveillance activities are inconsistent and often ignored both in the private and public health sectors (van der Linde, 2008:133). This is disappointing as developmental surveillance, carried out by professionals, could play an important role in recruiting infants and toddlers at risk for communication disorders, provided that the surveillance is carried out routinely and sensitive screening instruments are used (Kritzinger, 2000:47). Given the poor performance of informal methods such as checklists and clinical observation, there is a need for developmental surveillance programs and for the use of quality screening instruments (Glascoe, 2005:174, van der Linde, 2008:133).

2.3 EXAMPLES OF BEST PRACTICE

Two examples of best practice for the early identification of specific disorders are namely the use of newborn hearing screening programs and screening for autism spectrum disorders; both of which are presented in the discussion below.

2.3.1 SCREENING FOR HEARING LOSS

Early intervention for hearing loss has become an increasingly essential aspect of audiological service delivery (Swanepoel, 2004:55). Rising numbers of universal newborn hearing screening programs have been implemented to facilitate an optimal outcome for infants with hearing impairment in developed countries, and pilots of such programs in developing contexts such as rural

areas of South Africa (Swanepoel, Delport, & Swart, 2004:632). The technological advancements in audiology which have produced objective tests such as Otoacoustic Emissions (OAE) and Auditory Brainstem Response (ABR), making early detection of hearing loss a viable strategy (Theunissen & Swanepoel, 2008:24). Further, infants enrolled in UNHS programs are detected earlier and subsequent intervention can facilitate linguistic, speech and cognitive development that is comparable to normal hearing peers (Swanepoel *et al.*, 2007:3).

The adverse effects of hearing loss on language and cognitive development, as well as on psychsocial behaviour are widely reported against the established benefits of early intervention (Swanepoel *et al.,* 2007:3). Infants whose hearing loss is identified before six months of age have significantly better language abilities compared to those whose hearing loss was identified later (Yoshinaga-Itano *et al.*, 1998:1164). Newborn hearing screening leads to earlier detection and intervention. Schroeder *et al.* (2006:1110) investigated the cost savings associated with newborn hearing screening. The findings indicated a 22% less average annual education costs for children with hearing loss born in UNHS programs and an annual saving of 21% for children in middle childhood. As a result, numerous authoritative and well-respected bodies in developed countries with an interest in early detection of hearing loss have supported the implementation of widespread UNHS (White, 2003:86). This momentum has recently carried over into developing countries.

In light of the benefits and viability of early detection of hearing loss, it is not surprising that interest in newborn hearing screening programs and pilots of such programs have started to emerge in developing countries (Theunissen & Swanepoel, 2008:24). South Africa has taken the first step towards UNHS in the form of a Hearing Screening Position Statement conceptualised by the Professional Board for Speech, Language and Hearing Professions of the Health Professions Council of South Africa (HPCSA) (Swanepoel *et al.*, 2004:634). The South African Hearing Screening Position Statement provides valuable direction by setting the standards for newborn hearing screening. Further, the South African Minister of Health recently emphasised the moral

obligation to actively pursue ways of developing early identification and intervention programs for hearing loss in South Africa and throughout sub-Saharan Africa to ensure equal opportunities for children with hearing loss (Theunissen & Swanepoel, 2008:23).

Despite the increased awareness of screening for hearing loss among South African professionals and politicians, this momentum has not carried over into screening for developmental delay and disorders within South Africa. The South African government has recognised the importance of early intervention for children in the preventative approach proposed in the White Paper for the transformation of the Health System in South Africa (White Paper on an Integrated National Disability Strategy. 1997:3). As South African policy guidelines favour the philosophy of screening for developmental delay and disorders, it is only the implementation of such policy that is left wanting (Swanepoel *et al.* 2007:3).

South African contextual constraints, such as the lack of resources, poor literacy of the targeted population and lack of trained personnel, cannot be considered the primary contributing factor to the lack of screening programs for developmental delay and disorders. Pilot UNHS programs have been successfully implemented in South Africa despite the barriers posed by the South African context. Therefore, additional factors appear to be contributing to the lack of awareness and lack of screening programs for developmental delay and disabilities in South Africa. These factors may be explained by the differences encountered when screening for hearing loss and when screening for developmental delay and disorders.

Hearing is a sensory modality. Due to advances in technology, hearing loss has become easier to measure. Specific physiological screening tests have been designed to determine one of two results: all criteria for each ear are met and therefore the infant can hear the probe sound (Katz, 2002:459). Alternatively, all criteria for either one or both ears were not met, therefore the infant cannot hear the probe sound and the infant presents with hearing loss (Katz, 2002:459). Such a system falls within the medical model of cause and

effect as normal data are used as a standard to determine abnormal versus normal results.

Perhaps one of the biggest differences in screening for hearing loss and screening for developmental delay and disorders is that hearing is a sensory ability and development is a complex process as development does not occur in a straight line (Owens, 2001:68). There are orderly, predictable phases in which certain areas of development are emphasised but phases of physical growth do not necessary coincide with other phases of development such as cognition or socialisation (Owens, 2001:69). Development is more than a cumulative list of changes and accomplishments (Owens, 2001:215). Further, children's rapid growth and development during the first five years of life is well known and documented (Carrey *et al.,* 2006:5). The important skills gained during this period become the foundation for all development that follows. Therefore development must be monitored in several areas (motor, cognitive, communication, psychosocial) simultaneously and a simple pass-refer test cannot be applied at a single point in time. It is also easy to overlook a small delay in only one area (Bang, 2008:1524). Additionally, the range of normality is broad and normative data are meant to be used as a guide as development is a dynamic process which is often challenging to measure due to its nature (Owens, 2001:69). A simple cause and effect model would not be sufficient to survey all the factors relating to the development of milestones (Bang, 2008:1524).

Individual development can be varied and these differences are related to differences in intellect, personality, learning style, ethnicity, home language, socioeconomic status, family structure and birth order (Owens, 2001:215). Consequently, there is a reciprocal influence in the development of different skill areas. In general, these relationships are very complex and not simply cause and effect as a transactional model of risk exists (Owens, 2001:215). Therefore, when screening for developmental delay and disorders, these factors need to be taken into consideration as they may influence the outcome of the screen. This makes it more challenging to determine pass and fail criteria when screening for developmental delay and disorders.

A further difference in screening for hearing loss and screening for developmental delay and disorders is that screening for hearing loss makes use of high technological equipment such as OAE and ABR. Such equipment is expensive to purchase and requires funds for yearly calibration. Unfortunately, many PHC clinics do not possess high technology equipment or the funds to purchase such equipment (van der Linde, 2008:178). Theunissen and Swanepoel (2008:25) determined that most of the hearing screening and diagnostic equipment is located at South African tertiary institutions and no South African district hospitals have any diagnostic equipment. Very few South African PHC personnel are performing hearing screening activities with most hearing screening programs performed at regional (secondary) and tertiary institutions (Theunissen & Swanepoel, 2008:25). Due to limited funds within South African PHC clinics, purchasing and maintaining hearing screening equipment is challenging.

An advantage of hearing screening equipment is that it can be used on any population, regardless of ethnic, cultural or linguistic variables. Developmental screening tools, however, have to take all these factors into consideration due to the influence these factors have on development (Owens, 2001:216). It is therefore necessary that screening tools be developed for the unique characteristics of each population in order to promote sensitivity and specificity of screening programs for a specific context. The lack of such tools is a barrier to the development of developmental surveillance programs. This is reflected in a survey conducted by the AAP (2001:1) which aimed to determine professionals' views on the factors which act as obstacles to developmental surveillance activities taking place. Poor developmental surveillance tools were recognised by 25% of professionals as a contributing obstacle to developmental surveillance activities.

However, insufficient time to complete developmental testing was reported by professionals to be the main barrier to developmental surveillance programs (80% of professionals held this view) (AAP, 2001:1). Screening for hearing loss using physiological equipment takes only a few minutes to perform,

whereas screening for developmental delay and disorders is a more time consuming process (DeConde Johnson *et al.,* 1997:33). Due to time constraints, professionals might be more willing to screen for hearing loss than to screen for developmental delay and disorders. In order to further promote developmental surveillance activities, quick and easily administered developmental screening tools need to be developed.

2.3.2 SCREENING FOR AUTISM SPECTRUM DISORDERS

The recent and growing interest in autism spectrum disorders (ASD) has led to the development of screening programs and tools to screen for ASD. The increased awareness regarding ASD stems from the increased prevalence of ASD identification worldwide (Autism South Africa website, www.autismsouthafrica.org, June 2009). International research has shown that ASD is now considered to affect approximately 1 per 158 children under the age of 6 years, making it the most frequently occurring of all childhood neurological disorders (Autism South Africa website, www.autismsouthafrica.org, June 2009). Due to this high prevalence, ASD has become the most well defined and most intensively researched of all childhood developmental disorders (Chakrabarti *et al.,* 2005:201).

Early identification of children with ASD and intensive, early intervention during the toddler and preschool years improves outcomes for most young children with ASD (Filipek *et al*., 2009:469). However, early intervention for ASD necessitates early detection. This need has led to widespread agreement across disciplines that screening for ASD is critical in very young children and as developmental abnormalities characteristic of ASD manifest themselves early in infancy, early detection is possible (Filipek *et al.,* 2009:469). Specific recommendations for the identification of children with ASD have been made. This approach requires a dual process. Firstly, routine developmental surveillance and population screening specifically for ASD needs to be performed on all children to identify those at risk for any type of atypical development, and to identify those specifically at risk of ASD. Secondly, the diagnosis and evaluation of ASD needs to be performed, in

order to differentiate ASD from other developmental disorders (Filipek *et al.,* 2009:469). The suggested approach is depicted in Figure 2.3 below.

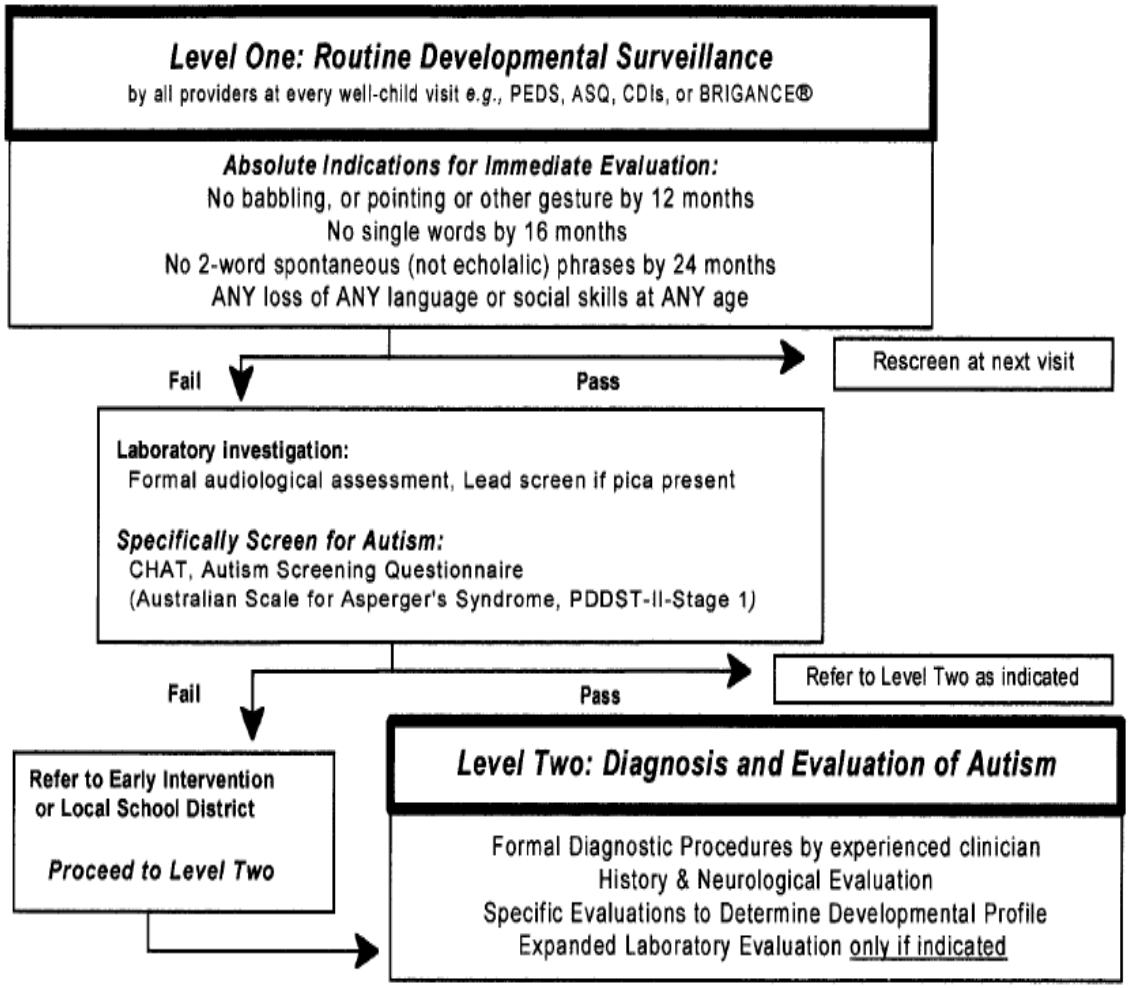

FIGURE 2.3: Suggested approach to screening for ASD (Filipek et al., 2009:469)

As a result of the recent emergence of screening programs for ASD, many tools specifically designed for the detection of ASD have been developed. These tools include the CHAT (Checklist for Autism in Toddlers; Baron-Cohen, Allen & Gillberg, 1992), Pervasive Developmental Disorder Screening Test (PDDST; Seigel, 1998), Screening Tool for Autism in Two-year-olds (STAT; Stone, Coonrod & Outsley, 2000), and the Modified CHAT (M-CHAT; Robins, Fein, Barton & Green, 2001). Now the challenge worldwide is to increase awareness for other developmental delay and disorders including cerebral palsy, late talkers and intellectual disabilities and to develop screening tools in order to detect these developmental delay and disorders.

Examples of best practice are available as discussed above. However, these examples now need to implemented and adapted for the South African context.

2.4 SCREENING TOOLS

The science of developmental testing has improved over the last 20 years, making it easier for health professionals to accurately and efficiently screen development (Committee on Children with Disabilities, 2001:193). Studies on the effectiveness of early detection show that when quality screening tests are used routinely, early detection and early intervention enrolment rates rise to meet prevalence figures identified by the Centers for Disease Control (Bryant & Graham, 1993:36). Therefore, the sensitivity and specificity of screening tools directly influences the success and cost effectiveness of early identification efforts. As a result, a great deal is expected from a screening tool.

Evaluating the accuracy of screening tools is difficult due to the wide variety of ways in which the performance of screening tools is determined (Glascoe, 2005:174). Obviously, no one brief, easily administrated tool can tap the complex interaction of factors that contribute to a child's possible risk for developmental problems (Brassard & Boehn, 2007:136). Although the screening tools available for young children have improved over the past few years, no screening tool is completely accurate and it is always difficult to maximise both sensitivity and specificity values in a screening tool (Stott *et al.,* 2001:134). In order to enhance screening outcomes, a measure which has a high degree of predictive accuracy, including few false negatives and few false positive results, as well as high sensitivity and specificity values needs to be used (Brassard & Boehn, 2007:136).

The most accurate means of determining the performance of a new screening measure is the use of a reference test, known as the "golden standard" against which sensitivity and specificity values are calculated (Stott *et al.,*

2001:136). However, most tools have not been tested and have not lived up to these criteria resulting in the quality of these instruments being variable and in some instances, poor (Brassard & Boehn, 2007:136). These tools results in poor detection rates and children who could have benefited from early intervention services are not identified.

There are numerous screening tests which have been developed and tested on the American and British populations. These tools have not, however, been tested on the South African population but are used informally. A brief description of various screening tools follows. Those selected for discussion cover most or all developmental domains and meet the standards for screening test accuracy, namely high sensitivity and specificity values. Measures are divided into those relying on parental report (Table 2.2) and tools relying on direct elicitation (Table 2.3). Table 2.2 and 2.3 describe the selected measures including the name of the test, age range, description accuracy and time taken to administer the test.

The screening tools presented in Table 2.2 and 2.3 have been proven to have high sensitivity and specificity values. Tools with low sensitivity and specificity values have been excluded from Table 2.2 and 2.3 as the measure fail to meet the standards or comply with basic psychometric values. Excluded tests are, for example, the Denver-II and its pre-screening derivative, the PDQ-R (Prescreening Developmental Questionnaire-Revised). The Denver-II has been shown to over refer or under detect infants depending on how scoring is handled and interpreted (Glascoe, 2005:175). The DIAL-III (Developmental Indicators for the Assessment of Language) was also excluded as it has failed to provide assessment of its sensitivity and specificity (Glascoe, 2005:175).

TABLE 2.2: Developmental and behavioural screening tools relying on information from parents

Developmental screens relying on parental information	Age range	Description	Scoring	Sensitivity and specificity	Time taken to administer
Ages and Stages Questionnaire (formerly Infant Monitoring System) (Brookes, 2004)	4–60 months	Parents indicate children's developmental skills on 25–35 items (4–5 pages), using a different form for each well visit. Reading level varies across items from 3rd to 12th grade. Can be used in mass mail-outs for child-find programs. In English, Spanish and French.	Single pass/fail score for developmental status	Sensitivity ranged 70–90% at all ages except the 4 month level. Specificity ranged from 76–91%.	About 15 min
Ages and Stages Questionnaires: Social Emotional (ASQ:SE) (Brookes, 2004)	6–60 months	Designed to supplement the ASQ, the ASQ:SE consists of 30-item forms (4–5 pages long) for each of 8 visits between 6 and 60 months. Items focus on self-regulation, compliance, communication, adaptive functioning, autonomy, affect and interaction with people.	Single cutoff score indicating when a referral is needed.	Sensitivity ranged from 71–85% and specificity from 90–98%.	10–15 min
Behavioural/Emotional Screens Relying on Information from Parents: Eyberg Child Behavior Inventory/ Sutter-Eyberg Student Behaviour Inventory (Eyberg, 2001)	2–16 years	The ECBI/SESBI consists of 36–38 short statements of common behaviour problems. More than 16 suggest the referrals for behaviour interventions. Fewer than 16 enable the measure to function as a problems list for planning in-office behaviour and selecting handouts. The tools are helpful in monitoring behaviour progress.	Single refer/non-refer score for externalizing problems, conduct, attention, aggression, etc.	Sensitivity 80%, specificity 86% to disruptive behaviour problems.	About 7 min
Brief-infant-toddler social emotional assessment (BITSEA) (Carter & Briggs-Gowan, 2001).	12–36 months	42-item parent-report measure for identifying social emotional/ behavioral. Problems and delays in competence. Items were drawn from the assessment level measure, the ITSEA. Written at the 4th to 6th grade level. Available in Spanish, French, Dutch and Hebrew.	Cut-points based on child age and sex show present/ absence of problems and competence	Sensitivity (80–85%) in detecting children with social emotional/behavioural problems and specificity 75–80%.	5–7 min
Child Development Inventory (CDI) (Ireton, 1992)	18 months – 6 years	Parent-completed questionnaire, measuring social, self-help, motor, language and general development skills. Suitable for more in depth evaluation or as a second-stage screening tool.	Results include developmental quotients and age equivalents for different developmental domains.	Sensitivity of 0.08 – 1.0 (moderate to high) and specificity of 0.94 – 0.96 (high).	30 – 50 min

TABLE 2.2: Continued

Developmental screens relying on parental information	Age	Description	Scoring	Accuracy	Time taken to administer
Child Development Review – Parent Questionnaire (CDR-PQ) (Ireton, 2004)	18 months – 5 years	Parent-completed questionnaire measuring social, self-help skills, motor and language skills. The questionnaire consists of 6 open-ended questions and a 26-item possible problems checklist which is completed by the parent.	Three possible responses are provided for answering the questions. Cutoff scores indicate when further investigation is needed.	Sensitivity of 0.68 (low) and specificity of 0.88 (moderate)	10-20 min
Infant Development Inventory (Creighton, 1992)	3–18 months	60 yes-no descriptions of development in five domains. Can be mailed to families, completed in waiting rooms, administered by interview or by direct elicitation. A 300-item assessment level version may be useful in follow-up studies or subspecialty clinics and produces age equivalent and cutoff scores in each domain. Also in Spanish.	Cutoffs for each domain tied to 30% delay or 30% advanced relative to chronological age.	Sensitivity in detecting children with difficulties is excellent (greater than 75% across studies) and specificity in correctly detecting normally developing children is good (70% across studies).	About 10 min
Infant-Toddler Checklist for Language and Communication (Wetherby & Prizant,1998)	6–24 months	Parents complete the checklist's 24 multiple-choice questions in English. Reading level is 6th grade. Based on screening for delays in language development as the first evident symptom that a child is not developing typically. Does not screen for motor milestones.	Manual table of cutoff scores at 1.25 standard deviations below the mean or an optional scoring CDROMs	Sensitivity is 78% and specificity is 84%.	About 5–10 min
Parents' Evaluations of Developmental Status (PEDS) (Glascoe, 1997)	Birth to 9 years	10 questions eliciting parents' concerns in English, Spanish, and Vietnamese which are written at the 5th grade level. Determines when to refer, provide a second screen, provide patient education, or monitor development, behaviour/ emotional and academic progress.	Identifies children as low, moderate, or high risk for various kinds of disabilities and delays.	Sensitivity ranging from 74 to 79% and specificity ranging from 70 to 80% across age levels.	About 2 min
Paediatric Symptom Checklist (Jellinek & Murphy, 2004).	4–16 years	35 short statements of problem behaviour including both externalizing (conduct) and internalizing (depression, anxiety, adjustment, etc.). Ratings of never, sometimes, or often are assigned a value of 0, 1, or 2. Scores totalling 28 or more suggest referrals. Factor scores identify attentional internalizing, and externalizing problems.	Single refer/non-refer score	One study showed high sensitivity (80–95%) but somewhat scattered specificity (68 – 100%).	About 7 min

TABLE 2.2: Continued

Developmental screens relying on parental information	Age	Description	Scoring	Accuracy	Time taken to administer
Modified Checklist of Autism in Toddlers (M-CHAT) (Robins, Fein, & Barton, 2006).	16–52 months	Parents complete 24-item, single- sheet form after a broadband screen is failed. Specifically designed to identify communicative and affective behaviours consistent with autism spectrum disorders. Available in Spanish.	Cut-off of 2 problematic answers on the "critical" items or three items overall suggests the need to see an autism specialist	Sensitivity is 96% and specificity is 94%.	About 5 min
Paediatric Language Acquisition Screening Tool for Early Referral (PLASTER) (Sherman et al., 1996)		Indicates communication development milestones by age with 7 individual areas. Each area contains 10 questions, 5 relating to receptive language and 5 relating to expressive language.	Cut-off scores indicate when a referral is needed.	Sensitivity 72%, specificity 83%	5 min

TABLE 2.3: Directly administrated developmental screening tools

Directly administrated screening tools	Age	Description	Scoring	Accuracy	Time taken to administer
Battelle Developmental Inventory Screening Tool 2ND Edition (BDI-ST) (Battelle, 2004)	Birth – 95 months	Designed to screen personal-social, adaptive, motor, communication and cognitive development. Can be modified for children with special needs.	Results indicate a pass/fail score and an age equivalent.	Sensitivity of 0.72 – 0.93 (moderate to high) and specificity of 0.77 – 0.88 (moderate)	10 – 15 min
Bayley Infant Neurodevelopmental Screen (BINS) (Aylward, 1995)	3 – 24 months	Screens basic neurologic functions such as receptive functions (visual, auditory, tactile input), expressive functions (oral, fine and gross motor skills) and cognitive processes.	Results place an individual in a risk category, either low, moderate or high in each of four conceptual domains by use of 2 cutoff scores.	Sensitivity of 0.75 – 0.86 (moderate) and specificity of 0.75 – 0.86 (moderate)	10 min
Brigance Screens – II (Glascoe, 2005)	0-90 months	Series of 9 forms which screen articulation, expressive and receptive language, gross motor, fine motor, general knowledge, personal social skills and pre-academic skills.	All results are criterion based, no normative data are presented	Sensitivity of 0.70 – 0.80 (moderate) and specificity of 0.70 – 0.80 (moderate)	10 – 15 min

TABLE 2.3: Continued

Directly administrated screening tools	Age	Description	Scoring	Accuracy	Time taken to administer
Capute Scales also known as Cognitive Adaptive Test/Clinical Linguistic Auditory Milestones Scale (CAT/CLAMS) (Volgt, Brown, Fraley, 2003)	3-36 months	Measure visual motor/problem solving, expressive and receptive language.	Results provide developmental quotients and age equivalents.	Sensitivity of 0.21 – 0.67 (low) in low-risk populations and 0.05 – 0.88 (low to high) in high-risk populations. Specificity of 0.95 – 1.00 (high) in low-risk populations and 0.82 – 0.98 (moderate to high) in high-risk populations	15-20 min
Communication and Symbolic Behaviour Scales-Developmental Profile (CSBS-DP) (Wetherby & Prizant, 2002)	6-24 months	Standardised tool for screening of communication and symbolic abilities. The Infant Toddler Checklist is a 1-page parent –completed screening tool.	Individuals are placed in one of two risk categories, namely, concern/no concern.	Sensitivity of 0.76 – 0.88 (moderate) and specificity of 0.82 – 0.87 (moderate)	5-10 min
Denver-II Developmental Screening Test (Frankenburg, 1992)	0-6 years	Designed to screen expressive and receptive language, gross motor, fine motor and personal-social skills.	Pass/fail results are presented for each question. These responses are compared with age-based norms to classify children as in the normal range, suspect or delayed.	Sensitivity of 0.56 – 0.83 (low to moderate) and specificity of 0.43 – 0.80 (low to moderate)	10 – 20 min
Early Language Milestone Scale (ELM Scale-2) (Coplan, 2002)	0-36 months	Assesses speech and language development from birth to 36 months.	A standardised score is provided and an age equivalent is also provided.	Sensitivity of 0.83 – 1.00 (moderate to high) and specificity of 0.68 – 1.00 (low to high).	1-10 min
Early Motor Pattern Profile (EMPP) (Morgan & Aldag, 1996)	6-12 months	Physician administered standard examination of movement, tone and reflex development.	Simple 3 point scoring system, the individual is either normal, suspect or abnormal.	Sensitivity of 0.87 – 0.92 (moderate to high) and specificity of 0,98 (high).	5-10 min
Motor Quotient (MQ) (Capute & Shapiro, 1985)	8-18 months	Uses simple ratio quotients with gross motor milestones for detecting delayed motor development.	Makes use of developmental age levels and quotients to determine a pass/refer result.	Sensitivity of 0.87 (moderate) and specificity of 0.89 (moderate)	1-3 min

Screening measures may involve direct interaction with the child, parent report on a standardised instrument or a combination of the two (ASHA, 2008: 41). However, research has documented that the validity of the screening process increases with the combination of professional-administrated and parent-completed measures (Glascoe, 2005:173). It must be noted that parent-completed measures may have limited value in PHC settings due to low literacy skills amongst parents. In such instances, questions should be read to the parent and their answers filled in by the clinician or interpreter which could affect reliability.

Directly administrated tools take longer to administer and generally provide more in-depth information (Glascoe, 2005:175). As such, they should be considered as second-stage screens in PHC. As an initial screen for developmental delay and disorders, clinician administrated parental interview questionnaires are considered the best method in obtaining developmental information as these measures are a quick and accurate method of identifying infants and young children and should therefore be used in PHC settings (Pinto-Martin *et al.,* 2005:1929). However, no screening tool has been specifically designed for use in the South African context (Scheffer *et al.,* 2007:473). As a result, health care providers tend to use problematic measurement techniques during screening which include heavy reliance on clinical observation and informal checklists that lack validation and distinct cut-offs, or the use of screening tests with limited accuracy (Glascoe, 2005:175; van der Linde, 2008:133). Further, PHC personnel are uncertain of their ability to identify communication delays and disorders in infants due to invalid screening measures and limited knowledge which translates into training and resource needs (van der Linde, 2008:133).

It would be unwise to rely on inaccurate screening methods and tools to identify developmental delay and disorders within the broader population. Therefore professionals need to implement more affordable and widely used screening measures within developing countries such as South Africa (Popich *et al.,* 2007:79). Given the poor performance of informal methods such as

checklists and clinical observation, there is also a need for high quality screening instruments (Glascoe, 2005:174).

The development of a screening tool depends on the disorder(s) targeted by the tool as well as the population for which it is designed. Most developmental screening tools are developed in order to have a wide application with children of varying ages, allow flexibility to capture parent report with minimal assistance, ask less threatening and more universal questions of parents, and coordinate with hallmark developmental milestones (Wagner, Jenkins & Smith, 2006:410). Items included on screening tools are selected based on hallmark developmental milestones which are used to inform the reported range for a normal result (Spitalnic, 2004:28). The implication being, that, those outside the range of normal are considered to be abnormal (Spitalnic, 2004:28).

Practitioners who screen child development in clinical studies in developing countries often makes use of Western developmental tools (Gladstone *et al.,* 2008:23). Gladstone *et al* (2008:28) demonstrated that many items from Western tools can work well when adapted and translated for other settings as these items have already had their own rigorous reliability and validity studies carried out in the West and therefore are more likely to be robust in use. When screening tools are adapted for a specific context, items considered to be culturally appropriate are added and translated, whereas those considered to be inappropriate are removed (Gladstone *et al.,* 2008:24).

For developmental surveillance to be feasible in South Africa it is firstly necessary to develop screening tools that are sensitive and specific enough to detect children with developmental delay and disorders and secondly to have an effective, accessible treatment system in place for those who are identified (Norbury, Tomblin & Bishop, 2008: 4). Although early identification through developmental surveillance is an evidence-based practice (Rossetti, 2001:32) and has the potential to improve the developmental outcome of young children and the quality of life of their families, South Africa currently lags behind other developed countries in terms of established developmental

surveillance programs and accurate screening tools for its population which results in many infants not being identified for ECI.

The development of accurate and economical means of identifying communication disorders in children is a goal which all speech-language therapists should strive for (Popich *et al.,* 2007:65). The challenge for speech-language therapists is to present a communication developmental screening tool for use on the South African population which yields high sensitivity and specificity values which have been developed according to the characteristics of the South African population.

2.5 CONCLUSION

Early identification of communication delays is considered to be crucial. However, the correct methods as well as accurate tools need to be used. By designing, developing and testing a surveillance tool for the South African population, early identification of infants in rural areas requiring ECI will improve, therefore enhancing access to ECI services for all infants at risk for communication disorders and their families. Consequently, the preventative role of the speech-language therapist and/or audiologist may be established within PHC clinics. Furthermore, by determining the validity of a surveillance tool for communication development in a PHC context South Africa, would provide the initial step towards enhancing developmental surveillance efforts in South Africa.

2.6 SUMMARY

Chapter 2 presented the basic philosophy of the importance and implementation of early identification strategies. Methods available to identify infants with developmental delay and disorders from literature were discussed. These methods included using a high-risk register, screening and developmental surveillance. It was concluded that developmental surveillance is the optimal method for identifying developmental delay and disorders. Due to the rising numbers of UNHS programs which have been implemented in

South Africa, a comparison was drawn between screening for hearing loss and screening for developmental delay and disorders. The recent implementation of screening for ASD serves as a model for the early identification of other communication disorders and delays. Screening tools were discussed in terms of accuracy and availability. It was concluded that the need exists for a screening tool high in sensitivity and specificity values which has specifically been designed for the South African population due to the unique characteristics of the population. The latter forms the background to Chapter 3.

CHAPTER 3

METHODOLOGY

The chapter describes the research design and methodology implemented in executing the study. The procedures used to achieve the objectives of the study are presented in order to demonstrate the study's validity, reliability and compliance with ethical principles as well as to facilitate duplication of the study by other researchers.

3.1 INTRODUCTION

In South Africa early communication intervention (ECI) is not yet established in rural communities. Consequently, research needs in South Africa differ from those in developed countries such as the United States of America and the United Kingdom where early intervention services are mandated. In the past, first-generation research needs in developed countries focused on determining the significance of early intervention (EI) for infants at risk or presenting with developmental delay (Gerber, 1998:21; Guralnick, 2001:2). However, the main focus of second generation research in EI is on specificity, where issues relevant to practice are addressed as the importance of EI has been recognised (Gerber, 1998:22; Guralnick, 2001:2). Even though research needs in South Africa differ from those in developed countries, local research is also required to focus on second generation research concerns, such as the sensitivity and specificity of surveillance tools within early identification programs for the South African infant population.

In virtually every subject area, knowledge is incomplete and problems are waiting to be solved (Mouton & Marais, 1990: 20). Based on research from developed countries, the preceding literature review provided guidelines for the development of surveillance tools and developmental surveillance programs for the South African infant population. The dearth of contextually relevant research regarding the design, use and validity of developmental surveillance tools was revealed in the literature review. Since the primary goal of research is to improve understanding of phenomenon (Leedy & Ormrod,

2004:5) information produced from the current research process should contribute to the improvement and maintenance of the developmental surveillance program in the primary health care (PHC) context selected for the study. The information gathered through the research process may also support the role of speech-language therapists and/or audiologists within the Lydenburg Hospital PHC context so that a special focus on ECI may be achieved.

Consistent efforts by speech-language therapists and/or audiologists to become involved in developmental surveillance programs may facilitate the early identification of those infants presenting with communication delay and/or disorders. Effective and efficient developmental surveillance programs in South Africa will be possible once valid screening tools have been developed for the South African population which is addressed in the current study. The use of appropriate research methodology is critical to the research process as the quality of research findings is directly dependent on the accountability of the research methodology followed (Mouton & Marais, 1990:32). This chapter presents the selected research design as the general plan for addressing the research question of the study. The methodological approach to acquiring, recording and analysing the empirical data in order to answer the objectives of the study is presented.

3.2 OBJECTIVES

The following main aim and objectives were formulated for the study.

3.2.1 Main aim

The main aim of the study was to develop and test the validity of the Surveillance Tool for Communication Development of infants aged 0-6 months, in a primary health care hospital in Mpumalanga and determine prevalent risk factors as well as information topics for caregivers as part of a prevention strategy within the context.

3.2.2 Objectives

In order to achieve the main aim, the following objectives were formulated:

- To determine whether there was an association between the risk factors and communication development as determined by the STCD.

- To determine the validity of the Surveillance Tool for Communication Development in identifying infants aged 0-6 months presenting with a developmental delay by:

  - Determining the sensitivity and specificity of the tool to identify infants with developmental delay and those without by comparing the results of participants when screened with the Surveillance Tool for Communication Development with their results on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) at the first and second screen.

  - Describing the infant's performance on the Rossetti Infant–Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development.

- To identify information topics regarding communication development of infants which need to be targeted during the developmental surveillance process for caregiver education.

Figure 3.1 illustrates the process of determining the validity of the Surveillance Tool for Communication Development as stated in the objectives.

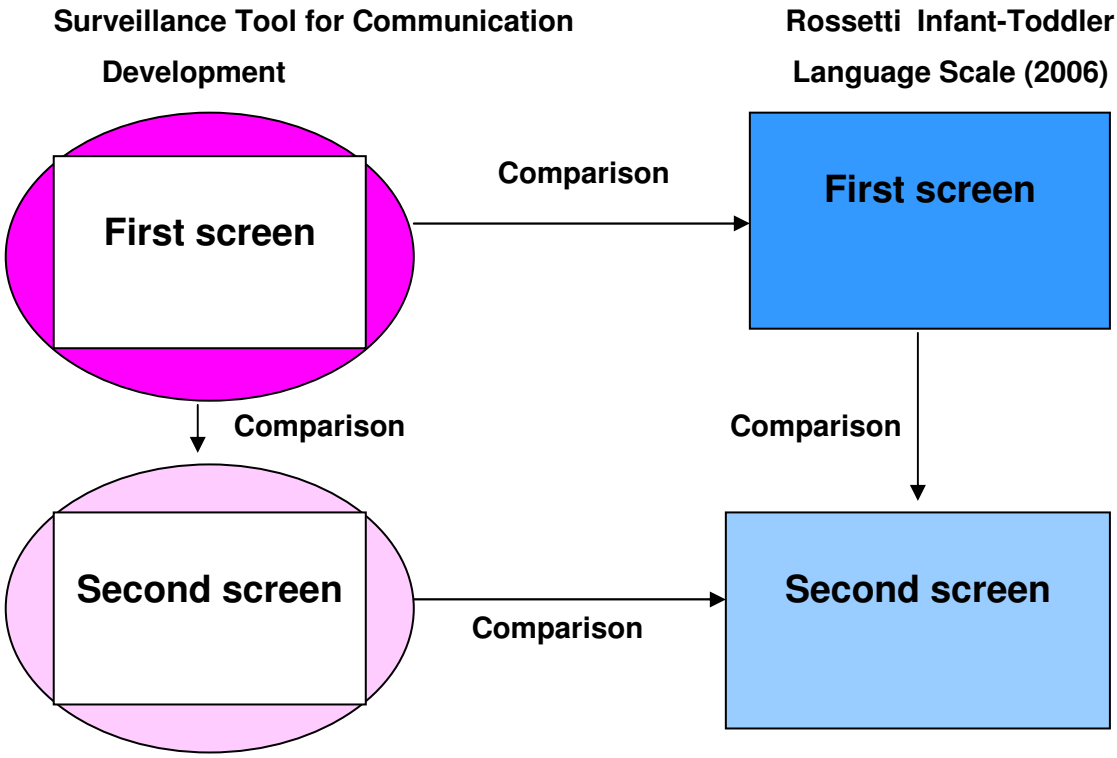

FIGURE 3.1: The validation process of the Surveillance Tool for Communication Development

3.3 HYPOTHESES

The following hypotheses were formulated.

The validity of a screening test is defined by its sensitivity and specificity values (Glascoe, 2005:173). The Rossetti Infant-Toddler Language Scale (Rossetti, 2006) is considered a valid assessment instrument that can correctly describe infants and toddlers with delayed communication development and those with typical communication development (Nott, 2003:406; Bam, Kritzinger & Louw, 2003:37). The Surveillance Tool for Communication Development will be valid if the same group of infants who were identified with delayed communication development (high sensitivity) also demonstrate delayed communication development on the surveillance tool as well as identifying the same infants with typical development (high specificity).

Secondly, it is hypothesised that the Surveillance Tool for Communication Development will have high sensitivity and specificity scores, therefore

providing an accurate measure for identifying delayed and typical communication development in infants aged 0-6 months in the selected PHC facility in Lydenburg. Alternatively, the null hypothesis is that the Surveillance Tool for Communication Development will have low sensitivity and specificity values which will not result in an accurate tool for the identification of typical and delayed communication development in infants aged 0-6 months in the selected PHC facility in Lydenburg.

3.4 RESEARCH DESIGN

A *longitudinal developmental* design which made use of a *descriptive comparative survey* was selected for this study based on the objectives of the study. The type of design used falls within the *quantitative research and qualitative* paradigm.

In this study, the communication development of infants 0-6 months was described through the use of the self-compiled Surveillance Tool for Communication Development and the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). A self-compiled tool was used due to the absence of valid screening tools developed for the South African population as identified in the literature review. The Rossetti Infant-Toddler Language Scale (Rossetti, 2006) was used as the assessment measure against which the results of the Surveillance Tool for Communication Development were compared to, to determine the criterion validity, namely, the sensitivity and specificity of the tool (Stott *et al.,* 2002:136). *Descriptive comparative research* involves the identification of characteristics of observed phenomena and the exploration of the correlation of two or more phenomena and was achieved through comparing results obtained from the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development (Leedy & Ormrod, 2004:182). *Descriptive comparative research* was also used to determine the prevalent trends in the data collected which informed the topics for caregiver education.

Survey research was conducted in this study by collecting case history information regarding developmental milestones and medical histories of

infants by asking the infants' caregivers questions and recording their answers (Leedy & Ormrod, 2004: 183). Through the use of an interpreter, the information gathered by the survey research was enhanced.

In this *longitudinal developmental study,* a single group of infants were followed over the course of six months, and data related to communication developmental milestones were collected twice, namely at 0 to 3 and 3 to 6 months of age.

In this quantitative research, a measuring instrument specifically developed for use within the study, namely the Surveillance Tool for Communication Development, was applied and then compared to a reference standard namely the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). In order to determine the sensitivity to identify infants with delayed development and specificity to identify those with typical development of the Surveillance Tool for Communication Development through average scores (Spitalnic, 2004:27). In doing so, the characteristics and trends of the data collected could be precise and objective (Maxwell & Satake, 2006: 7). The Rossetti Infant-Toddler Language Scale (Rossetti, 2006) was considered to be the golden standard measurement as the assessment tool has been compiled by an expert in the field of ECI and has wide-spread use on the South African population (Bam, Kritzinger & Louw, 2003:37).

Comparison of the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and Surveillance Tool for Communication Development for each infant at 0-3 months and at 3-6 months was used to determine the sensitivity and specificity of the Surveillance Tool for Communication Development within a primary health care context in South Africa (Diamantoupulous & Schlegelmilch, 2000:176).

3.5 RESEARCH CONTEXT

Lydenburg Hospital was selected as the research context for collecting the data for the current study. Lydenburg Hospital falls within the Thaba Chewu Municipality in Mpumalanga Province, South Africa. Mpumalanga consists of

close to 3 million people who constitute 6.3% of the SA population (Department of Health, 2005:152). More than half of the people living in Mpumalanga reside in rural areas and 86.7% of the households in Mpumalanga province have access to water (Department of Health, 2005:152). According to the 2001 South African Census, the population of Lydenburg consists of 81,236 people. Of these, 86% are African, 11.7% are White, 2% are Coloured and 0.4% are Asian (Statistics South Africa, 2001:5).

PHC expenditure within Mpumalanga has increased dramatically over the past four years by more than 200% and the PHC utilisation rate of two visits per person has been constant since 2003. The expansion of PHC services within Mpumalanga province over the past four years emphasises the need for different programs, for example ECI, to be integrated within the PHC package. The nurse clinic workload is currently 46.7 patients per day which is 50% higher than the South African average, resulting in nurses in Mpumalanga province being overworked (Department of Health, 2005:152). A previous study conducted by Moodley (1999:124) recommended that nurses perform screening within early identification programs, but due to the high nursing workload experience in Mpumalanga, nursing staff do not have the time to screen infants for communication developmental delay and disorders. There is therefore a need for other professionals to expand their scope of practice to become involved in the early identification of infants in Mpumalanga.

Lydenburg Hospital was established in 1947 and serves the communities of Lydenburg, Mashishing and Kellysville. Clinics served by the hospital include Mashishing Clinic, Cormandel Clinic and Brondal Clinic. A PHC clinic is situated on the same grounds as the hospital from which the study was conducted. Figure 3.2 illustrates a map of Lydenburg and the surrounding areas served by the hospital in order to orientate the reader to the research context.

FIGURE 3.2: Map of Lydenburg and surrounding areas

Since the hospital's establishment in 1947, it has expanded to a 100 bed hospital consisting of four wards namely, medical, surgical, maternity and paediatric wards. The following services are offered at the district hospital: inpatient services, outpatient services, casualty, pharmacy, radiography, dentistry, voluntary testing and counselling for HIV/AIDS, occupational therapy, physiotherapy, speech therapy and audiology, eye care clinic, occupational health and safety, infection control, environmental health and a primary health care clinic located on the hospital's premises. Patients requiring specialised services are referred to the nearest tertiary referral hospital, either to Rob Ferreria Hospital in Nelspruit or Witbank Hospital in Witbank, as these hospitals access such services. A profile of the most prevalent diseases encountered at Lydenburg Hospital is provided in Figure 3.3 below.

TOP 10 DISEASES ENCOUNTERED AT LYDENBURG HOSPITAL

1. HIV/AIDS
2. Tuberculosis
3. Chronic Diarrhoea
4. High Blood Pressure and Cerebral Vascular Incident
5. Heart Conditions
6. Diabetes
7. Meningitis
8. Hepatitis
9. Chronic Renal Failure

FIGURE 3.3: Top 10 diseases encountered at Lydenburg Hospital (Provided by Lydenburg Hospital, 2009)

It should be noted that Figure 3.3 provides conditions mostly encountered in adults. More information is required of diseases and conditions for the infant population. A description of the most prevalent risk factors in infants born at Lydenburg Hospital follows.

In the period of April 2008 to March 2009, Lydenburg Hospital had a neonatal mortality rate of 11.3%, mostly due to stillbirth (Department of Information, Lydenburg Hospital, 2009). This rate is lower than the neonatal mortality rate for South Africa of 21% (Pattinson, 2003-2005:19). South Africa ranks poorly in the world when the neonatal mortality rate is compared with other middle-income countries (Pattinson, 2003-2005:19). Due to advances in technology, an increased number of infants survive and the same risk factors which contribute to neonatal mortality also contribute to surviving infants increased risk for developmental delay (Rossetti, 2001:3). The relatively high neonatal mortality for a developing context is an indication of the risk status for the surviving infants' developmental trajectory. In South Africa, almost 90% of child deaths occur under the age of five years, with 55.9% of these deaths occurring in the first year of life (Pattinson, 2003-2005:93).

During the period indicated above, the hospital experienced an incidence of 11.2% low birth weight infants. The hospital's incidence is lower than the rural reported incidence of 13.3% in South Africa (Pattinson, 2003-2005:3). Low birth weight is however associated with communication developmental delay and disorders and such infants should receive early intervention to prevent later developmental delay and disorders (Rossetti, 2001:15).

Further, the hospital also had 36 multiple birth deliveries (Department of Information, Lydenburg Hospital, 2009). Multiple births are considered to be a risk for communication development as the risk of these infants being born prematurely and with low birth weight is elevated (Rossetti, 2001:15).

The provision of antenatal care during pregnancy can prevent low birth weight, still birth and prematurity (Pattinson, 2003-2005:26). It is possible that only 14.53% of the mothers who delivered their infants at Lydenburg Hospital did not receive antenatal care prior to delivery. This percentage is lower than the non-attendance of antenatal care average in Mpumalanga of 25-34% (Pattinson, 2005:135). The high antenatal care attendance percentage obtained at Lydenburg Hospital indicates that education and awareness campaigns are positively impacted the attendance of antenatal care visits.

The South African government published the *White Paper for the Transformation of the Health System in South Africa* (Department of Health, 1997), which sets out the implementation of PHC in the South African health system to meet the basic needs of all people and has become the main approach in reconstructing the health system in South Africa. Lydenburg hospital has the Gate Clinic, a PHC clinic, located on the same grounds as the hospital. Table 3.1 indicates the services offered by the clinic in accordance with the PHC package.

TABLE 3.1: Components of the PHC package offered at the Gate Clinic (Department of Health, 2000;2001; van der Linde, 2008:33)

PHC Programs	***Description***	***Offered at PHC clinic***
1. Non-personal health services	• Promotion of occupational health	**No**
	• Promotion of health and disease prevention	**Yes**
	• Dissemination of information on environmental health	**Yes**
2. Disease prevention and control	• Prevention of chronic diseases	**Yes**
	• Promotion of well-being in geriatric patients	**Yes**
	• Rehabilitation of disabilities	**No**
	• Promotion of oral health and prevention of oral diseases	**Yes**
	• Prevention of communicable diseases (including notifiable medical conditions)	**Yes**
3. Maternal, child and women's health	• Provision of ante-natal and post-natal care	**Yes**
	• Provision of contraceptive methods	**Yes**
	• Screening for cervical cancer	**Yes**
	• Termination of pregnancy	**No**
	• Provision of genetic services	**No**
	• Management of childhood illnesses and immunization	**Yes**
	• Intervention in protein energy malnutrition	**Yes**
	• Sustaining the primary school nutritional program	**No**
4. HIV/AIDS/ sexually transmitted infections (STI) and tuberculosis (TB)	• Support and home based care for HIV/AIDS patients	**Yes**
	• Voluntary confidential counselling and testing for HIV/AIDS	**Yes**
	• Prevention of mother-to-child HIV transmission	**Yes**
	• Prevention and management of sexually transmitted diseases	**Yes**
	• Diagnosis and treatment of tuberculosis	**Yes**
5. Health monitoring and evaluation	• Obtaining health information from health care facilities	**No**
	• Surveillance of the public health system	**No**
	• Coordination of research on health related topics and current issues influencing health care in South Africa	**Yes**
6. Mental health and substance abuse	• Prevention and treatment of mental disability	**Yes**
	• Prevention of substance abuse	**Yes**
7. Gender issues	• Referral and counselling of victims of violence and sexual abuse	**Yes**

One of the PHC programs utilised by families during the first year of an infant's life at the Gate Clinic is immunisations. An immunisation visit may be one of the best opportunities to provide ECI services to the family and infants. The Early Intervention Screening Clinic at Lydenburg Hospital was coordinated with immunisation days as families already accessed the Gate Clinic which provided ample opportunity for the early detection of communication delays and disorders in infants (van der Linde, 2008:34). Lequercia (1997:285-300) described a one-stop approach where developmental, behavioural and educational services are provided together in clusters congruent with the infrastructure and the model of care functioning at district level. The successful application of the one-stop model facilitates an integrated approach which proves to be cost and time effective (Lequercia, 1997:287) Caregivers could have their infant's immunisations and then come to the Early Intervention Clinic for developmental surveillance. This allowed for caregivers to access a variety of services at one place on the same day.

The Early Intervention Screening Clinic was initiated by the Rehabilitation Department at Lydenburg Hospital in 2005 by a community-service occupational therapist due to the increased prevalence of developmental delay within PHC settings as well as the late identification of infants and children presenting with developmental delay in South Africa (Pickering *et al.,* 1998:6). The clinic further aims to monitor the development of at-risk infant development over the period of the first year of their lives and provide caregivers with guidance regarding developmental milestones and ways in which they can promote health and development. It is at this clinic that a valid surveillance tool for infant communication development is required. Previously, only a general development tool which had been developed by an occupational therapist was available in the clinic. The tool included limited information on communication development and had not been validated.

Before 2008, speech-language therapists and/or audiologists were not involved in the clinic. The researcher identified such a need to be involved in the clinic and joined the occupational therapists on the clinic days. From January 2009, the researcher was appointed as the manager of the Early Intervention Screening Clinic. In 2009, dieticians joined the clinic team when available to assist during developmental surveillance. A transdisciplinary

model of team work exists within the clinic. The clinic takes place once every two weeks. Mothers of newborn infants without established risk criteria are booked daily to attend the clinic. Referrals from the Gate Clinic as well as the Paediatric ward to the clinic also take place. In 2008 the average number of infants and mothers seen at the clinic was eight to ten per month. This average in clinic attendance increased to 17.09 infants per month in 2009 as shown in Figure 3.4. This increase in attendance of the clinic can be attributed to a concerted effort from the Rehabilitation team to educate maternity nursing staff, clinic staff and mothers of the importance of the clinic as well as incorporating more professionals in the clinic.

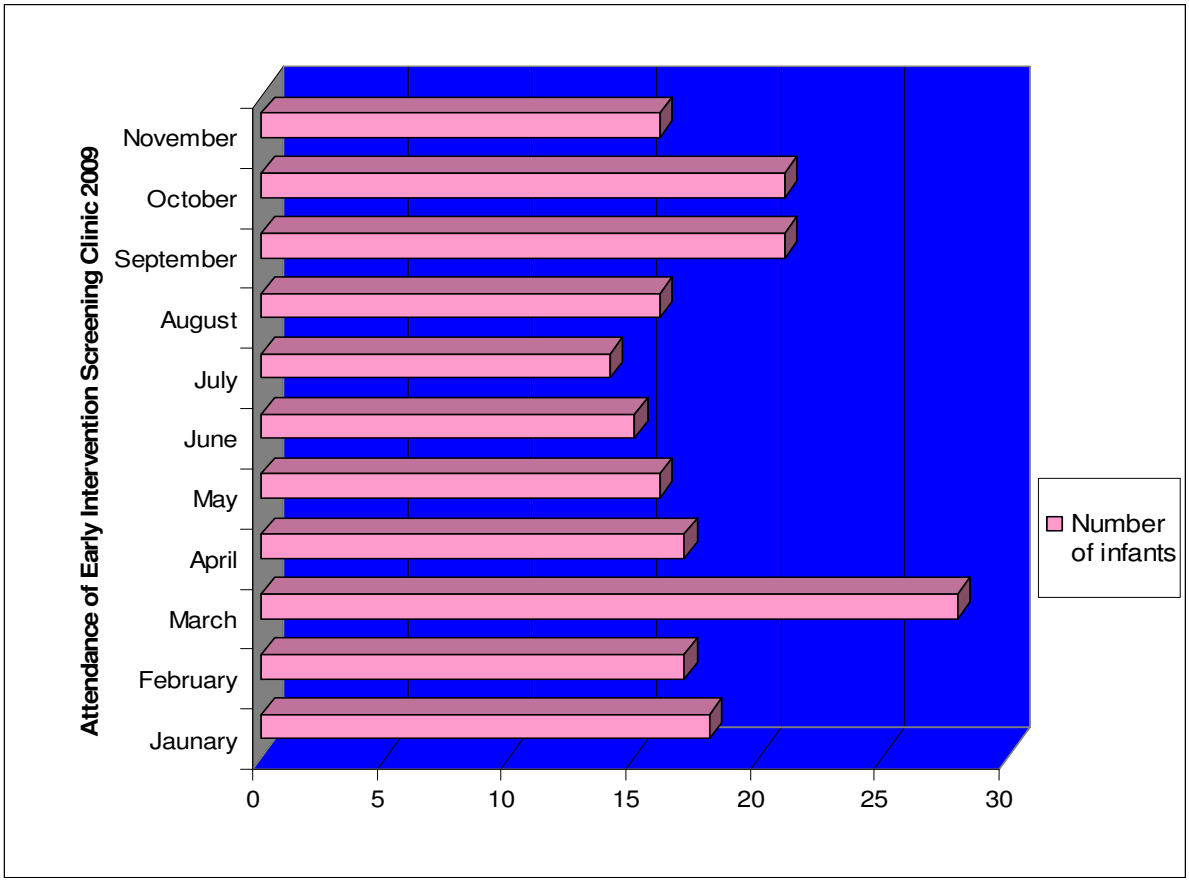

FIGURE 3.4: Early Intervention Screening Clinic attendance in 2009

3.6. ETHICAL CONSIDERATIONS

Researchers need to act professionally and in accordance with research ethics principles as stated by ASHA (2008:1) and SASLHA (2004:2). Unique ethical problems become apparent that are not relevant in clinical laboratory settings of the natural sciences when human beings are the objects of study in social sciences (Leedy & Ormrod, 2004:23). Infants and their caregivers were utilised as participants in the study, necessitating that caregivers be

well-informed about the general agreements of what is proper and improper in scientific research in order to give informed consent for their infants' participation in the study (Babbie, 2001:470). The following ethical principles were applied throughout the study: *autonomy, beneficence and non-maleficence* (Leedy & Ormrod, 2004:27).

Autonomy or respect for other persons:

Autonomy was ensured in the following manner:

- **Confidentiality**

Privacy and confidentiality was respected and maintained for all participants throughout the study. Participants' rights were respected by ensuring that research results were not presented in a manner that would have allowed others to become aware of how respondents behaved and no personal information was made public in the final research report (Leedy & Ormrod, 2004:89). Research findings were reported in an honest fashion without misleading or misrepresenting others (Babbie, 2001:23).

- **Informed consent**

As the infants were too young to provide assent, informed consent was obtained from subjects' caregivers by providing the caregivers with a letter describing the nature of the research project as well as the nature of their participation in it (Oliver, 2003:53). Participants were given a choice of either participating or not and were informed about their right to withdraw from the study at any time (Cohen, Manion & Morrison, 2002:56; Leedy & Ormrod, 2004:107). A letter of informed consent, Appendix B, was compiled and was used as a guideline to convey information to participants verbally by the researcher, second fieldworker or interpreter, before being given to them to sign or mark. Furthermore, an occupational therapist who acted as an interpreter, explained the contents of the information letter to possible participants who were unable to understand English or Afrikaans or those with low literacy skills. The languages used by the interpreter included Seswati, Sepedi and Zulu.

- **Permission to conduct research**

Ethical clearance was obtained from the Research Proposal and Ethics Committee, Faculty of Humanities, University of Pretoria, and from the Mpumalanga Department of Health, Research Committee prior to data collection. Permission to conduct the research project as well as to use the hospital's name in the research report was obtained from the Chief Executive Officer (CEO) of Lydenburg Hospital, as well as the Rehabilitation Services Coordinator at Lydenburg Hospital. These letters are included in Appendices C, D, E and F.

Beneficence and non-maleficence:

The principle of beneficence and non-maleficence were applied as follows:

- **Avoidance of harm to participants**

Participants were not subjected to any risks or harm during the study as the collection procedures of this study were non-invasive. Reducing the risks associated with this study was achieved through the use of an appropriate research design and theoretical underpinnings of the research.

- **Provision of services for those infants identified as possibly having a communication developmental delay or disorder**

Infants identified during developmental surveillance with a possible communication developmental delay, were first discussed with their accompanying caregivers and were then followed up and provided with appropriate assessment and intervention services at the hospital.

3.7 PARTICIPANTS

Participants in the study included the infants (age 0-6 months) and caregivers accompanying the infants who had chosen to attend an Early Intervention Screening Clinic, the researcher, a second fieldworker and an interpreter.

3.7.1 Recruitment of participants

A *purposive* sampling strategy was used to select the participants (Leedy & Ormrod, 2001:206). This sampling method was deemed suitable for this study as all infants together with their caregivers who attended the Early

Intervention Clinic between November 2008 and May 2009 were recruited as participants for the study for the purpose of developmental surveillance. According to routine hospital procedures, all infants born at the hospital, without established risk criteria were booked for the Early Intervention Screening Clinic, therefore no infants without established risk criteria were excluded. Booking of infants in the maternity ward by the researcher formed the referral system for the Early Intervention Screening Clinic. Inclusion of all infants in a surveillance program is a fundamental principle of developmental surveillance (Glascoe, 2005:175). Infants born with established risk criteria are immediately referred for a comprehensive multi-disciplinary assessment, followed by intervention. The participants were selected according to certain selection criteria.

3.7.2 Selection criteria

The selection criteria formulated for the participants, fieldworker and interpreter are discussed below.

3.7.2.1. Infants and their accompanying caregivers

The following selection criteria were applied to the infants and their accompanying caregivers:

- ***Infants***

➢ *Age*

Infants were required to be between the ages of 0-6 months as the surveillance tool is only specified for infants aged 0-6 months. The Surveillance Tool for Communication Development was designed for infants in this age range to facilitate early identification before infant's first birthday. According to Rossetti (2001:166) identification of infants with developmental delay needs to take place in the first year of life in order to minimise and prevent the later effects thereof. Further, during this time, the first signs of otitis media which can negatively affect listening skills and communication development, as well as developmental disorders, such as ASD may be present (Webb & Jones, 2009). The first few months are also the time where poor mother-infant attachment which may lead to reduced communication interaction resulting in delayed communication development, can be identified. Infants between the ages of 6 to 12 months were excluded due to the time limitation in collecting the data needed for the study.

- *Registered patients attending the Early Intervention Screening Clinic*

Infants were required to be hospital patients attending the Early Intervention Screening Clinic at Lydenburg Hospital in Mpumalanga as this context is used for developmental screening activities. Infants are screened for developmental delay at the Early Intervention Screening Clinic at 1, 3, 6, 9 and 12 months in accordance with primary health care principles which aim to prevent later developmental delay by early detection through screening activities (Department of Health, 2001:26).

- *Exclusion criteria*

Infants older than six months chronological age were excluded from the study as the Surveillance Tool for Communication Development was designed to screen infants for communication delay up to six months of age. Infants with established risk criteria and identified at birth, such as Down Syndrome, were excluded from the study as such infants would be provided with intervention services following a multi-disciplinary assessment in accordance with hospital policy.

- ***Accompanying Caregivers***

- *Biological mother/alternative caregiver*

The infants were required to be accompanied by a responsible caregiver who was knowledgeable about the infant's development and routine as the Surveillance Tool for Communication Development consists of questions which caregivers are required to answer regarding the infants in their care. Guralnick (2001:7) states that primary caregivers possess unique information regarding their child which therapists are unable access in a short screening session. Therefore South African caregivers can give an indication to areas in which further investigation by therapists is needed even though, in South Africa, caregivers may not necessarily be the mothers of the infants as culturally, infants are often taken care of by their grandmothers (van der Linde, 2008:134). In the study by van der Linde (2008:134) nurses reported that parents consult PHC personnel on their child's health issues, therefore the focus is on the symptoms of the illness and not on the child's developmental milestones. It was therefore important that the immunisation visit and developmental surveillance were at two different sites at the hospital,

occurring on the same day so that parents could separate illness and developmental issues.

- *Exclusion criteria*

Caregivers accompanying infants who did not possess knowledge on the infant's developmental history and routine or who were unable to understand the questions posed by the interpreter and therapist due to language barriers were excluded from the study as these caregivers were unable to communicate accurate information on the infants' developmental milestones.

3.7.2.2 Fieldworkers

The fieldworkers used to collect the data for the study consisted of the researcher and a second fieldworker. A second fieldworker was utilised to collect the data for one in every four infants to reduce researcher bias. The following selection criterion was formulated for the second fieldworker:

- *Qualification*

The second fieldworker and the researcher were required to have a tertiary qualification in speech-language therapy as the administration of the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) requires undergraduate training in early identification as well as experience in the use of the assessment tool. As the Surveillance Tool for Communication Development only included hearing screening, it was not required that the fieldworkers be qualified in both speech-language therapy and audiology as screening for hearing loss falls within the scope of practice of a speech-language therapist.

3.7.2.3 Interpreter

The interpreter had to comply with the following criteria:

- *Language proficiency*

The interpreter was required to be proficient in at least three African languages, including, Sepedi, Zulu and Seswati as these are the main languages spoken in the Lydenburg area. Further, the interpreter needed to be able to converse fluently in English and/or Afrikaans as these are the languages spoken by the therapists. The interpreter was required to have strong oral skills in these languages (Langdon & Quintanar-Sarellana, 2003:238).

➢ *Involvement in the Early Intervention Screening Clinic*

The interpreter was required to be actively involved in the Early Intervention Screening Clinic so that she was familiar with the procedures conducted at the clinic.

3.7.3 Sample size

3.7.3.1 Infants and their caregivers

The infants and their caregivers were recruited for the study as they attended the Early Intervention Screening Clinic during November, 2008 and May, 2009. Figure 3.5 is used to illustrate the number of infants participating in the study at different screening intervals as well as the number of infants who failed the screening and infants who did not return for follow-up screenings.

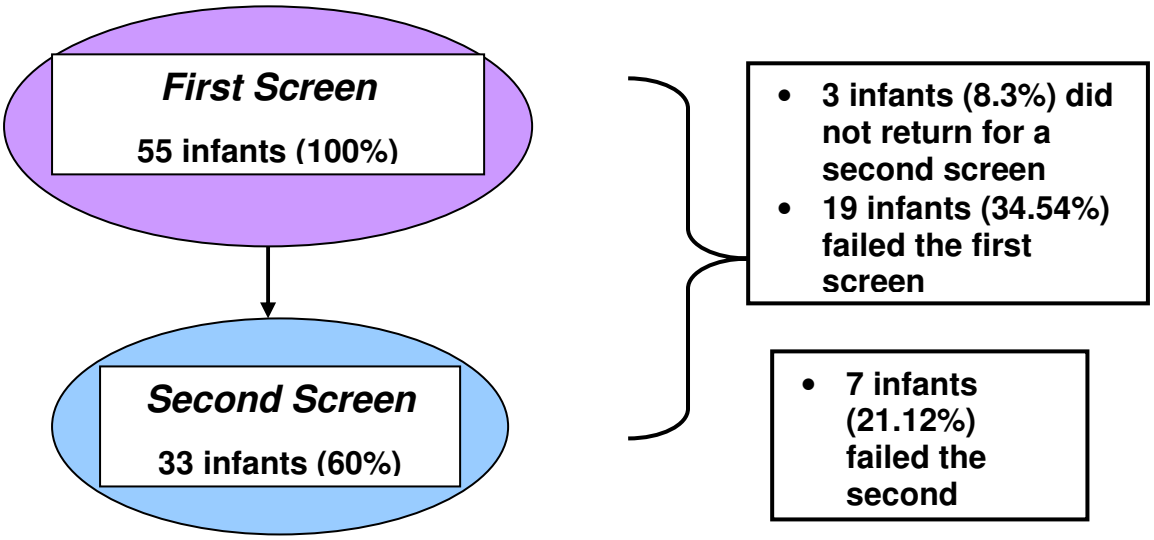

FIGURE 3.5: Number of infants participating in the study at different screening intervals

Fifty-Five infants were recruited for the first screening interval. Only three infants did not return for a second screen, producing a return rate of 91.7%. The return rate achieved in the study is high for the PHC context as it has been well documented that low return rates are common for the PHC context due to various reasons (Popich *et al.,* 2007:64). Thus it is summarised that the high return rate indicates that caregivers of all cultures have the desire for their infants to develop optimally and if their infant is not developing optimally, then to be identified early. Gravel *et al.* (2000:132) specify the return rate to be one of the primary indicators of both the efficiency and effectiveness of screening programs. The high return rate in this study therefore indicates that the current program is highly effective to attract caregivers for developmental

monitoring. The caregivers only need to travel a distance of 5.4km from Mashishing to the hospital and 5.1 km from Kellisville to the hospital. It should be noted that the relatively minimal distances travelled may have been a factor contributing to the high return rate as one of the main factors for parents not complying with health care services is the long distances which need to be travelled (Swanepoel, 2004:221). However, this was not formally addressed in the study.

3.7.4 Description of the sample

3.7.4.1 Infants and their caregivers

An abbreviated description of the characteristics of the sample surveyed is presented in Table 3.2.

TABLE 3.2: Description of infants and their caregivers (n = 55)

CATEGORY	CHARACTERISTIC		NUMBER AND PERCENTAGE OF PARTICIPANTS	
1. Gender	• Male • Female		30 (54.5%) 25 (45.5%)	
2. Home Language	• Sepedi • Zulu • Swazi • Northern Sotho • Afrikaans • English • Ndebele		22 (38.1%) 12 (21.1%) 9 (16.3%) 6 (10.9%) 4 (7.2%) 1 (1.8%) 1 (1.8%)	
3. Race	• African • White		51 (92.7%) 4 (7.3%)	
4. Average birth weight	• 3.013kg			
5. Age of infants	• <u>Age at first screen:</u> • 6 weeks • 2 months • 3 months • <u>Age at second screen:</u> • 4 months • 5 months		 41 (75%) 10 (18%) 4 (7%) 18 (55%) 15 (45%)	
6. Birth order	• First • Second • Third • Fourth • Fifth		24 (43.6%) 11 (20%) 15 (27.3%) 1 (1.8%) 2 (3.7%)	
7. Caregivers accompanying infants attending EI clinic	• Mother • Mother & father • Grandmother • Mother & aunt • Mother & grandmother	*1st screen* 48 (85.5%) 3 (5%) 0 1 (2%) 3 (5%)	*2nd screen* 28 (84.8%) 1 (3%) 1 (3%) 2 (6%) 1 (3%)	*3rd screen* 4 (66%) 1 (16%) 0 0 1 (16%)

Infants were mostly accompanied by their mothers for both the first screen (85.5%) and the second screen (84.8%) attendance of the Early Intervention Clinic. This can be explained by the fact that fathers generally work and are therefore unable to attend clinic visits. South African has also seen an increase in female-headed households with 42% of South African children younger than seven years old reported in 1995 to be living with their mothers (Nyman, 1999:4). A contributing factor to an increase in female-headed households is due to a high number of children being born out of formal partnerships (Children in 2001, 2001:55). Further, a number of South African men establish dual households. Typically a man from a rural area will establish a second town household (Children in 2001, 2001:55).

It is surprising that only one grandmother was the accompanying primary caregiver during the study as a reported 25% of grandparents tend to become the primary caregivers of South African children (Children in 2001, 2001:55). This is often due to the mother and/or father working far away from home and due to death, which is increasingly becoming the case with the spreading of HIV/AIDS (Children in 2001, 2001:55). As indicated previously in Figure 3.3, HIV/AIDS is the main cause for adult death at Lydenburg Hospital which results in HIV/AIDS orphans which are often sent to live with their grandmothers. Mpumalanga province has the second highest prevalence of HIV/AIDS in South Africa which has slowly risen from 14.1% in 2002 to 15.8% in 2008 (South Africa HIV/AIDS statistics website, www.avert.org, February 2010). Due to the rising prevalence of HIV/AIDS in Mpumalanga, it would be expected that more grandmothers would be caring for the infants due to parental death.

The characteristics of the sample have important implications for ECI programs since effective ECI is reliant upon parent/caregiver training and involvement. The empowerment of families to actively participate in decision-making and become central figures in intervention has become one of the basic tenants of ECI service delivery (ASHA, 2008:23). ECI programs within this context need to target mothers as the active participants in local ECI programs.

3.7.4.2 Fieldworkers

Both the researcher and the second fieldworker were competent in English and Afrikaans and are both qualified speech-language therapists. At the time of the study, the second fieldworker was completing her community service year as speech-language therapist at Lydenburg Hospital and the researcher was employed as a junior speech-language therapist and audiologist at the same hospital.

3.7.4.3 Interpreter

The interpreter was fluent in Zulu, Sepedi, Ndebele, Seswati, Tswana and English. The interpreter was trained by using briefing, interaction and debriefing as recommended by Langdon and Quintanar-Sarellana (2003:237). Further, as the interpreter was an occupational therapist at the hospital, she had knowledge of the policies and procedures followed at the Early Intervention Screening Clinic.

3.8 MATERIAL AND APPARATUS USED FOR DATA COLLECTION

The compiled Surveillance Tool for Communication Development, the Rossetti Infant-Toddler Language Scale (Rossetti, 2006), an otoscope, a middle-ear analyser, a blanket to create a play area and age-appropriate toys were used for data collection.

3.8.1 Surveillance Tool for Communication Development

Due to the limited availability of surveillance tools for infants from 0-6 months of age in South Africa, the Surveillance Tool for Communication Development was compiled and based on the Infant-Toddler Checklist (Wetherby & Prizant, 1998). The Infant-Toddler Checklist (Wetherby & Prizant, 1998) is a brief checklist designed to be completed by the parents of infants and young children in order to determine whether referral for a communication assessment is needed. The Infant-Toddler Checklist (Wetherby & Prizant, 1998) provided the outline for an effective surveillance tool, however items and wording of the items needed to be modified for use within the South African context and within the Early Intervention Screening Clinic as determined by the pilot study (section 3.9). Items were also added to the tool, for example, items relating to hearing behaviour and feeding. The Surveillance Tool for Communication Development was designed to identify

prevalent risk factors and give the indication of communication developmental delay in a specific context in South Africa.

The Surveillance Tool for Communication Development consists of a combination of a questionnaire and professional-administrated items as such methods have proven to be the best in screening for development (Glascoe, 2005:174). The tool focuses on the following twelve areas: Pregnancy and birth history, medical history, risk factors, mother-child interaction, emotion and use of eye gaze, use of communication, use of gestures, use of sounds, understanding, use of objects, feeding and hearing. Pregnancy and birth history, medical history, risk factors, mother-child interaction, feeding and hearing were the areas added to the original tool. The parental questionnaire was compiled and was used as a method of data collection as parental questionnaires are able to provide a quick and simple way of determining developmental milestones in young infants (Scheffer *et al.,* 2007:473).

Screening is required to be simple and quick (Glascoe, 2005:174). Simplicity and time efficiency of the tool was enhanced by using mostly close-ended questions. Close ended questions, with the possibility of five graded options (never to often) as well as yes/no questions were included because close ended responses are suitable for data entry into a database and statistical computer processing (Strydom, 2002:43). In contrast to close ended questions, open ended questions may result in too many response options, increasing the length of time taken to complete the questionnaire (Strydom, 2002:43). For this reason, open-ended questions were limited and were only included where further explanations or additional comments were required. A description of the items included in the Surveillance Tool for Communication Development as well as the rationale behind including these questions is provided in Table 3.3.

TABLE 3.3: Description of questions included in the Surveillance Tool for Communication Development, 0-6 months

Question	*Rationale*	*Targeted Disorder*
Information relating to pregnancy, birth, medical history and risk factors	Risk factors relating to the infant and mother in terms of pregnancy, birth, illness and at-risk categories were collected as any of these factors could interfere with the child's ability to interact with the environment in a normal manner could potentially cause or be a	At-risk status of infants leading to delayed development

	contributing factor to developmental delay (Rossetti, 2001:5).	
1.1 Is there anything which worries you about the baby?	It has been proven that parental and primary caregiver concerns about language, fine motor, cognitive, and emotional-behavioural development are highly predictive of true problems (Committee of Children with Disabilities, 2001:193) and can therefore indicate to the clinician developmental areas which require further investigation (Kritzinger, 2007).	Hearing loss, language disorders, autism spectrum disorder (ASD), cognitive impairments
1.2 What can the baby do?	The intimate contact between a caregiver and the infant influences the caregiver's later behaviour to that infant and subsequently the development of that infant (Rossetti, 2001:50).	Poor care-giver child attachment
1.3 Do you know when the baby is happy? *1.4 Do you know when the baby is sad/upset?*	These questions were sourced from the interview schedule (Kritzinger, 2007) used in a Kangaroo Mother Care unit by speech-language therapists in South Africa. Mothers and other caregivers should understand infant's behaviour and stress signs. A parent's or caregiver's difficulty in understanding an infant suggests poor mother-infant attachment or poor communication development (Rosetti, 2001:128).	Hearing loss, speech disorders (e.g., cerebral palsy), language disorders
2.1 Can the baby see? *2.2 If not, why and/or when?*	These questions were sourced from the interview schedule (Kritzinger, 2007) used in a Kangaroo Mother Care unit by speech-language therapists in South Africa. Parental or caregiver concern about an infant's sight can be indicative of blindness.	Blindness or visual impairment
2.3 Can the baby hear? *2.4 If not, why and/or when?*	These questions were sourced from the interview schedule (Kritzinger, 2007) used in a Kangaroo Mother Care unit by speech-language therapists in South Africa. Parental or caregiver concern about an infant's hearing can be indicative of hearing loss.	Hearing loss
3.1 Does the baby look at you?	Children with autism have been found to display less eye gaze directed to people (Wetherby, Prizant, & Hutchinson, 1998:82), Joint attention is important for language development (Wetherby et al, 1998:82).	ASD
3.2 Does the baby become quiet when he/she hears your voice?	Infant activity diminishes or ceases when approached by sound at 0-3 months of age (Rossetti, 2001:141; Owens, 2001:79).	Hearing loss
3.3 Does the baby laugh when you play with him/her?	Infants of 0-3 months of age will smile at the mother's voice (Rossetti, 2001:141). Infants of 3-6 months will smile in response to positive speech (Rossetti, 2001:141).	Hearing loss ASD Cognitive impairments
3.4 When you look at and point to a toy across the room, does the baby look at it?	Children with autism have been found to display less eye gaze directed to people (Wetherby, Prizant, & Hutchinson, 1998), Joint attention is important for language development (Wetherby et al, 1998)	ASD
3.5 When your child play with toys, does he/she look at you to see if you are watching?	Joint attention is important for language development (Wetherby et al, 1998) Infants later diagnosed with an ASD are less likely than other babies to make eye contact, follow objects visually, turn in response to hearing their name, to smile, or to imitate other people (Filipek *et al.,* 2009:470).	ASD
4.1 Does the baby have different facial expressions?	Infants of 6 months of age communicate through the use of different facial expressions (Rossetti, 2001:144).	ASD Cognitive Impairments
4.2 Does the baby let you know that he/she needs help eg: when an object out of reach?	Infants of 5 months will inform parents of assistance (Owens, 2001:80)	ASD Cognitive impairments
4.3 Does the baby get upset when objects are taken away from him/her?	Infants of 6 months resist when objects are removed from them, indicating protest as a communication function (Owens, 2001:84).	ASD Cognitive impairments
4.4 When you are not paying attention to the baby, does	An infant of 6 months will intentionally try to get a mother's attention (Owens, 2001:84).	ASD Cognitive

he/she try to get your attention?		impairments
5.1 Does the baby give objects to you?	Gesture usage by infants is known to be a preliminary to verbal communication (Rossetti, 2001:137). Infants of 6 months reaches for and gives objects to a caregiver (Owens, 2001:80).	Late talkers Cognitive impairments ASD
5.2 Does the baby point to objects?	Gesture usage by infants is known to be a precursor to verbal communication (Rossetti, 2001:137). Communication intent demonstrated by pointing to objects should be established by 6-9 months of age and should be replaced by words at 18 months of age (Rossetti, 2001:137).	Late talkers Cognitive impairments ASD
6.1 Does the baby look for you?	Infants are able to search for caregivers at 3-6 months of age (Rossetti, 2001:141).	Hearing loss ASD
6.2 When you call the baby's name, does he/she respond by looking or turning towards you?	Infants are able to recognise and respond to their own names at the age of 3-6 months (Rossetti, 2001:141; Owens, 2001:80)	Hearing loss ASD Cognitive impairments
7.1 Does the baby make sounds while lying in his/her cot or when you are talking to him/her?	Infants of 6 months of age should be able to produce a range of vocalisations (Rossetti, 2001:144; Owens, 2001:83).	Late talkers Cognitive impairments ASD Cerebral palsy
7.2 Does the baby use sounds to get your attention or help?	Infants use sounds to get attention at 6 months of age (Rossetti, 2001:143).	ASD Late talkers Hearing loss
7.3 About how many of the following consonant sounds does the baby use: ma, na, ba, da, ga, wa, la, ya, sa, sha.	Infants of 6 months of age should be able to babble a variety of consonant-like sounds (Rossetti, 2001:144).	Late talkers Hearing loss ASD
8.1 Does the baby play with lots of toys?	Children with autism often have restricted behaviour and will only show interest in a restricted number of objects (Watt, Wetherby, & Shumway, 2006:1226)	ASD Cognitive impairments
9. Feeding *9.1 How do you feed the baby?* *9.2 What do you feed the baby?* *9.3 Do you have any problems feeding the baby?*	Infant feeding skills are known to be a predictor of later speech developmental skills (Rossetti, 2001:167; Kritzinger, 1994)).	Cerebral Palsy Language delay ASD ADD
10.1 and 10.2 Information relating to auditory status:: Otoscopic examination and tympanometry bilaterally	Early detection of hearing loss and abnormal middle ear functioning can reduce the negative effects on social, language and cognitive development (Swanepoel *et al.,* 2007:3).	Hearing loss
10.3 Does the baby become frightened by loud sounds?	A startle response is observed in infants with normal hearing when a loud sound is presented (Katz, 2002:46).	Hearing loss ASD
10.4 Has the baby had any ear pain/secretions coming out of the ears? *10.5 Has the baby received any medicine for his/her ears?*	It is important to pay attention to the language development of children with middle ear infection because researchers have found that chronic middle ear infections can have a negative effect on language development (Dufy *et al.,* 1997:10).	Language delay Speech delay

* Questions included in the tool were based on The Infant-Toddler Checklist (Wetherby & Prizant, 1998); Owens (2001) and Rossetti (2001)

Items included in the Surveillance Tool for Communication Development were organised under different categories as follows: case history, caregiver-child

interaction, senses, emotion and use of eye gaze, use of communication, use of gesturers, understanding, use of sounds, use of objects, feeding and hearing. These categories were taken from The Infant-Toddler Checklist (Wetherby & Prizant, 1998), and were supplemented with the categories of case history, caregiver-child interaction, senses, feeding and hearing. By using an existing tool, the face validity of the tool was enhanced. All communication development items were included on the tool.

The first section of the tool is comprised of a case history section which is filled in by the administrator of the tool from the information provided by the infant's Road to Health Card and parental interview. The Road to Health Card is an instrument designed to be used by doctors and nurses to monitor the development of infants and children (Tarwa & De Villiers, 2007:15a). As stated earlier, the Road to Health Card (RTHC), often referred to as the Baby Card, the Health Card or the Clinic Card, is issued to the mother when a baby is born in either the private or state hospital service. Babies born elsewhere also receive a RTHC with their first contact visit with the health services. The RTHC contains relevant records of the child's important health events, including information such as identifying data, details of the mother's pregnancy and antenatal care, details of birth, size at birth, family and sibling history, immunisation history, infant feeding guidelines, family planning practices, growth weight plotting, developmental milestones and illnesses (Tarwa & De Villiers, 2007:15a). During this study, all infants had their RTHC with them when attending the Early Intervention Screening Clinic as the infants first attended the immunisation clinic where they were required to have their RTHC.

Once the information had been recorded from the RTHC, the rest of the items were presented in a question format. The data collector proceeded to ask the questions indicated under mother-infant attachment first, and then proceeded to the other sections. The administrator asked the questions in the Surveillance Tool for Communication Development to the caregivers as well as observing whether the behaviours are present or not in the infants. When a specific behaviour was not observed nor reported by the caregivers, the administrator attempted to elicit the behaviour. Under the section of information relating to auditory status, the administrator performed otoscopic examinations and tympanometry bilaterally for each infant.

3.8.2 The Rossetti Infant-Toddler Language Scale (Rossetti, 2006)

The Rossetti Infant-Toddler Language Scale (Rossetti, 2006) was designed to assess infants from birth to three years in a response to a dearth of assessment tools in the area of ECI (Kritzinger, 2000:47). The scale is a comprehensive assessment tool for early communication development and is not a screening tool. The items developed for the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) are a compilation of author observation, descriptions from developmental hierarchies and behaviours recognised and used by leading authorities in the field of infant and toddler assessment. The items were selected because they best reflect current information available about preverbal and verbal aspects of interaction and communication in young children (Rossetti, 2006:10).

The scale is a criterion referenced instrument designed to assess the language skills of children from birth to 36 months of age. The scale is used to assess preverbal and verbal areas of communication, and it provides an overview of the child's development, as well as providing caregivers with information on how communication relates to development and monitors early language development. The scale assesses the areas of interaction-attachment, pragmatics, gesture, play, as well as language comprehension and language expression. Parent reports provide information about the broader range of skills the child may display in different settings and with different caregivers. The extent to which a child's limitations on his/her daily functioning and family interactions are best determined through parent input (Nott, 2003:406). Parent report is a vehicle through which the parent or caregiver can express her concerns about the child and her expectations of the assessment process (Nott, 2003:406). The Rossetti Infant-Toddler Language Scale (Rossetti, 2006) therefore promotes the family's role as a full partner in the assessment process.

Application of the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) involves observation and interaction to elicit behaviour as well as parent report (Nott, 2003:406). The examiner's goal throughout the assessment is to encourage the occurrence of specific behaviours from the child rather than to control how a specific behaviour is obtained (Rossetti, 2006:19).

Firstly, the administrator observes a period of free-play or interaction between the caregiver and infant and marks those items observed as observed (O) on the scale. The administrator then proceeds to elicit the remaining items on the scale and these items are marked as elicited (E) on the scale (Rossetti, 2006:20). If an item is neither observed nor elicited, then the administrator can ask the caregivers if the infant demonstrates the behaviour. If the caregiver reports that the behaviour is present, then the item is marked as reported (R) on the scale (Rossetti, 2006:20).

If all items are not passed at a particular age level, testing moves backwards in the developmental area until an age range is reached where all items are mastered. The lowest age level at which all items are mastered, is the basal for that developmental area. This process is repeated for each developmental area (Rossetti, 2006:21).

Although no data has been collected regarding the sensitivity and specificity of the Rossetti Infant-Toddler Language Scale (Rossetti, 2006), it was developed by an expert in the field of ECI and is considered an effective measure of an infant's current communication skills (Nott, 2003:409). A study by Nott (2003) examined the initial evaluation of a technique known as the *Diary of Early Language* (Di-EL), designed to obtain data about early lexical development in young children with profound hearing loss using cochlear implants, hearing aids, or both. The validity of the Di-EL, a parent report technique, was examined through comparisons with other measures of language development. The rate of lexical acquisition on the Di-EL was found to correlate highly with expressive language skills as measured by the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). Although the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) is currently used extensively in South Africa, it's applicability to the South African population has not been determined to date.

The Rossetti Infant-Toddler Language Scale (Rossetti, 2006) was considered as the best assessment measure to be used as the golden standard in the study due to the wide use of the scale throughout South Africa, the international acceptance of the scale as an effective measurement of an

infant's communication development and the age range of the tool matched the age of the participants used in the study.

3.8.3 Otoscope

A Heine Mini 2000 Otoscope was used to examine the status of the outer ear structures as well as the tympanic membrane. The otoscopic examination was used to identify malformations of the auricle or external ear canal, signs of trauma, infection or obstruction present in the external ear canal which may influence the hearing ability of the child (Katz, 2002:17).

3.8.4 Middle-ear analyzer

A GSI Tympstar Middle-Ear Analyser was used for the assessment of middle ear functioning by recording tympanograms. Disposable probes were used for each infant. A high frequency probe tone of 1000Hz was utilized to record tympanograms as recommended for young infants (Holte, Margolis & Cavanaugh, 1991:23).

Otoscopic examinations and tympanometry measurements are not considered to be sufficient practice for hearing screening (Swanepoel, 2004:32). However, the PHC context selected does not own an OAE (oto-acoustic emissions device). Therefore the current hospital procedure for hearing screening was followed in the study and otoscopic examinations and tympanometric measurements were used to identify the presence of otitis media and external ear malformations and were not used to identify the presence or absence of hearing loss. If hearing loss is, however, suspected, infants were referred to the nearest referral centre, Rob Ferreira Hospital in Nelspruit, for appropriate physiological testing.

3.8.5 Blanket and toys

A blanket was used to create a play area during the assessment. Toys, such as a rattle, a mirror and a teddy bear were used to elicit the responses required for the items in the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development. The toys were washed and wiped with alcohol swabs for infection control. More than one of each toy was available so that cleaning the toys did not delay the early intervention screening clinic.

3.9 PILOT STUDY

A pilot study was conducted prior to the main study to determine whether the method, sampling, instruments and analysis methods were adequate and appropriate (Leedy & Ormrod, 2004:56). In performing a pilot study, the reliability and validity of the results obtained from the respondents during the main study was increased (Leedy & Ormrod, 2004:30). The pilot study is discussed below.

3.9.1 Objectives

The objectives of the pilot study were:

- To evaluate the developmental surveillance data collection tool and data collection procedures used for the study in terms of appropriateness (Strydom, 2002:15).
- To ensure that the procedures used to collect the data were suitable, effective, reliable, valid and free from problems and errors (Strydom, 2002:15).
- To enable the researcher to determine how long each screening session would take and whether the time taken would fit into the Early Intervention Screening Clinic's time schedule as well as to establish the sequence of activities: interviewing the caregiver, playing with the infant and giving feedback to the mother.
- To increase the researcher's familiarity and competence in completing the Rossetti Infant-Toddler Language Scale and Surveillance Tool for Communication Development.
- To train the fieldworker in the administration of the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development.
- To train the interpreter in correcting relaying information to and from the fieldworkers as adequate practice with concrete cases promotes interpreting proficiency (Langdon & Quintanar-Sarellana, 2003:239).

3.9.2 Participants

Ten infants, between the ages of 0-6 months, together with their caregivers were utilised as participants during the pilot study. The same inclusion and exclusion criteria used for the main study were used for the infants and

accompanying caregivers, fieldworkers and an interpreter participating in the pilot study.

3.9.3 Material and apparatus

The material and apparatus used consisted of the Surveillance Tool for Communication Development, the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) toys and a blanket to create a play area.

3.9.4 Procedures

The following data collection procedures were used in the pilot study:

- Ten infants, between the ages of 0-6 months, and their accompanying caregivers were selected as participants for the pilot study, while they were attending the Early Intervention Clinic at Lydenburg hospital.
- Informed consent from the caregiver was obtained following an explanation of the nature of the study as well as their participation in it.
- The Surveillance Tool for Communication Development as well as the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) was performed on each infant and the results were noted.
- The second fieldworker collected the data from four of the ten infants in the presence of the researcher in order to ensure that the fieldworker was adequately trained to administer both the Surveillance Tool for Communication Development and Rossetti Infant-Toddler Language Scale (Rossetti, 2006). The procedures and results were discussed to ensure that consistent data collection occurred between the researcher and the fieldworker.
- The interpreter was used when participants did not understand English or Afrikaans or when they preferred to converse in their first language.

3.9.5 Findings

During the application of the Surveillance Tool for Communication Development in the pilot study, it was determined that questions referring to specific communication developmental areas were lacking and that additional questions were therefore required to address these gaps. As a result, questions relating to feeding and hearing were included into the Surveillance Tool for Communication Development. Further, the wording of some of the questions led to misunderstandings among some of the caregivers. It was

therefore necessary to adapt the formulation of some of the questions into a simplified format in order to enhance understanding. The time taken to administer both tools was easily accommodated into the early intervention clinic's time schedule. The pilot study allowed for increased experience of the two data collectors as well as the agreement upon the testing procedures chosen.

3.9.6 Implications

Based on the findings from the pilot study, adaptations to the Surveillance Tool for Communication Development were made. These adaptations are listed in Table 3.4 and the final version of the Surveillance Tool for Communication Disorders is presented in Appendix A.

TABLE 3.4: Description of the adaptations made to the Surveillance Tool for Communication Development (0-6 months)

ADAPTATION	JUSTIFICATION
Bilateral otoscopic and tympanometry results were included for each infant.	***Otoscopic examinations will determine the status of the outer ear canal and tympanic membrane and tympanometry will be used to determine the functioning of the middle ear system to identify otitis media (Katz, 2002:17).***
Specific questions regarding hearing and listening behaviour were included into the tool.	***Otoscopic and tympanometry results are included in the tool, however, oto-acoustic emissions are not. Therefore it was deemed important to include questions which may indicate hearing loss due to poor listening behaviour.***
The question "*Can your baby see?*" was added into the tool.	***When the caregivers were asked "Does your baby look at you?", three of the mothers said that their baby could not see. Therefore a question related to the baby's ability to see was needed.***
The following questions related to caregiver-child interaction were included: ***1.1 Is there anything which worries you about the baby?*** ***1.2 Do you know when the baby is happy?*** ***1.3 Do you know when the baby is sad?*** ***1.4 What can the baby do?***	***The learning process for infants begins early and requires a healthy start, sufficient opportunity and exposure to a caregiving environment that allows the child's innate predisposition to learn to communicate ample opportunity to function (Rossetti, 2001:45). Poor care-giver attachment influences this learning process negatively and therefore questions related to caregiver-infant interaction were required.***
Questions related to pregnancy, birth and medical history were included into the tool.	***Very low birth weight, prenatal and perinatal complications and inadequate health care puts infants in the at risk category for communication developmental delay (Rossetti, 2001:5-6).***
The following questions related to feeding were added into the tool: ***9.1 How do you feed the baby?*** ***9.2 What do you feed the baby?*** ***9.3 Do you have any problems feeding the baby?***	***Feeding skills and methods have a correlation with later speech and language development (Rossetti, 2001:16).***
All the questions included in the tool were worded using "the baby" in place of "your child".	***Primary caregivers for example grandmothers and aunties, and not necessarily mothers, will accompany the infants to the Early Intervention Screening Clinic, and therefore the term "your child" will not be***

A risk register for hearing loss was included into the tool under the section of risk factors	***appropriate if the caregiver is not the mother. The risk register for hearing loss would aid the clinician in referring infants for OAE testing when the infants present with one or more risk factors for hearing loss to compliment the insufficient hearing screening protocol.***
Short sentences are used to formulate questions	***Short, simple questions aid in the understanding of the question's content.***
The tool was translated into Afrikaans and Sepedi	***The translation of the tool into another language aids with comprehension of questions for caregivers whose home language is not English.***

3.10 PROCEDURES

3.10.1 Data collection procedures

Data were collected from the infants and their accompanying caregivers attending the Early Intervention Screening Clinic and the following procedures were followed:

- Mothers of newborn infants in the maternity ward at the hospital were informed about the service provided by the Early Intervention Screening Clinic by the speech-language therapist and audiologist.
- Infants without established risk criteria were booked to attend the Early Intervention Screening Clinic by the speech-language therapist and audiologist on a daily basis according to hospital practice.
- Infants were booked for attendance of the clinic at one, three, six, nine and twelve months of age. However, the current study only focused on infants aged 0-6 months.
- The Early Intervention Screening Clinic took place twice a month on a Wednesday morning. Participation in the Early Intervention Screening Clinic was voluntary and the service was delivered free of charge.
- Infants with their accompanying caregiver attended the Early Intervention Screening Clinic on the day on which they were booked to attend.
- The occupational therapist at the hospital was trained as the interpreter for use within the Early Intervention Screening Clinic. Contact sessions were arranged and the interpreter was trained by making use of briefing and debriefing.
- Informed consent was obtained from the caregivers by explaining the nature of the project as well as their participation in it. For caregivers who do not understand English or Afrikaans, an interpreter was utilised to explain these research procedures. Following verbal explanation, a

written information letter describing these research procedures was given to the caregivers as shown in Appendix B.

- Data was collected through the use of the compiled Surveillance Tool for Communication Development as well as the Rossetti Infant-Toddler Language Scale (Rossetti, 2006).
- The result of the screening obtained from the Surveillance Tool for Communication Development, either pass or fail, was recorded on the front page of the Surveillance Tool for Communication Development.
- Following the use of the Surveillance Tool for Communication Development, the administrator performed the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) on each infant. The infant and caregiver-infant interaction as well as the elicitation of behaviours in the infant was observed by the administrator. All observations were noted on the tools used.
- Following the screening procedures, feedback was given to the caregivers as well as guidelines for communication and motor development.
- A second fieldworker was used to perform the assessment measures on one in every four infants, therefore reducing researcher bias.
- Depending on the information obtained from the Surveillance Tool for Communication Development and the Rossetti Infant-Toddler Language Scale (Rossetti, 2006), referrals were made to other professionals for further assessment and intervention when necessary.
- When a developmental delay was detected during the screening and during the duration of the study, the infant entered an early intervention program provided by the speech-language therapist and audiologist in conjunction with the occupational therapist and/or dietician, depending on the nature of the developmental delay as in accordance with hospital procedure.
- Figure 3.6 is a graphical illustration of the procedures followed at the Early Intervention Screening Clinic.

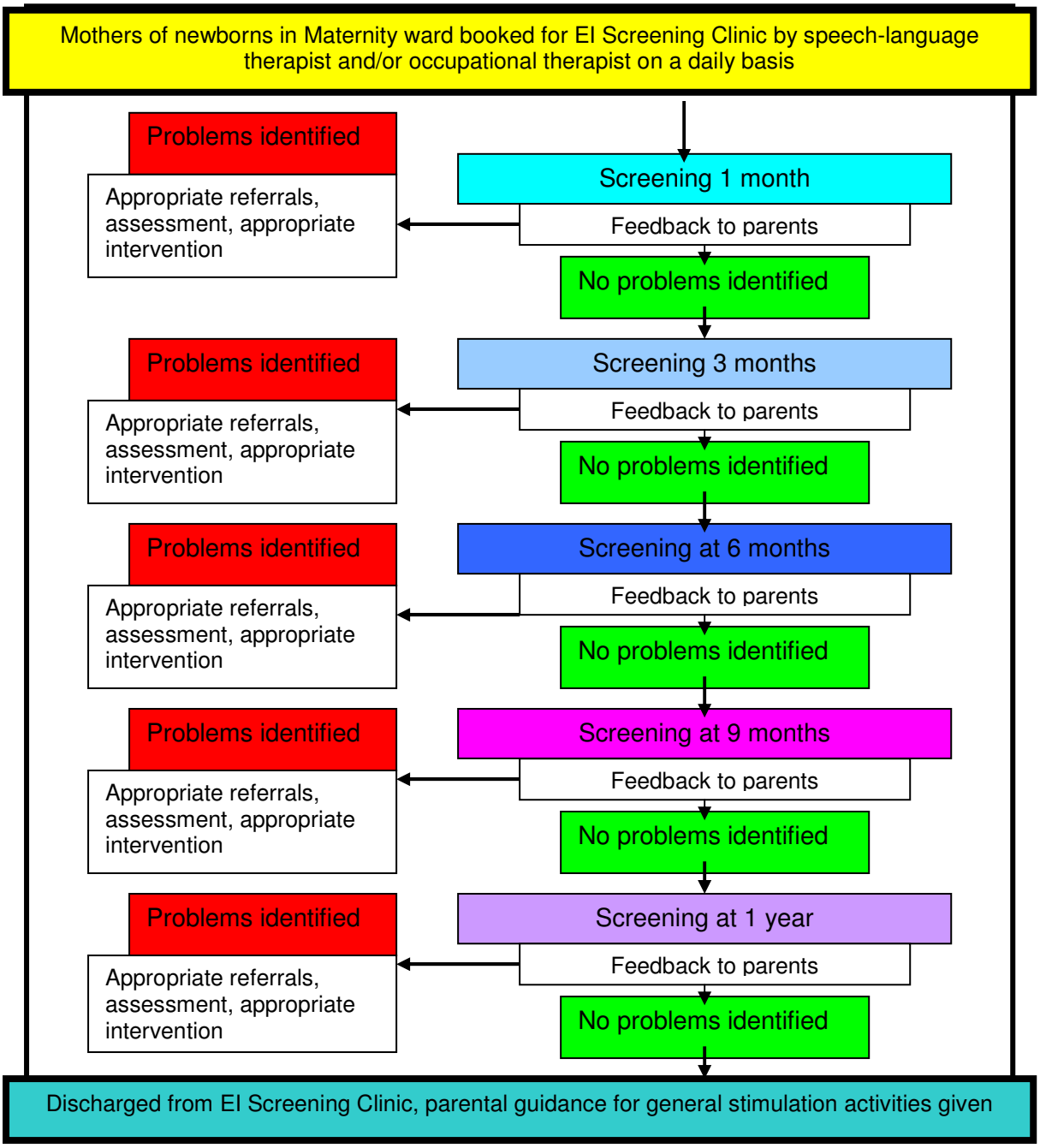

FIGURE 3.6: Procedures followed at the Early Intervention Screening Clinic

3.10.2 Data recording procedures

Data was recorded on the Surveillance Tool for Communication Development and the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). Data were stored in a marked file in a secure location within the Rehabilitation Department at Lydenburg Hospital.

Scoring was performed to determine either a passed or failed outcome. An infant was considered to be at a higher risk for a developmental delay in communication development, indicating a failed result, when the infant scored

1-3 for any of the items on the Surveillance Tool for Communication Development. Scores of 4 – 5 on any of the items indicated normal communication development. However, under the item of hearing, if a problem was detected, the infant would receive a follow-up assessment, in the form of a diagnostic auditory brainstem response test (ABR) or auditory steady state response test (ASSR) and depending on the nature of the assessment results, intervention would be provided in the form of hearing aid fitting and auditory rehabilitation. If an infant was identified after otoscopic examination and tympanometry as having otitis media, the patient would be considered to have failed the screening test, would be referred for medical management and would be followed up at the following Early Intervention Screening Clinic date to determine if the otitis media had resolved.

Items on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) were scored according to the scale's manual and were considered "passed" if the behaviour in question is noted in one of the three following ways, "O" for observed, "E" for elicited and "R" for reported as indicated in the manual (Rossetti, 2006:21). If the examiner directly observed the child spontaneously demonstrating the behaviour, the examiner placed a mark in the "O" column on the protocol next to any scale item. If the examiner or caregiver elicited a desired behaviour from the child directly, the examiner placed a check mark in the "E" column on the protocol next to the scale item. When a specific behaviour was not observed or elicited during the assessment, the examiner asked the caregiver if the child had mastered the behaviour. The examiner placed a check mark in the "R" column on the protocol for behaviours reported to occur without regard to their frequency of occurrence. If the child was not yet demonstrating a particular behaviour, the box next to the item was left unchecked and the child was considered to be behind the expected path of development (Rossetti, 2006:21). An infant presented with delayed communication development when all items for a specific developmental area were not observed or noted by the caregivers. If the infant was able to perform all items relating to his/her age group, the infant was considered as developing typically. If the infant was unable to perform all items relating to his/her age group, the infant was considered as having delayed communication development.

3.10.3 Data analysis procedures

Data tabulation was the first step in the process of data analysis whereby raw data was converted into a list of meaningful information in Microsoft Excel™ spreadsheets (Maxwell & Satake, 2006: 150). The accuracy of the data recorded electronically was confirmed by determining that the data on the Microsoft Excel™ spread sheets were the same as the data on the Surveillance Tool for Communication Development and the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). The data were then transferred into the SAS system (Anderson *et al.*, 2003:21). Two-way/contingency tables summarising the results of Surveillance Tool for Communication Development and the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) were used for the results obtained at each of the two visits in order to draw comparisons between the results obtained. Descriptive statistics were used and data was analysed according to a nominal scale due to the characteristics of the sample, sampling method chosen as well as the objectives of the study (Diamantoupulous & Schlegelmilch, 2000:66). Graphs, pie charts and tables were used to graphically illustrate the information in order to aid in the interpretation of data (Anderson *et al.*, 2003:42).

The chi-square method was used in order to test the association between a risk factor and an outcome variable, namely, the influence of a risk factor on communication development in infants in the study as determined from the first research objective (Diamantoupulous & Schlegelmilch, 2000:175). However, when the counts in the table cells were too small (i.e. the expected cell frequencies less than 5), the Fisher exact test was used to test the association between variables as the Fisher exact test is performed on small samples and evaluates exactly the same null hypothesis as the chi-square test (Diamantoupulous & Schlegelmilch, 2000:175). In this study a five percent level of association was used for all statistical tests ($\alpha = 0.05$). The decision rule was to reject the null hypothesis (H_O) if the p-value of the test (exact p-value for Fisher exact test) was less than 0.05 and not to reject the null hypothesis if p-value of the test was greater than 0.05. The null hypotheses (H_O) were determined as the risk factor in question *would not* have an influence on the communication development of the infant. Alternatively if the null hypotheses (H_O) were rejected, then the risk factor under analysis would have an influence on the communication development

of the infant and was considered a risk factor for communication development in the study. Contingency tables were used to summarise the results obtained from the chi-square test as this was the best way to visualise the results (Diamantoupulous & Schlegelmilch, 2000:175).

Four steps were used to determine the validity of the Surveillance Tool for Communication Development in order to achieve the second research objective. Firstly, two-way/contingency tables were used to classify and compare the number of infants identified with typical and delayed development on the Surveillance Tool for Communication Development and the Rossetti Infant-Toddler Language Scale (Rossetti, 2006).

Secondly, a comparison was made between the results obtained on the Surveillance Tool for Communication Development and the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). In doing so, it was determined which infants presented with typical development depending on which tool as well as which infants presented with delayed development and on which tool.

Thirdly, false negative, false positive, true negative and true positive values were calculated for the Surveillance Tool for Communication Development for each of the two screening intervals.

Lastly, a 2x2 table was used to determine the sensitivity and specificity values for the Surveillance Tool for Communication Development by comparing scores obtained with the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) for each screening interval. Calculating the sensitivity and specificity scores at both screening intervals was performed on the data collected to determine whether the screening tool had contributed to the accurate early identification of infants 0-6 months (Leedy & Ormrod, 2004: 245). Table 3.5 and 3.6 illustrate the method and calculations used to determine the sensitivity and specificity of the Surveillance Tool for Communication Development.

TABLE 3.5: 2X2 Table method of determining sensitivity and specificity (Diamantoupulous & Schlegelmilch, 2000:175)

	Have disorder	***Do not have disorder***	***Total***
Test is positive	**a** True positive	**b** False positive	**a + b**
Test is negative	**c** False negative	**d** True negative	**c + d**
	a + c	**b + d**	**a + b + c + d**

TABLE 3.6: Calculating sensitivity and specificity (Diamantoupulous & Schlegelmilch, 2000:175)

Sensitivity: The percentage of those who have the disorder* and have positive tests	***[a/(a + c)] [x100]***
Specificity: The percentage of those who do not have the disorder* and have negative tests	**[d/(b + d)][x100]**

*According to the reference standard, namely the Rossetti Infant-Toddler Language Scale (Rossetti, 2006)

Themes and trends in the data, specifically relating to information areas for caregivers were identified by the researcher. These trends and themes were sorted which established a basis for further categorisation of the content and provided the data for the third objective of the study (Reid & Gough, 2000:76). The correlation of items within the information areas were analysed by cross-tabulation (Diamantoupulous & Schlegelmilch, 2000:98). Descriptive statistical methods were used to summarize large bodies of information which formed part of the qualitative approach. Different categories were used in the interpretation of the data and these categories dealt satisfactorily with the different dimensions of the problem and addressed the formulated research objectives (Maxwell & Satake, 2006: 151). The different fields of data categories were analysed by calculating frequency distributions, means and two-way frequencies in some circumstances. Text data was analysed and described according to the objectives and design of the study.

3.11 RELIABILITY AND VALIDITY

The procedures implemented to ensure quality criteria include reliability and validity and were as follows:

3.11.1 Reliability

Clear instructions regarding the participation in the study were supplied to each of the participant's caregivers and the following techniques were used to gain the participant's trust and therefore enhancing the nature of the data collected during the parental interview: active listening, empathy, positive tone of voice, respect and making use of clear statements when communicating (Flasher & Fogle, 2004:90). A trained interpreter was used to explain the concepts to caregivers whose home language was not English or Afrikaans.

Questions, regarding developmental milestones, were presented in a logical sequence and answer sheets followed the same sequence as the questions. The same Surveillance Tool for Communication Development and Rossetti Infant-Toddler Language Scale (Rossetti, 2006) was utilized in the same manner for each of the participants according to the selection criteria. Structured questions were used in the Surveillance Tool for Communication Development to obtain data as structured inventories generally yield more reliable information than open-ended questions (Squires *et al.,* 1990: 65).

The pilot study yielded important information and assisted the researcher in enhancing the reliability of the study. The reliability of the testing procedures was integrated in the discussion of the materials and apparatus used. A pilot study was conducted to enable the modification of the data-collection protocol in order to increase the reliability of the results obtained from the participants during the main study (Neuman, 2000:32).

A second fieldworker was used to collect the data for every one in every four infants for the study. In doing so, researcher bias was reduced and inter-rater consistency was improved (Leedy & Ormrod, 2004:213).

As the results are representative of one context only, the results cannot be generalised to other contexts. However, the researcher used descriptions throughout the study in order to make it possible for the reader to determine the transferability of the data to similar research contexts.

The researcher increased the reliability of the individual screening sessions by using a new data sheets and assessment tool for each session to reduce

any possible bias which could be created by referring to previous data collections.

3.11.2 Validity

The main purpose of the study was to determine the highest possible validity of the Surveillance Tool for Communication Development by calculating sensitivity and specificity scores. Validity refers to a test's ability to assess the conditions it reports to address and content, criterion and construct validity exist (Struwig & Stead, 2001:18).

- **Face validity**

Face validity refers to the instrument's ability to evaluate what it appears to evaluate in the study, in this case, communication development of infants 0-6 months (Delport, 2002:62). Face validity was ensured as only items relating to communication development of infants 0-6 months were included in the Surveillance Tool for Communication Development and the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). The layout of the Surveillance Tool for Communication Development was designed to be user friendly by providing items in sections and providing enough space for recording responses. All communication items under each section were included. By basing the Surveillance Tool for Communication Development on the Infant-Toddler Checklist (Wetherby & Prizant, 1998), face validity was enhanced.

- **Content validity**

Content validity refers to how well the tool adequately represents the various content domains which the tool was designed to assess (Maxwell & Satake, 2006:74). The Surveillance Tool for Communication Development used in this study contained questions which reflected the various parts of the content domain (communication development) in appropriate proportions in accordance with Neuman (2000:147). By basing the tool on the Infant-Toddler Checklist (Wetherby & Prizant, 1998), the content validity of the tool was enhanced as only items relating to communication development were included. The particular behaviours and skills specific to the age at which certain communication behaviours are expected were presented accordingly (Owens, 2001:34; Rossetti, 2001:64). To ensure and increase the content validity of the data-collection protocol for this study, the pilot study was

conducted to identify the modification required the Surveillance Tool for Communication Development based on issues relating to context.

- **Criterion validity**

Criterion-related validity is a concern for tests that are designed to predict someone's status on an external criterion measure and is concerned with the relationship between a test score and an outcome (Neuman, 2000:156). Criterion validity was ensured by comparing the results obtained from the surveillance tool with an assessment tool, namely the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). In doing so, the results obtained during screening could be verified by an assessment measure.

- **Construct validity**

Construct validity pertains to establishing the meaning of the tools' results in relation to the theoretical constructs upon which it was based (Maxwell & Satake, 2006:74). In order to ensure the construct validity of the Surveillance Tool for Communication Development, the following procedures were followed (Leedy & Ormrod, 2004:28):

- The Surveillance Tool for Communication Development was compiled based on relevant research findings in the field of ECI and was adapted from an existing tool (van der Linde, 2008:64).
- All items relating to the components of language, namely, form, content and use, were included on the Surveillance Tool for Communication Development (Owens, 2001:18).
- An assessment tool, namely the Rossetti Infant-Toddler Language Scale (Rossetti, 2006), which was developed by an expert in the field of ECI and is considered an accurate means of assessing communication development in infants, was used as the measure against which the Surveillance Tool for Communication Development was compared.
- Clear instructions for the completion of the Surveillance Tool for Communication Development were discussed with caregivers before the tool was administrated by the speech-language therapist and audiologist.
- Questions were presented in a logical sequence and answer sheets followed the same sequence as the questions.

- Following a pilot study, the questions included in the Surveillance Tool for Communication Development were structured in such a way as to be free from ambiguity.

Concurrent validity was used to determine the validity of the Surveillance Tool for Communication Development as the predictor and criterion data were collected at the same time during data collection at each screening interval. This kind of validation was deemed appropriate as it was used to assess the infant's current criterion status. However, when a comparison was made between screening intervals, predictive validity was used.

3.12 CONCLUSION

The need for contextual data relating to developmental surveillance programs in South Africa has been established by clinical practice and local research due to the high prevalence of disorders as well as the importance of early identification and subsequent early intervention for infants with developmental delay. In order to answer the research question, the methodology of the current study was designed to investigate the validity of a developmental surveillance tool for early communication development in the PHC context. The goal of this chapter was to provide a method to achieve the research objectives. This method provided the means of investigating the context, providing insight into the demographics of the population served as well as determining the tool's performance, sensitivity and specificity. The results obtained from the study will be used to guide and inform clinical practice.

3.13 SUMMARY

This chapter provided a description of the procedures implemented in the research method used to acquire the data according to the aims of the study. The hypotheses, research design and research context were described, followed by the ethical principles implemented during the course of the study. A description of the participants was included. The research apparatus and material, data collection methods and data analysis procedures were explained subsequently. The chapter was concluded by discussing issues relating to the reliability and validity of the study.

CHAPTER 4

RESULTS AND DISCUSSION

The chapter presents and discusses the results according to the objectives of the study. By comparing the Surveillance Tool for Communication Development with the Rossetti Infant-Toddler Language Scale (Rossetti, 2006), the validity of the surveillance tool for communication development was determined.

4.1 INTRODUCTION

In South Africa, PHC clinics have presented new opportunities for the screening of hearing loss and communication development in infants (Swanepoel, 2004:46). Such programs are, however, limited despite the great need within these contexts. It has been suggested that the dearth of such programs is due to the limited availability of valid surveillance tools for the South African population. In order to meet this need, the current study aimed to establish the validity of the self-compiled Surveillance Tool for Communication Development by recruiting 55 infants for the first screening interval and, due to attrition, 33 for the second screening interval. The results obtained will reveal whether the Surveillance Tool for Communication Development could accurately identify normal communication development as well as communication developmental delay in infants 0-6 months of age in a sample of the Lydenburg Hospital infant population. Research of this nature is essential to the planning and implementation of similar programs in other PHC clinics.

According to Neuman (1997:367) comparison is the key to all research and the meaning and significance of results depend upon appropriate intervention, relevant conclusions and generalisations based on the analysed data. In order to draw conclusions from the analysed data obtained at the first and second screening intervals, quantitative measurements are discussed and interpreted in an integrated approach according to each objective in the following sections. Figure 4.1 indicates the integration of different data sources which were used to achieve the objectives of the study.

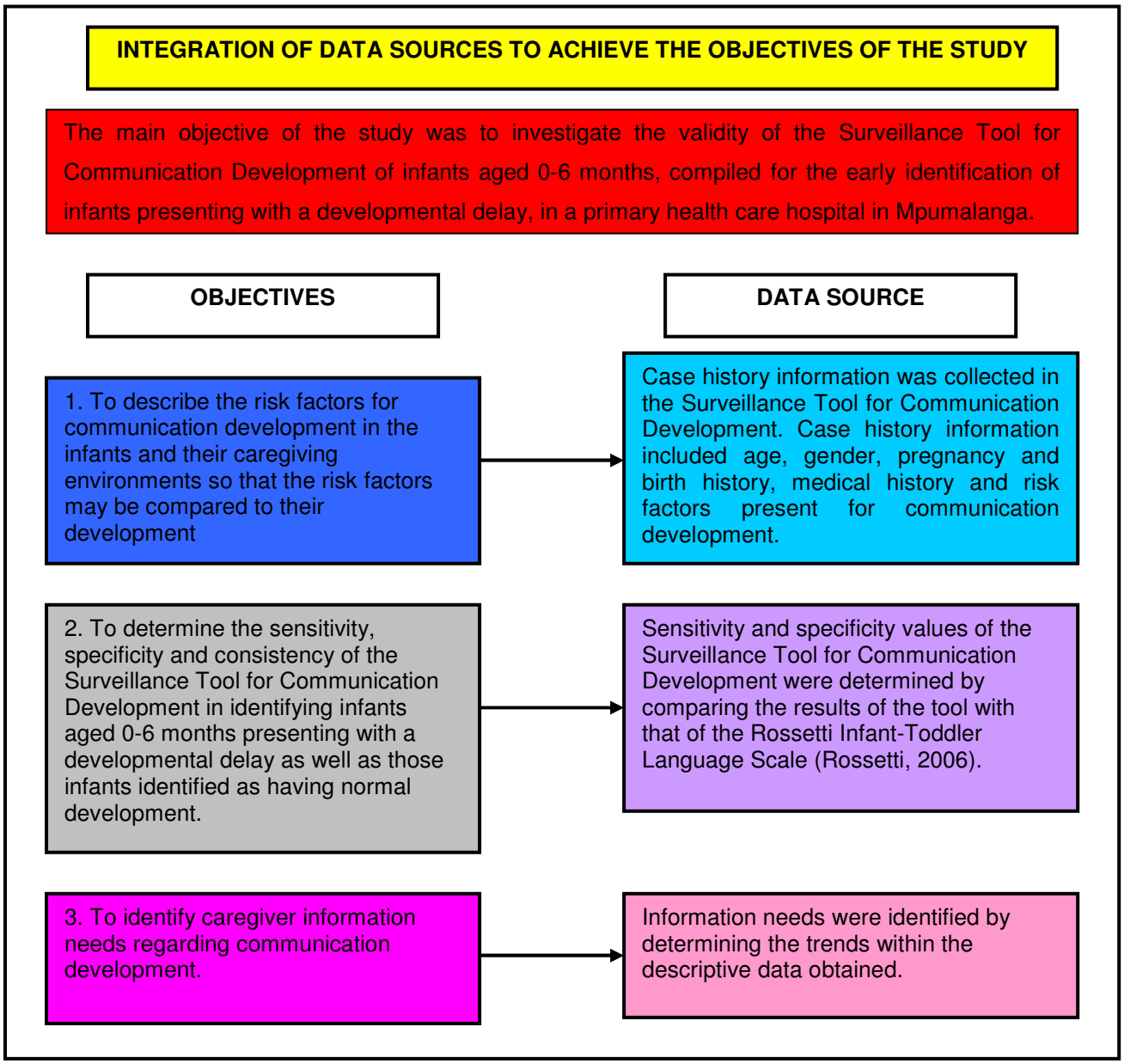

FIGURE 4.1: Integration of data sources to achieve the objectives of the study

The characteristics of the sample of caregivers and infants were previously described in Chapter 3. 92.7% of the participants were African and Sepedi was the most commonly spoken language among the participants (38.1%). The most prevalent birth order among the infant population was first born (43.6%), and the average birth weight of the sample was 3.013kg (please refer to Chapter 3, Table 3.2). The risk factors for communication development identified within the sample are presented in the following section.

4.2 RISK FACTORS FOR COMMUNICATION DEVELOPMENT

Risk factors for communication development were determined by consulting each infant participant's Road to Health Chart as well as through a structured interview with each of their accompanying caregivers. A risk assessment formed part of the Surveillance Tool for Communication Development and the results were recorded under the section for risk factors (See Appendix A).

4.2.1 Description of risk factors

A total of 26 out of 55 infants (47.28%) did not present with any risk factors for communication development. However, 29 out of 55 infants (52.72%) had at least one risk factor which could potentially affect their communication development. As mothers primarily accompanied their infants to developmental visits (100% for the first screening interval and 97% for the second screening interval), as opposed to aunts, grandmothers or other caregivers, the risk factors reported in the study can be considered to be accurate as mothers are the most informed about their infants. The risk factors for communication development present in the infants and their families are depicted in Figure 4.2.

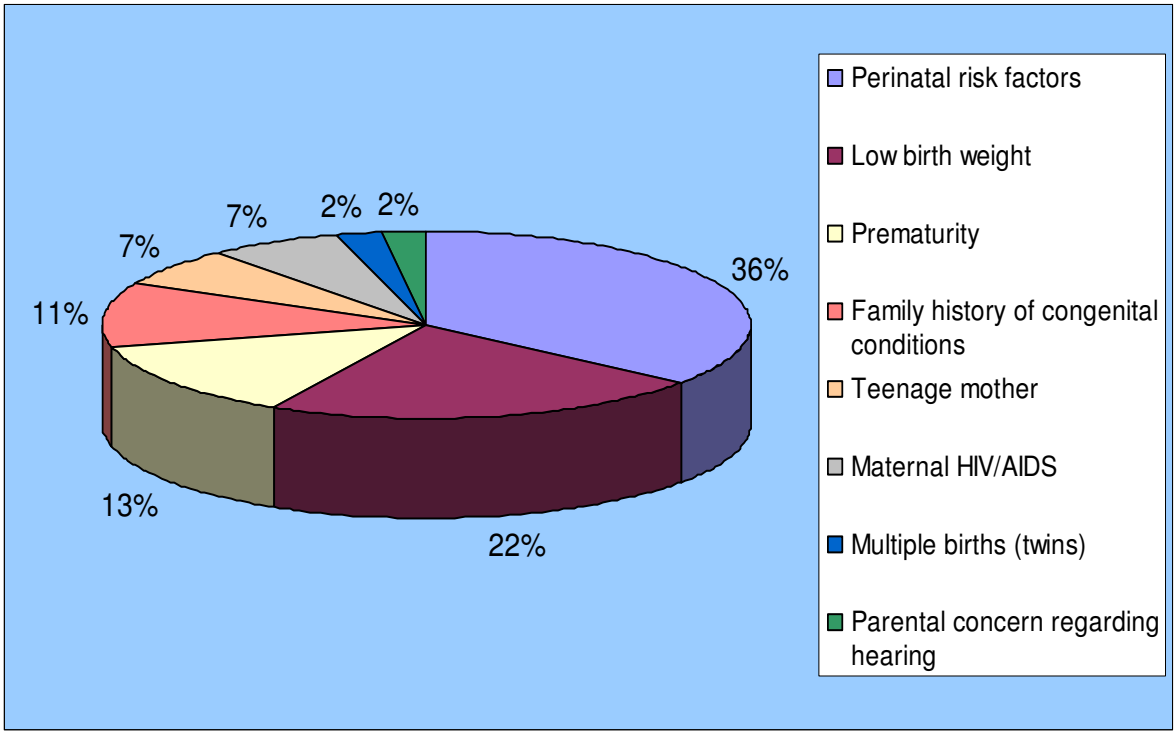

FIGURE 4.2: Risk factors for communication development in participants (n=29)

A description of each of the risk factors follows.

4.2.1.1 Perinatal risk factors

Figure 4.2 illustrates that perinatal risk factors, relating to the mothers' health before and after birth, were the most common risk factor in the sample (36%) according to Figure 4.2. As mentioned previously, Lydenburg falls within the Ehlanzeni District in Mpumalanga Province. Ehlanzeni District has a perinatal infant mortality rate of 31.1% (Pattinson, 2003-2005:31). Thirty seven percent (37.07%) of these perinatal deaths are due to perinatal risk factors (Pattinson, 2003-2005:7). Perinatal risk factors are an area of national concern in South Africa due to the high incidence of such risk factors and subsequent increased perinatal mortality rate. As a result the Perinatal Problem Identification Program (PPIP) was established by a branch of the Medical Research Council based at Kalafong Hospital (Pattinson, 2003-2005:2) in order to identify and intervene so to prevent maternal and infant deaths. According to Rossetti (2001:5), the same factors which lead to infant mortality, also lead to developmental delay and disorders in surviving infants. Given the high incidence of such factors identified in the sample by the Surveillance Tool for Communication Development, it is important that these infants receive developmental surveillance at Lydenburg Hospital.

Figure 4.3 indicates the distribution of different types of perinatal risk factors within the sample. These risk factors were reported by 16 mothers themselves and were indicated on the infant's Road to Health Card.

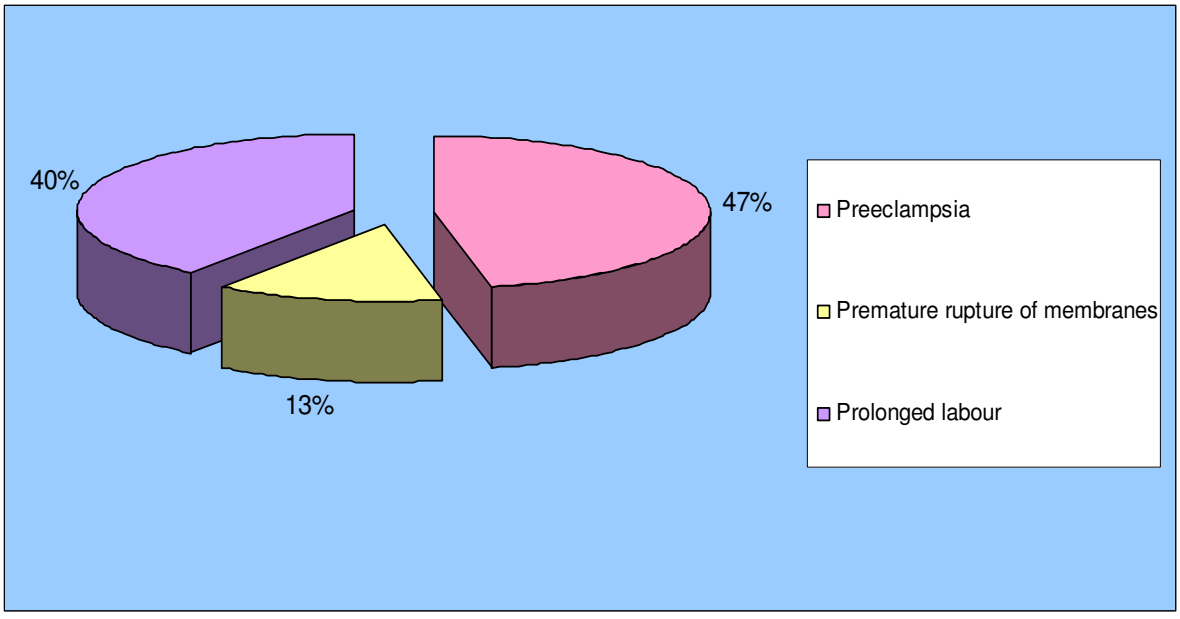

FIGURE 4.3: Perinatal risk factors (n=16)

As shown in Figure 4.3, preeclampsia was the most commonly (47%) reported perinatal risk factor in the sample. Hypertensive disorders, which include preeclampsia, are the fourth highest cause of perinatal deaths in South Africa (4.06%) (Pattinson, 2003-2005:7). The high incidence of preeclampsia can be attributed to the fact that the majority (90.9%) of the mothers participating in the study were African. Preeclampsia is known to affect African women more than women of other races due to increased levels of plasma homocysteine found in women presenting with preeclampsia (Patrick *et al.,* 2004:1526). Homocysteine concentrations are affected by nutritional deficiencies, particularly decreased folic acid and B12, leading to increased homocysteine (Patrick *et al.,* 2004:1526). Previous studies have reported racial differences in nutritional intake including folic acid in African women which causes the elevated prevalence of preeclampsia (Patrick *et al.,* 2004:1526). Preeclampsia can cause complications during pregnancy, including prematurity and low birth weight which are risk factors for communication development as well as infant and/or maternal death (Rossetti, 2001:6). Consequently, preeclampsia could be one of the contributing factors to the high incidence of low birth weight and prematurity in the participants of the study as shown in Figure 4.2.

Prolonged labour (40%) was the second most common perinatal risk factor reported in Figure 4.3. Prolonged labour has been reported to be more common in the rural areas of South Africa due to the poor attendance of antenatal care as well as the increased number of home deliveries and failure to take the mothers to the hospital if a problem arises during delivery (Ozturk *et al.,* 2007:40). Participants had to travel between 5.1 km and 79.8 km to the nearest birthing hospital. All participants reported that transport to Lydenburg Hospital was often difficult to access and that travel time was long. Lack of transportation, lack of funds for transportation as well as far travelling distances to the hospital may have contributed to the high incidence of prolonged labour in the study. The fact that all these conditions were reported on the Road to Health charts indicates that the mothers eventually obtained medical care, although it may have been too late to prevent adverse effects on the infant.

The premature rupture of membranes was the least common (13%) perinatal risk factor reported in the sample as shown in Figure 4.3. The premature rupture of membranes can lead to premature birth and asphyxia which are risk factors for communication developmental delay and perinatal death (Rossetti, 2001:6). Both infants who were born to mothers with the premature rupture of membranes were born prematurely and were therefore placed in an at-risk status for communication developmental delay.

In addition to the risk factors in the mothers, risk factors identified in the infants themselves are discussed next.

4.2.1.2 Low birth weight

Apart from perinatal risk factors, the risk factor with the second highest incidence in the sample, as shown in Figure 4.2, was low birth weight. As expected, the incidence of low birth weight (22%) in the study was higher than the recorded incidence at Lydenburg Hospital (11.2%) (Department of Information, Lydenburg Hospital, 2009:3). The incidence reported in the study is also higher than the average reported incidence of low birth weight in South Africa (15%) and the rural reported prevalence of 13.3% (Pattinson, 2003-2005:3).

The increased incidence of low birth weight in the sample is related to the recruitment process as extra effort which was made to encourage mothers of low birth weight and premature infants to attend the Early Intervention Screening Clinic due to the known negative developmental outcomes associated with these conditions. Information sharing provided to mothers of infants with low birth weight and prematurity was justified due to evidence of the benefits of providing mothers with information regarding their low birth weight and premature infants during the neonatal period (Kritzinger & Louw, 2003:11). As a consequence, the increased incidence of low birth weight may have been due to the information provided to the mothers, creating awareness of the risks.

Four of the ten infants with low birth weight in the study were born full-term and therefore their low birth weight status could not be attributed to prematurity. Socio-economic status is the principal risk factor associated with

low birth weight as poor maternal nutrition causes intra-uterine growth retardation (Fritzgerald, Karraker & Luster, 2002:17). Lydenburg Hospital serves a low socio-economic population which may explain this result. African women who are poor both prior to and during pregnancy are 1.3 times more likely to have a low birth weight infant (Fritzgerald *et al.,* 2002:17). Contrary to research findings by Chen *et al* (2007:370), low birth weight in the current study could not be attributed to the young age of motherhood as all of the teenage mothers in the study had full-term, normal birth weight infants.

4.2.1.3 Prematurity

Prematurity proved to be the third highest risk factor in the sample (13%) according to Figure 4.2. Due to purposive recruiting to attend the Early Intervention Screening Clinic, the prevalence of prematurity in the sample is slightly higher than the recorded incidence of 10.3% at Lydenburg Hospital (Department of Information Lydenburg Hospital, 2009:3). This is a positive finding as it indicates that the mothers of premature infants in the study showed an interest in the development of their infants by choosing to attend the Early Intervention Screening Clinic.

Furthermore, all of the four infants in the study who were born prematurely also had low birth weight which is associated with prematurity (Rossetti, 2001:20).

4.2.1.4 Family history of congenital conditions

Figure 4.2 indicates a prevalence of 11% for a family history of congenital disorders. Items reported under a family history of congenital disorders included: a family history of Down Syndrome (1 participant), cleft lip and/or palate (1 participant) and a hearing loss (2 participants).

In the study by Swanepoel *et al.* (2004:226), a prevalence of 13% for a family history of congenital disorders was reported. Kennedy *et al.* (1998:1959) reported a prevalence of 6.6% for a history of congenital disorders. The high prevalence of family history of congenital disorders (11%) in the sample as shown in Figure 4.2 may be explained by two possible factors. Firstly, poverty, which is prevalent in the research context, is known to correspond with increased incidence rates of congenital conditions, such

as hearing loss (Kubba *et al.,* 2004:125). Secondly, eliciting an accurate history of familial congenital conditions was problematic due to differences in cultural beliefs as well as the understanding of disability in the participants (Swanepoel & Almec, 2008:46). The interpreter utilised in the study aimed to reduce the misunderstandings by using familiar words as well as having a good understanding of congenital disorders as she herself is an Occupational Therapist. However, in spite of these efforts, the caregivers may have misunderstood or misinterpreted the questions which would produce an incorrect response (Swanepoel & Almec, 2008:45).

Three of the five infants presented with a family history of congenital hearing loss. This risk factor is of importance as it is the most prevalent risk factor (22% - 42%) in infants identified with hearing loss (Vohr *et al.,* 2000:355). Guidelines for universal newborn infant hearing screening indicate that a high-risk register should be used in conjunction with physiological hearing screening methods such as OAE and ABR in order to identify the presence of factors associated with hearing loss (JCIH, 2007:12).

4.2.1.5 Teenage motherhood

Three infants comprising of 7% of the study's population were born to teenage mothers as shown in Figure 4.2. The prevalence of teenage mothers in the study's sample concurs with the hospital's recorded prevalence of 7.83% teenage mothers (Department of Information Lydenburg Hospital, 2009:3). Infants of teenage mothers are at risk of health as well as developmental problems (Rossetti, 2001:25). However, when teenage mothers are supported by other women, there is a better outcome for both the infant and the mother (AAP, 2001:431). All infants born to teenage mothers were accompanied by their mothers to developmental visits despite the fact that these mothers still attended school. This reflects their concern for their infants' development.

4.2.1.6 Maternal HIV/AIDS

Figure 4.2 indicates that only three mothers comprising 7% of the study's population indicated that they were HIV/AIDS positive. This finding may be considered unreliable as HIV/AIDS is a pandemic in South Africa and is ranked as the country with the second highest estimated number of pregnant

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women living with HIV/AIDS (14%) worldwide (WHO, 2009:90). The fact that only three mothers, compared to a reported 28% of women attending maternal health care clinics in Mpumalanga province who are HIV/AIDS positive, indicates the possibility of under reporting in the current study as well as the possibility that not all participants disclosed their status (Mngadi, 2003:1). Infants' exposure to HIV/AIDS is also not reported on the Road to Health Card. HIV/AIDS is not a notifiable disease in South Africa (Swanepoel & Louw, 2010:8).

In addition, this finding may be attributed to other factors, including the a reluctance to report such information due to fears of isolation and the associated stigmatism of HIV/AIDS, poor recording systems, the lack of awareness regarding HIV/AIDS status and well as the right for participants not to disclose their status (Swanepoel & Louw, 2010). Although the percentage of pregnant mothers tested for HIV/AIDS in Ehlanzeni District has dramatically increased from 16.6% in 2003/2004 to 77.2% in 2007/2008 (District and Provincial Profiles, 2008:183), mothers still have the opportunity to refuse testing and therefore could be unaware of their HIV/AIDS status. The potential lack of disclosure of HIV/AIDS status amongst mothers in the study compromises early identification programs as many of the children who are HIV/AIDS exposed are often only detected at a much later stage.

4.2.1.7 Multiple births

There was one occurrence of multiple births in the form of twins (2%) in the sample as shown in Figure 4.2. The set of twins were among the premature infants with low birth weight, which is often associated with multiple births (Rossetti, 2001:19) and presented with multiple risks for communication development. As a result, these infants were recruited to attend the Early Intervention Screening Clinic due to their multiple at-risk status.

4.2.1.8 Maternal concerns regarding hearing

Maternal concern of hearing loss in their infant has proven to be a risk factor for hearing loss as maternal concerns of the hearing ability of their infants has been shown to be indicative of true problems (JCIH, 2007:18). Maternal concerns regarding hearing loss was one of the lowest risk factors reported in the study (2%) as shown in Figure 4.2. A recent survey of 100 mothers,

representative of a developing South African context has indicated that knowledge regarding risk factors for hearing loss is limited amongst mothers and 57% held at least one superstitious cultural belief regarding a possible cause of infant hearing loss (Swanepoel & Almec, 2008:47). This finding can be explained by the lack of maternal knowledge of hearing loss in infants among mothers as well as the lack of interest in knowing the hearing ability of their infant (Swanepoel & Almec, 2008:47). Developmental surveillance programs will contribute to the early identification of infants with hearing loss as it has been proved that relying on maternal concern of infant hearing loss is not a reliable method of identifying hearing loss.

4.2.1.9 The overall prevalence of risk factors in the sample

The overall prevalence of risk factors for communication development was 52.72% in the infants who were deliberately recruited to attend the Early Intervention Screening Clinic. Evidence for the increased prevalence of risks factors in a rural South African context has been found in other South African studies.

The Surveillance Tool for Communication Development was able to identify all of the risk factors discussed and combines risk factors identified in the participants' case histories with direct observation of infant behaviour. The instrument therefore provides a holistic view of infant communication developmental functioning as well as factors which contribute towards communication development. Furthermore, the high prevalence of risks for communication development justifies the establishment of the Early Intervention Screening Clinic as well as the expansion of the clinic.

4.2.1.10 Distribution of risk factors in the sample

The distribution of the number of reported risk factors in the infants and their families is presented in Figure 4.4.

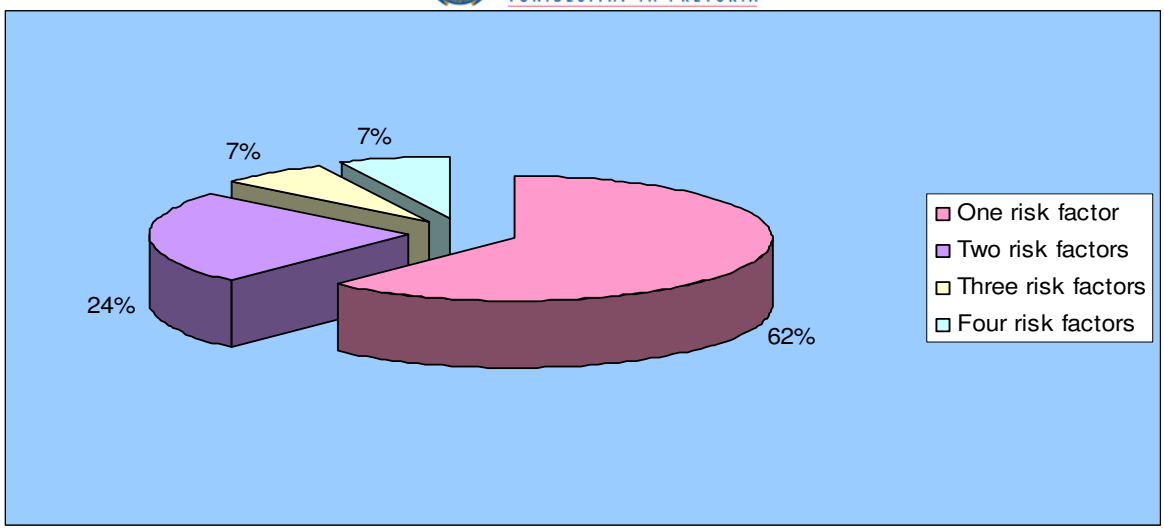

FIGURE 4.4: Distribution of risk factors for communication development in the participants (n=29)

As shown in Figure 4.4, most infants (62%) presented with only one risk factor for communication development. The high percentage of infants presenting with only one risk factor may be due to the age of the infants as environmental risk factors such as the effect of chronically disturbed family interaction and dangerous living conditions have not yet become apparent. Research has indicated that the effect of environmental risks factors only become apparent in the second year of life (Meisels & Shonkoff, 2000:54; Escalona, 1982:673).

According to Figure 4.4, 38% of the infants, accounting for 11 infants in the sample, presented with more than one risk factor for communication development. Figure 4.5 below shows that six of these 11 infants presented with low birth weight and prematurity as risks for communication development. As discussed earlier, low birth weight is associated with prematurity (Rossetti, 2001:15) and therefore it is not surprising that these two risk factors were reported together for these infants. Low birth weight and prematurity were also two of the most prevalent risk factors in the sample as shown in Figure 4.5.

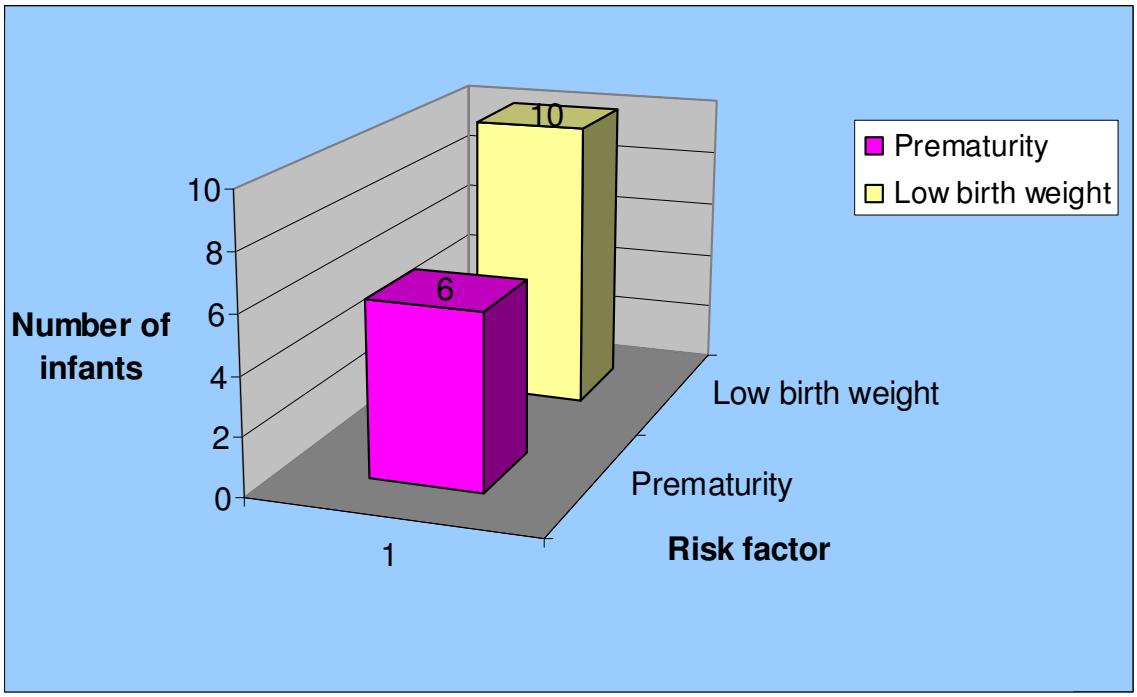

FIGURE 4.5: Number of infants born with both prematurity and low birth weight (n=10)

The infants with multiple risk factors in the sample, as represented in Figure 4.4, are at an increased risk for communication developmental delay (Bang, 2008:1256). The presence of multiple risk factors makes the risk profile of these infants more complex and indicates the necessity to establish a surveillance program in Lydenburg.

It is concluded that the prevalence of risk factors appears to be elevated, due to the sample being biased towards infants with risk factors for communication development. The most prevalent risk factors in the sample are consistent with low socio-economic status and lack of resources which is common of rural contexts. A closer analysis of the factors revealed that HIV/AIDS status may have been under reported in the study.

4.2.2 The influence of risk factors on the communication development of participants

Communication development of the participants was screened using the Surveillance Tool for Communication Development and was assessed using the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). The influence of risk factors on communication development was determined from these results. The Rossetti Infant-Toddler Language Scale (Rossetti, 2006) was used as a standard to which the Surveillance Tool for Communication

Development was compared. The results are illustrated in Table 4.1. P-values in red and italics indicate those factors which had an influence on communication development in infants, while P-values in black indicate those factors which did not have an influence on communication development in the infants. P-values of 0.05 and less were considered as significant as determined by the chi-square method and Fisher's exact test (Diamantoupulous & Schlegelmilch, 2000:175).

TABLE 4.1: The influence of risk factors on the two measurements of communication development

Risk factor	Rossetti Infant-Toddler Language Scale (Rossetti, 2006) P-value	Surveillance Tool for Communication Development P-value
Prematurity	***0.0154***	***0.0085***
Low birth weight	***0.0227***	***0.0062***
Perinatal risk factors	***0.0052***	***0.0028***
Birth order	0.8671	0.8604
Infant illness	1	1
Teenage motherhood	1	1
Maternal HIV/AIDS	1	0.5445

According to Table 4.1, three factors were indicated to have a negative influence on communication development namely, prematurity, low birth weight and perinatal risk factors. The lower the participants' gestational age at birth (indicated as preterm birth), the lower the birth weight and the greater the presence of multiple risk factors, the poorer the participants scored on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development.

According to Table 4.1, no relationship was indicated for the following risk factors: birth order, infant illness, and teenage motherhood as well as HIV/AIDS exposure. Both instruments obtained similar results and it is concluded that the Surveillance Tool for Communication Development was able to identify the relationship between risk factors and communication development. This was the first step in determining the validity of the Surveillance Tool for Communication Development. These risk factors are discussed below in the order mentioned in Table 4.1.

4.2.2.1 Prematurity

As shown in Table 4.1, a negative relationship was found to exist between prematurity and delayed communication development as determined by the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) as well as by a fail result on the Surveillance Tool for Communication Development. The finding that prematurity is significantly linked to infants' communication development concurs with literature which indicates that prematurity is an influencing risk factor for developmental delay in infants (Stoelhorst *et al*., 2003:89). Stoelhorst *et al.* (2003:89) followed premature infants under 32 weeks gestation at the corrected age of 18 and 24 months and reported that 40% of the children at both ages showed moderate to severely delayed development. Such findings have also been supported by other researchers which have found that at 14 months corrected age for prematurity, 40.9% of infants had functional neurological problems, 18.8% of infants were mildly disabled, 7.2% of infants were severely disabled with no possibility of locomotion and only 31% of the infants were healthy (Mares, Neuman & Warren, 2005:90). These studies indicate that prematurity has a profound and lasting effect on development. The credibility of the result is acceptable as it concurs with previous findings.

4.2.2.2 Low birth weight

Table 4.1 indicates that a negative relationship exists between low birth weight and delayed communication development as determined by the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) as well as a fail result on the Surveillance Tool for Communication Development. This finding is in agreement with current literature as a variety of medical complications are generally associated with low birth weight which lengthens the infant's hospitalization and therefore contributes to the potential for communication developmental delay and disorders (Rossetti, 2001:21). Furthermore, as previously mentioned, low birth weight is often a complication of prematurity which has a negative impact on communication development (Rossetti, 2001:21).

In the South African context as discussed previously, prematurity and low birth weight are the most common causes of death in the perinatal period (Pattinson, 2003-2005:3). The perinatal infant mortality rate for Ehlanzeni District in which Lydenburg is situated, has slowly decreased from 33.3% in

2003/2004 to 30.7% in 2007/2008 due to an improvement in antenatal care (District and Provincial Profiles, 2008:183). According to Pattinson (2003-2005:31), Ehlanzeni District, Mpumalanga Province, has a perinatal infant mortality rate of 31.1% (Pattinson, 2003-2005:31). Although the reported prevalence varies in both studies, the perinatal mortality rate still remains high. Health care provided to premature and low birth weight infants in the form of early identification through the use of the Surveillance Tool for Communication Development may minimise communication developmental delay if such infants are treated by a team of health care professionals.

4.2.2.3 Perinatal risk factors

As illustrated in Table 4.1, perinatal risk factors proved to have a negative relationship with communication development as determined by the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and a fail result as determined by the Surveillance Tool for Communication Development. The negative influence of perinatal risk factors on development is supported by research which has indicated that complications of pregnancy and birth are more frequent in the medical histories of children with cerebral palsy than in the histories of neurologically normal children (Logan, 1995:32). As previously mentioned, the presence of preeclampsia was the highest reported type of birth complication in the study (43.75%). Bang (2008:1256) found that when mothers had preeclampsia, developmental delay among infants was much higher than that of healthy mothers (P-value: 0.080 when a $p<0.10$ was used). Anderson *et al.* (2003:40) performed developmental tests on infants at 18 months of age and observed school performance once the participants had entered school and also concluded that prenatal (such as preeclampsia and prolonged labour) and postnatal conditions as well as maternal education provide the best predictors of school achievement difficulties. It is positive that the Surveillance Tool for Communication Development was able to identify the influence of perinatal risk factors on communication development in the participants.

4.2.2.4 Birth order

Table 4.1 indicates that no relationship existed between birth order and communication development on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development. Birth order has been found to have an influence on communication

development in older infants and toddlers as explored by previous studies. Sigman *et al.* (1991:11) investigated the relationship between birth order and the developmental competence of 106 preterm infants at 4, 9, 18, 24, and 25 months of age and found that developmental scores were predominantly influenced by the infant's ordinal position in the family (Sigman *et al.,* 1991:11). Firstborns have been shown to learn to speak earlier as well as speaking more than later-born children as first-borns generally receive more attention than later born children (Werner, 2000:24).

Although previous literature has indicated that birth order influences communication development, infants in the current study were too young to have the effect of birth order playing a role in their current development status. If the infants were followed up at a later stage, birth order could be a factor influencing communication development.

4.2.2.5 Infant illness

Table 4.1 shows that no relationship was determined between infant illness and communication development on both the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development. Infant illness was marked as a risk factor if the infant had received medication for an illness during the time period of the study. Infant illness is often temporary and therefore the infant was not sick for long enough or did not present with a serious illness which could have influenced communication development. Infants are at an increased risk for developmental delay when a serious, long-term illness has occurred such as meningitis or post-natal asphyxia (Mares, Neuman & Warren, 2005:97).

None of the infants in the current study had a history of serious infections such as meningitis, which is associated with hearing loss and developmental delay due to mental disability (Plante & Beeson, 2004:188). They rather presented with flu-like symptoms which were easily resolved with a course of antibiotics. However, if infants were HIV/AIDS positive, it may be more difficult to identify these infants as it would not be known if the flu-like symptoms were due to a weakened immune system which is characteristic of HIV/AIDS. The result indicates that a short-term illness does not have an influence on the communication development of infants from the results obtained on the

Rossetti Infant-Toddler Language Scale (Rossetti, 2006) as well as the Surveillance Tool for Communication Development.

4.2.2.6 Teenage motherhood

Table 4.1 indicates that no relationship was found to exist between teenage motherhood and communication development as determined by the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development. Although teenage motherhood did not prove to be a risk factor for infants 0-6 months in this study, teenage motherhood is viewed to be a risk factor for communication development as the infant develops as indicated in previous literature (Rossetti, 2001:14). Young mothers are often not equipped for the demands of an infant and can easily become overwhelmed (Rossetti, 2001:14). This may lead to decreased maternal involvement with the infant which can significantly influence a child's development as inadequate stimulation to enhance developmental outcomes for the infants is present (Rossetti, 2001:14).

These negative outcomes associated with teenage motherhood were not reflected in the current study as the infants were too young to have reflected the negative developmental patterns due to poor mother-infant attachment and lack of stimulation. Further, the number of young mothers in the sample was too small to account for the negative influence of teenage motherhood on communication development of infants. The fact that the teenage participants attended the clinic could be interpreted as a positive sign of their attachment and concern for their infants. The result indicates that teenage motherhood does not have an influence on the communication development of infants 0 to 6 months during developmental surveillance when the Surveillance Tool for Communication Development is used.

4.2.2.7 Maternal HIV/AIDS

As illustrated in Table 4.1, HIV/AIDS did not prove to be a risk factor for communication development as determined by the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development. HIV/AIDS is known to be a significant risk factor for developmental delay in all developmental domains including communication development (Ebersohn & Eloff, 2002:78; Rossetti, 2001:6). All infants born to HIV/AIDS positive mothers in the study were born full-term

with normal birth weight. Previous reports have, however, shown that infants infected with HIV/AIDS may be not display any signs of developmental delay in Stage 1 of paediatric HIV/AIDS (National Institute of Allergy and Infectious Disease, 2004:2; WHO, 2000:11). Due to the negative developmental outcomes associated with HIV/AIDS it is important that these infants be monitored.

As previously mentioned, only three mothers disclosed their HIV/AIDS status during the study. It was not determined if any of these mothers received antenatal care and if Neviropine, which prevents mother-to-child transmission of the HI virus, was administered during pregnancy and after birth. This also explains the lack of the relationship of HIV/AIDS on communication development obtained in the study.

4.2.2.8 Comparison of the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development

A comparison between the risk factors which proved to have an impact on communication development was made between the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development. A positive relationship exists between the two instruments as the same risk factors which had a negative influence on the Rossetti-Infant Toddler Language Scale (Rossetti, 2006) also had a negative impact on the results obtained from the Surveillance Tool for Communication Development as depicted in Table 4.1. Furthermore, the same risk factors which had no impact on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) also had no impact on the results obtained from Surveillance Tool for Communication Development. These results indicate that the Surveillance Tool for Communication Development is able to identify the impact of risk factors on infant development in infants of 0 to 6 months, similar to the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). This finding indicates the credibility of the Surveillance Tool for Communication Development as a screening tool for the Lydenburg infant population as it was able to account for the influence of risk factors on communication development.

In summary, the results obtained on the Surveillance Tool for Communication Development compare well with the results obtained on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). All information gained from the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) could also be obtained from the Surveillance Tool for Communication Development. Thus far, the results indicate that the Surveillance Tool for Communication Development acts favourability as a screening tool for the infant population contained in the sample and is useful within clinical practice.

4.3 VALIDITY OF THE SURVEILLANCE TOOL FOR COMMUNICATION DEVELOPMENT

The validity of the Surveillance Tool for Communication Development was determined by calculating sensitivity and specificity scores of the tool at both the first (0-3 months) and second (3-6 months) screening intervals. Four steps involving sequential statistical procedures were followed as previously indicated in Chapter 3.

4.3.1 Step 1 – The overall results of both screening intervals

Figure 4.5 illustrates the overall percentage of infants identified with typical as well as delayed communication development in the study for both screening intervals. The results are based on the results gathered from the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) as this tool was used as the "golden standard measurement" in the study.

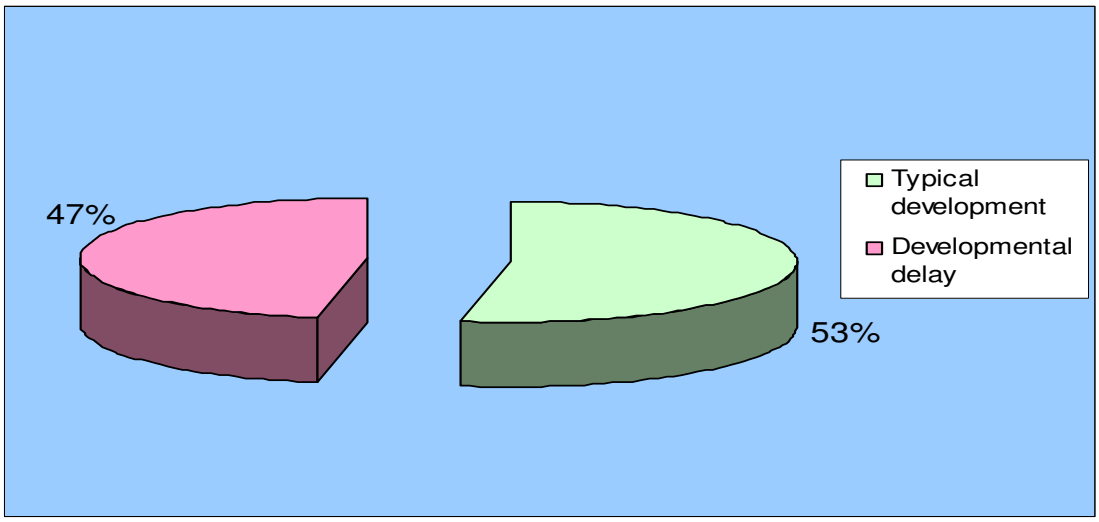

FIGURE 4.6: Percentage of infants identified with typical as well as delayed communication development for both screening intervals (n=55)

According to Figure 4.6, the overall prevalence for infants with delayed communication development in the study was 47%, but as previously indicated, the sample was biased towards at-risk infants who have a greater chance of having developmental delay. It is therefore not surprising that 47% of the sample were identified with delayed communication development.

4.3.2 Step 2 - Initial comparison of results obtained

Based on the number of infants identified with typical as well as with delayed communication development, the results of the Surveillance Tool for Communication Development, were compared to the results obtained from the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) according to guidelines by Diamantoupulous and Schlegelmilch (2000:175). This provided the first step in determining the validity of the Surveillance Tool for Communication Development. A summary of the results obtained for the first screening interval are depicted in Table 4.2 below.

TABLE 4.2: Comparison between the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development results at first screen (n=55)

Tool	Number of infants who passed (showed typical development)	Percentage of infants who passed (showed typical development)	Number of infants who failed (showed delayed development)	Percentage of infants who failed (showed delayed development)
Rossetti Infant-Toddler Language Scale	36	65.5%	19	34.5%
Surveillance Tool for Communication Development	38	69.1%	17	30.1%
Difference	2	3.6%	2	3.6%

According to Table 4.2, a minor difference exists in the actual number of infants identified with normal as well as delayed communication development when the results of the Surveillance Tool for Communication Development are compared to the results of the Rossetti Infant-Toddler Language Scale (Rossetti, 2006).

Participant attrition occurred from the first to the second screening interval as participants who were identified at the first screening interval were not included in the second screening interval due to ethical considerations as discussed in Chapter 3. Furthermore, some infants failed to return for the

second screening interval. The results obtained at the second screening interval are depicted Table 4.3 below.

TABLE 4.3: Comparison between the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development results at second screen (n=33)

Tool	Number of infants who passed (showed typical development)	Percentage of infants who passed (showed typical development)	Number of infants who passed (showed delayed development)	Percentage of infants who passed (showed delayed development)
Rossetti Infant-Toddler Language Scale	26	78.8%	7	21.2%
Surveillance Tool for Communication Development	28	84.8%	5	15.2%
Difference	2	6.1%	2	6.1%

Table 4.3 indicates a higher percentage difference between the results obtained from the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development when compared to the first screening interval. This is due to the smaller sample size used for the second screening interval (n=33). However, it cannot be deduced whether the difference is statistically significant or not, because when determining the validity of a screening tool no correlations are determined at this stage in the process (Diamantoupulous & Schlegelmilch, 2000:175).

It appears that a minor difference exists between the screening instrument and assessment tool based on the initial comparison of the results obtained from the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) and the Surveillance Tool for Communication Development for both screening intervals. However, further investigation is needed to determine the validity of the tool.

4.3.3 Step 3 – Calculating true negative, true positive, false negative and false positive results

The third statistical procedure in determining the validity of the Surveillance Tool for Communication Development was to calculate the percentage of true negative, true positive, false negative and false positive results obtained using the Surveillance Tool for Communication Development at each screening interval when compared to the Rossetti Infant-Toddler Language Scale

(Rossetti, 2006). This procedure was performed according to Diamantoupulous and Schlegelmilch (2000:175). The results are presented in 2X2 Tables. Table 4.4 is used to display the results for the first screening interval and Table 4.5 is used to display the results for the second screening interval.

TABLE 4.4: The percentage of true negative, true positive, false negative and false positive results obtained for first screen (n=55)

False negative 5.5%	**True negative 63.6%**
False positive 1.8%	**True positive 29.1%**

According to Table 4.4, a very low percentage of infants produced false negative and false positive results on the Surveillance Tool for Communication Development at the first screening interval. The low percentage of false negative and false positive results indicates the accuracy of the Surveillance Tool for Communication Development in identifying delayed as well as typical communication development in the infants for the first screening interval at 0-3 months of age.

The same procedure was conducted for the second screening interval and the results are presented in Table 4.5.

TABLE 4.5: The percentage of true negative, true positive, false negative and false positive results obtained for second screen (n=33)

False negative 9.1%	**True negative 75.8%**
False positive 3%	**True positive 12.1%**

According to Table 4.5, the percentage of false negative and false positive result is higher than those obtained for the first screening interval. This finding indicates that the Surveillance Tool for Communication Development is less accurate in identifying delayed as well as typical communication development in infants for the second screening interval, between 3 and 6 months of age. The results obtained may be influenced by the reduction in the sample size at

the second screening interval. However, calculating the sensitivity and specificity values of the Surveillance Tool for Communication Development will provide the final step in determining the validity of the tool.

False positive and false negative results were lower for the first screening interval than the second screening interval indicating that the Surveillance Tool for Communication Development was more accurate in identifying infants with delayed and typical development at the first screening interval of 3 months.

4.3.4 Step 4 - The sensitivity and specificity of the Surveillance Tool for Communication Development

The final step in determining the validity of the Surveillance Tool for Communication Development was to calculate the sensitivity and specificity scores from the 2X2 Tables for each screening interval. From Tables 4.4 and 4.5, the calculations presented in Chapter 3, section 3.10.5, were performed to calculate the sensitivity and specificity values. These calculations were performed according to Diamantoupulous and Schlegelmilch (2000:176). The results for both screening intervals are shown in Table 4.6 below.

TABLE 4.6: Sensitivity and specificity scores of the Surveillance Tool for Communication Development at the first screen (n=55) and second screen (n=33)

	Surveillance Tool for Communication Development - First screen	Standardisation requirement score (Glascoe, 2005:174)	Surveillance Tool for Communication Development - Second screen
Sensitivity	**84.21%**	**70-80%**	**57.14%**
Specificity	**97.22%**	**80%**	**96.15%**

According to statistical analysis in Table 4.6, a high sensitivity score of 84.21% was obtained for the first screening interval. However, the results also indicate that a low sensitivity score of 57.14% was obtained for the second screening interval. Standardisation scores for the sensitivity of developmental surveillance tools suggest that scores of 70-80% and above should be obtained for the identification of children with a communication developmental

delay or disorders at a single administration (Glascoe, 2005:174). The Surveillance Tool for Communication Development scored above the recommended standardisation score of 70-80% for the first screening interval, but scored below the recommended standardisation score for the second screening interval. The results indicate that the Surveillance Tool for Communication Development was an *accurate* means of *identifying infants with communication developmental delay* for the *first screening interval* at *0-3 months of age* for infants in the sample, but was shown to be *less accurate* in *identifying infants with developmental delay* at the *second screening interval of 3-6 months* in the sample.

Sensitivity and specificity scores are directly derived from the number of participants contained in the standardised sample (Frisk *et al.,* 2009:291). Therefore the reduction in the number of participants from the first screening interval (55 infants) to the second screening interval (33 infants) may have negatively influenced the sensitivity score obtained at the second screening interval. The more infants included in the standardised sample, the more stable the sensitivity and specificity scores will be (Frisk *et al.,* 2009:291). However, even when screening tests have been standardised on large samples, the specificity scores are often more robust than the sensitivity scores since there are many more children included in the sample who are developing typically than those who are exhibiting developmental delay (Frisk *et al.,* 2009:291).

According to the calculations shown in Table 4.6, high specificity scores were obtained for both screening intervals. Standardisation scores for developmental surveillance instruments recommend specificity scores of 80% and above, in order for such tools to accurately identify typically developing infants (Frisk *et al.,* 2009:291; Glascoe, 2005:174). Specificity scores at both screening intervals were above the recommended standardisation score of 80% (see Table 4.6), indicating that the Surveillance Tool for Communication Development was an *accurate* means of *identifying children with typical communication development* between the ages of *0 and 6 months* in the sample.

In summary, the validity of the Surveillance Tool for Communication Development was determined for the 0 to 6 months old infants participating in the study. The tool compared favourably with the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) in identifying typical communication development of infants in the sample.

4.3.5 Areas in which delayed communication development was identified

Following determination of the sensitivity and specificity values of the Surveillance Tool for Communication Development, the developmental areas in which infants presented with a fail result as well as delayed communication development required investigation. Failed developmental areas were investigated in order to determine which areas of communication development the screening tool and assessment tool were able to identify in infants in the sample. Infants produced a fail outcome during developmental surveillance due to one of three reasons, namely: hearing loss, abnormal middle ear function or delayed communication development. Figure 4.7 indicates the distribution of infants identified amongst these categories.

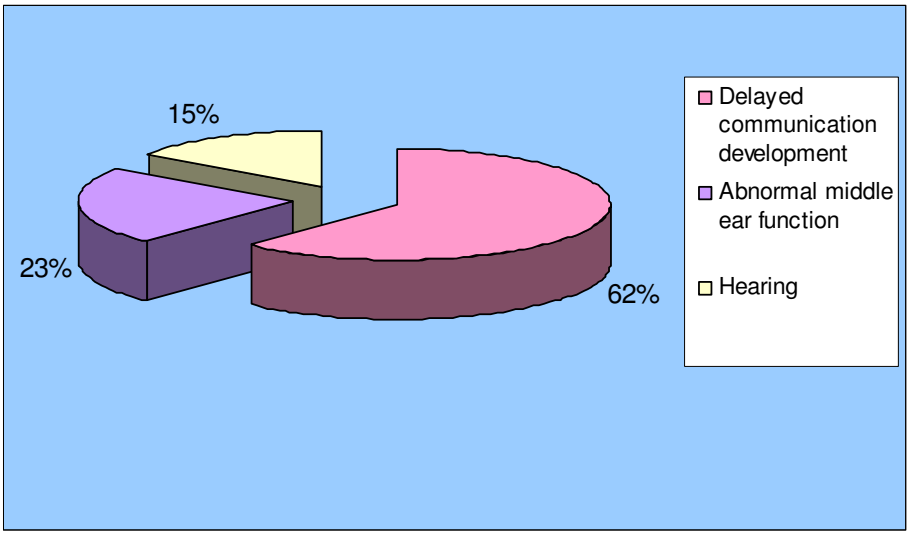

FIGURE 4.7: Infants identified with hearing loss, abnormal middle ear function and delayed communication development (n=26)

Each category is discussed below in the following sections.

- **Hearing loss**

According to Figure 4.7, the overall prevalence of hearing loss (either confirmed or suspected) in the sample was 15% which accounted for four infants. Out of the four infants who were suspected as having a hearing loss, two received diagnostic ABR testing and were diagnosed to have moderate to

severe hearing loss. One of the two infants was diagnosed with bilateral hearing loss, while the other infant was diagnosed with a unilateral moderate to severe hearing loss. The remaining two infants did not receive diagnostic audiological testing as they failed to arrive at the referral hospital on the dedicated day for ABR testing. Hearing loss was identified through parental concern, reaction to sound as well as the presence of risk factors associated with hearing loss. As previously mentioned (Chapter 3, section 3.4.8), no physiological hearing screening measures were used as the hospital did not possess such measures. Only infants suspected of hearing loss were referred for OAE hearing screening. Therefore not every infant received physiological hearing screening and the number of infants with hearing loss in the sample could be higher. Despite a lack of appropriate hearing screening equipment, two infants with significant hearing loss could be identified.

It was expected that infants within the sample would be diagnosed with hearing loss due to the high prevalence of risk factors identified in the sample as discussed in section 4.2. Further, the number of children with hearing loss is known to be higher in rural contexts such as that of the research context (Swanepoel & Storbeck, 2008:1). The number of children with hearing loss is also on the rise worldwide. The World Health Organisation's (WHO) global estimate for disabling hearing impairment (>40 dB) has more than doubled in the decade between 1995 and 2005, from 120 million to at least 278 million and 25% of these losses are estimated to have originated from childhood (WHO, 2006:10).

The identification of two infants with hearing loss before six months of age led to the initiation of early and appropriate intervention. Yoshinago-Itano *et al.* (1998:1168) have demonstrated that infants identified and fitted with hearing aids before six months of age have language development equivalent of their normal hearing peers. The results indicate that through developmental surveillance, the potential of early identification of auditory disorders could be demonstrated.

- **Abnormal middle ear function**

As indicated in Figure 4.7, 23% of infants were identified with abnormal middle ear function in the study. The identification of abnormal middle ear

function was targeted in the study as high frequency tympanometry and otoscopic examinations were used during developmental surveillance. Abnormal middle ear function has been associated with poor socioeconomic circumstances characteristic of the PHC context and it is therefore not surprising that six infants were identified with abnormal middle ear function (Swanepoel, 2007:3).

- **Delayed communication development – first screening interval**

Figure 4.8 illustrates the different components of language in which delayed communication development was identified on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) for the first screening interval.

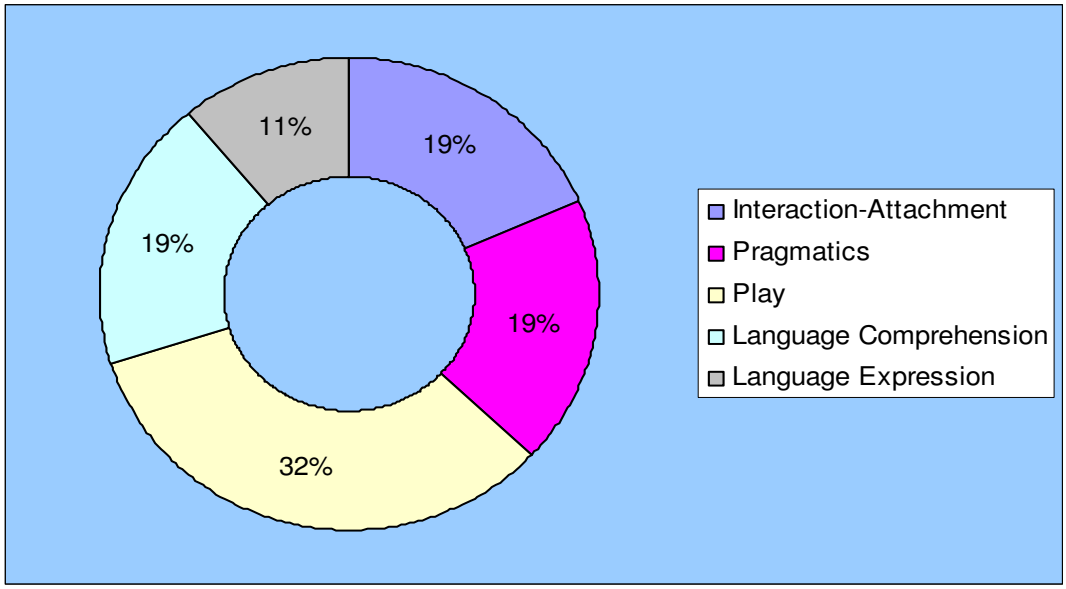

FIGURE 4.8: Developmental areas in which developmental delay were detected on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) at the first screening interval (n=19)

According to Figure 4.8, 39% of infants with communication delay demonstrated difficulties in play for the first screening interval on Rossetti Infant-Toddler Language Scale (Rossetti, 2006). The items included on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) under the developmental category of play were divided into two sections, namely: object play and interactive play. The distribution of infants identified with delayed play development amongst the two sections is shown in Figure 4.9 below.

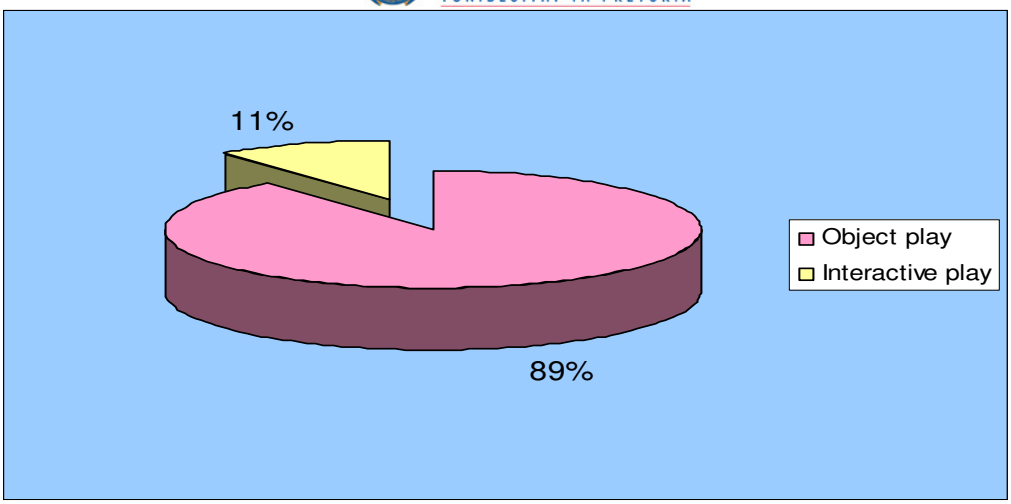

FIGURE 4.9: Distribution of infants identified with delayed play development (0-3 months) on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) (n=19)

Figure 4.9 indicates that 89% of infants identified with delayed play development were identified due to the lack of object play. The Rossetti Infant-Toddler Language Scale (Rossetti, 2006) relies on the use of toys to evaluate play development of young infants as two of the three items under the play development category are reliant on toys. The failure of all infants to meet the developmental requirements for the category of play may be attributed to poor resources within families as infants are not given the opportunities to play with toys such as rattles. Nayak and Kalyankar (2010:210) indicated that the failure of infants and children to be provided with appropriate materials as well as the opportunity to play with toys negatively impacts their play development. The Rossetti Infant-Toddler Language Scale (Rossetti, 2006) may therefore be an inadequate assessment of play development in infants within low resource settings as it is biased towards infants who have been exposed to toys.

Figure 4.10 illustrates the items in which a fail outcome was identified on the Surveillance Tool for Communication Development for the first screening interval.

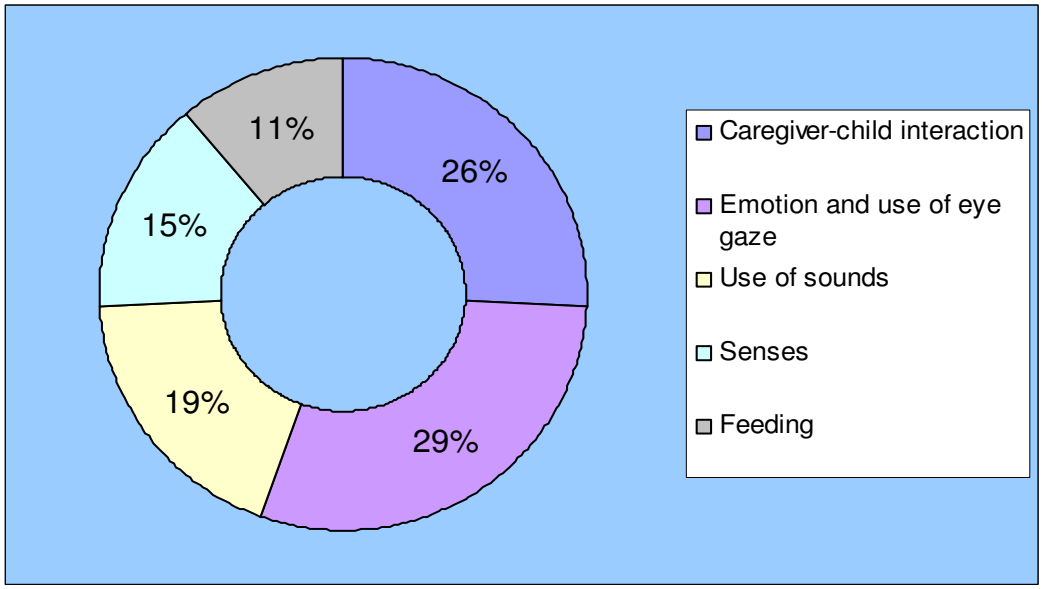

FIGURE 4.10: Areas failed on the Surveillance Tool for Communication Development at the first screening interval (n=19)

According to Figure 4.10, the most common category in which infants produced a fail outcome on the Surveillance Tool for Communication Development was emotion and use of eye gaze.

Items included under the category of emotion and use of eye gaze in which infants produced a fail outcome is shown in Figure 4.11 below.

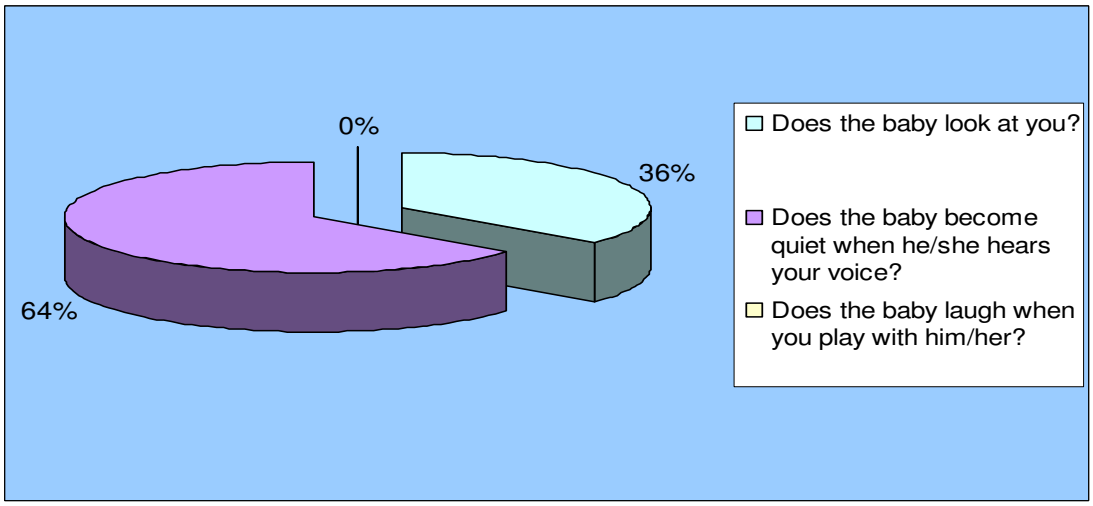

FIGURE 4.11: Items producing a fail result under emotion and use of eye gaze on the Surveillance Tool for Communication Development (n=10)

According to Figure 4.11, 64% of infants produced a fail outcome due to failure to respond to their caregiver's voice. Only 3 of the 10 infants who produced a fail outcome due to failure to respond to their caregiver's voice also produced a fail outcome due to hearing. Hearing can therefore not be the main cause for the majority of infants failing to respond to their caregiver's

voice. Alternatively, 7 of the 10 infants who produced a fail outcome due to emotion and use of eye gaze also produced a fail outcome due to poor caregiver-child interaction as determined by the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) under the section of Interaction and Attachment. Poor caregiver-child interaction negatively affects the rhythm of interaction between the caregiver and infant and may explain why these infants failed to respond to their caregiver's voice (Rossetti, 2001:54).

Figure 4.11 further indicates that 36% of the infants failed to make eye contact. These same infants failed the first screening interval due to poor caregiver-child interaction. Poor caregiver-child interaction is known to manifest in the form of poor eye contact between infant and caregiver (Rossetti, 2001:54). This is an important finding since the use of eye gaze is an important precursor to communication development as the foundation of communication interaction is based upon eye gaze (Owens, 2001:164).

- **Delayed communication development– second screening interval**

Figure 4.12 illustrates the categories in which delayed communication development was identified on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) for the second screening interval.

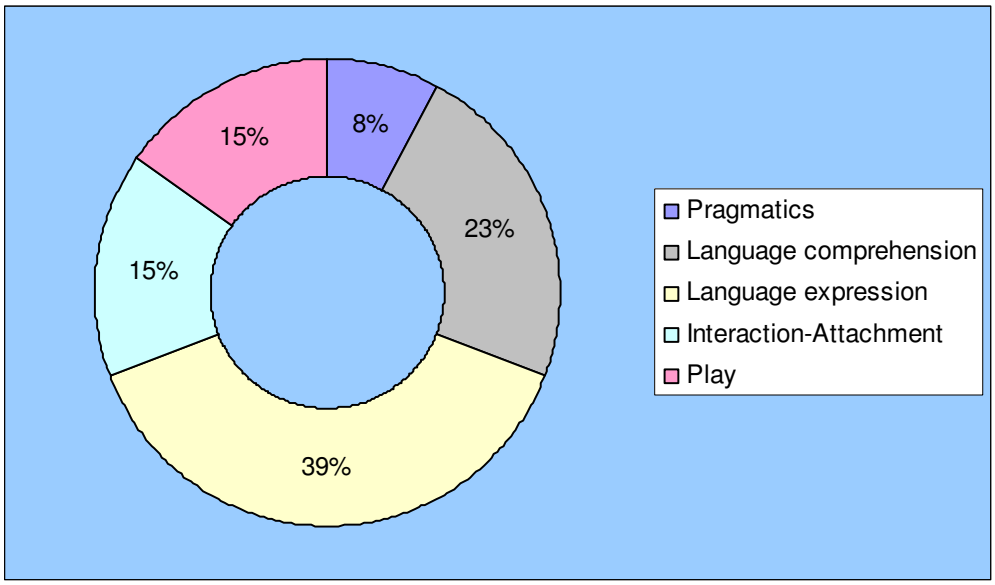

FIGURE 4.12: Areas in which developmental delay was detected on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) at the second screening interval (n= 7)

As shown in Figure 4.12, the results of the first and second screening intervals differ greatly. For the first screening interval, play was the most common category in which delayed development was identified, however, for the second screening interval, as shown in Figure 4.12, language expression was the most common category in which delayed communication development was identified amongst infants. This may be explained by the difference in developmental milestones expected at the two screening intervals. Typically developing infants of 3 to 6 months begin to babble more frequently and produce more sound variations as well as intonation patterns than infants of 1 to 3 months (Owens, 2001:174). Babbling is therefore an important milestone for the second screening interval and developmental delay was detected in infants at the second screening interval when the infant failed to reach this expected milestone (Owens, 2001:173).

Figure 4.13 illustrates the developmental areas in which a fail outcome was identified using the Surveillance Tool for Communication Development at the second screening interval.

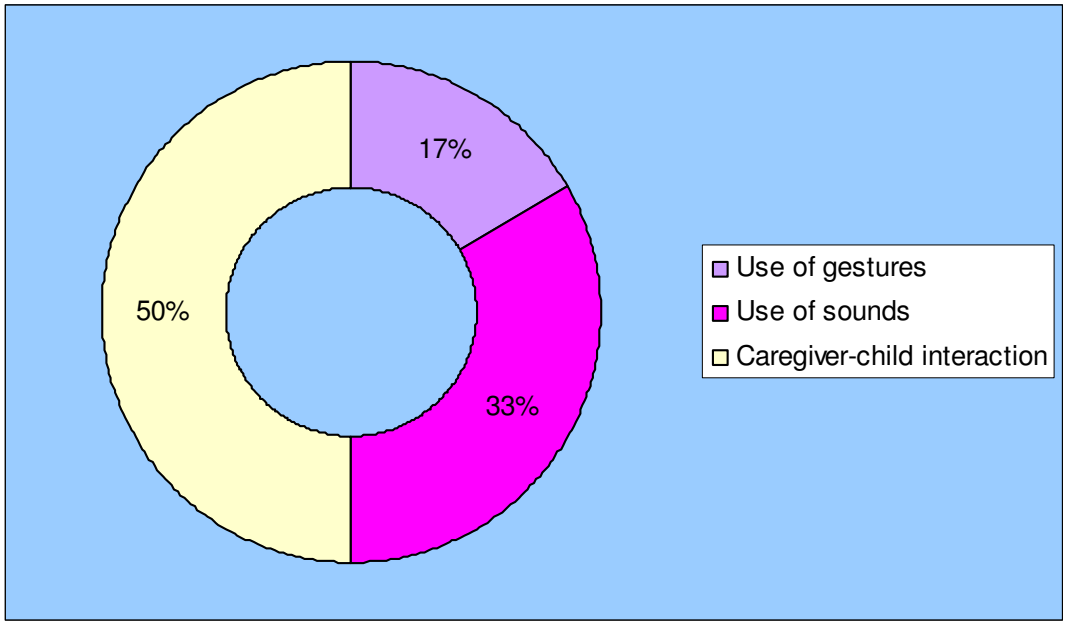

FIGURE 4.13: Developmental areas failed on the Surveillance Tool for Communication Development at the second screening interval (n=7)

As shown in Figure 4.13, the use of sounds was the most common category in which infants produced a fail outcome during the second screening interval. This result compares favourably with the results obtained for the second screening interval on the Rossetti Infant Toddler-Language Scale (Rossetti,

2006) as shown in Figure 4.12. As previously discussed, language expression was the most common category in which delayed communication development was identified for the second screening interval.

In summary, although individual variation occurred within the results obtained, play, emotion and use of eye gaze, language expression and use of sounds were the categories in which delayed development was most commonly identified. The results differed greatly between the first and second screening intervals as different milestones were expected for each of the screening intervals. The results also revealed that the Rossetti Infant-Toddler Language Scale (Rossetti, 2006) is biased towards infants who have been exposed to toys.

4.4 TOPICS FOR CAREGIVER EDUCATION

Research has highlighted education as being an important component of a successful prevention program (Gerber, 1998:102). However, specific information topics need to be identified and targeted during developmental surveillance visits. The most prevalent trends within the data collected were identified through cross-tabulation. This lead to the identification of four information topics for caregivers and are discussed below.

4.4.1 The influence of feeding methods on middle ear functioning

Figure 4.14 is used to display the feeding methods used by caregivers to feed their infants at the first and second screening intervals.

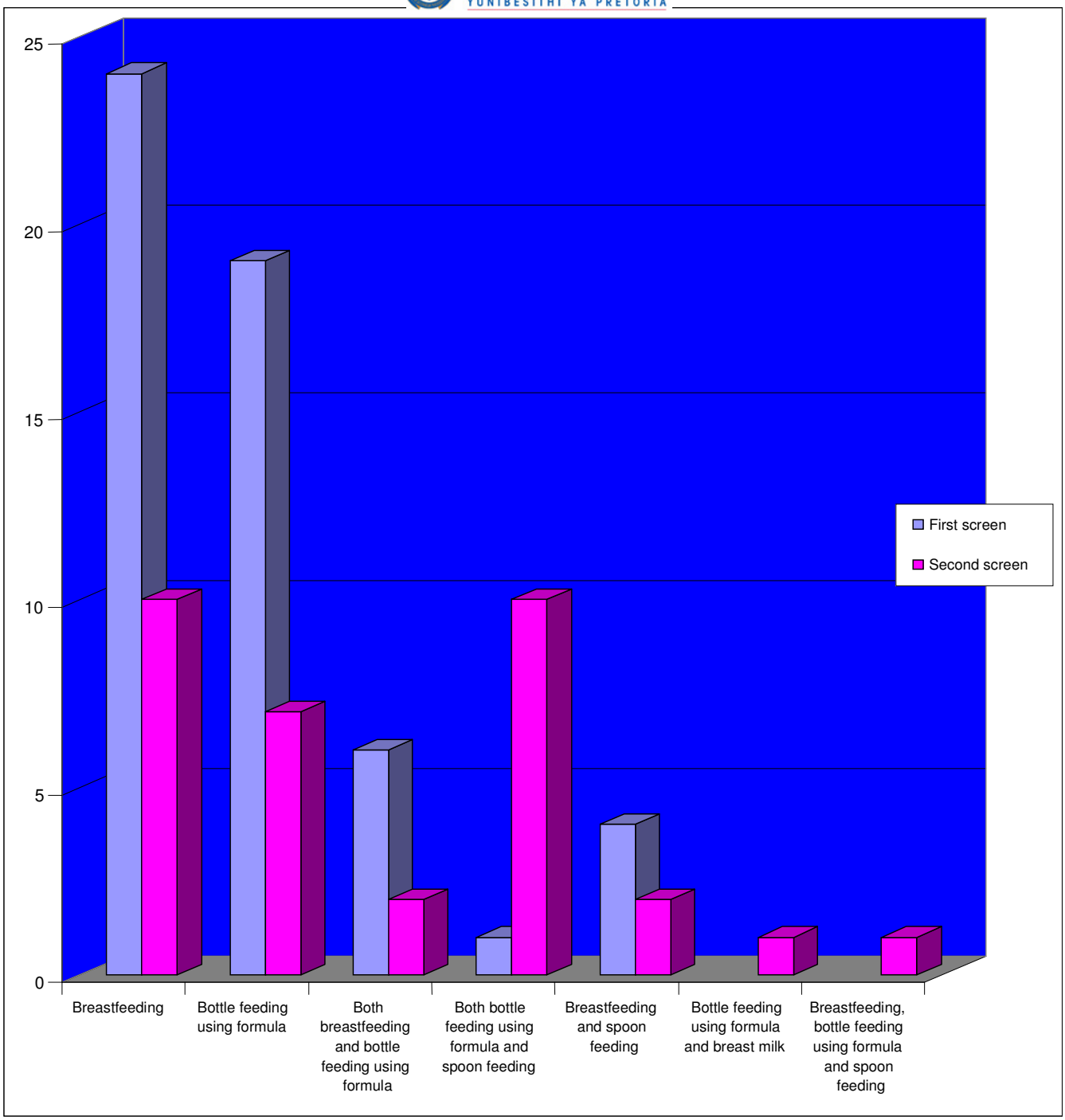

FIGURE 4.14: Distribution of feeding methods amongst infants at the first and second screening interval (n=55)

As shown in Figure 4.14, breastfeeding was the most common feeding method at the first screening interval (62%) in infants 0 to 3 months of age. However, formula feeding became the most common feeding method at the second screening interval (61%) in infants 3 to 6 months of age.

The study confidently concludes that 62% of the infants were breastfed at the first screening interval. Recent literature has indicated that mothers in rural areas of the United States of America tend to choose formula feeding over

breastfeeding as formula feeding is considered a status symbol due to the expense involved (Flower *et al.,* 2008:411). However, the continuation of breastfeeding beyond three months of age in the sample dramatically decreased by 58%. In the study conducted by Flower *et al.* (2008:410), it was found that 55% of women in rural areas of the United States of America initiated breastfeeding and only 18% of these women continued breastfeeding beyond six months of age. This is also true for African countries: even though most infants in sub-Saharan Africa are breastfed, rates of exclusive breastfeeding are low as early introduction of liquids and solid foods is a common practice (Doherty, Chopra & Colvin, 2006:26). South African guidelines for infant feeding recommend that all infants be exclusively breast-fed for the first six months of age in order to save the lives of millions of children in the developing context (Doherty *et al.,* 2006:26). Maternal employment, termination of maternity leave at three to four months, lack of assistance to rural breastfeeding mothers as well as bottle feeding being considered a status symbol amongst rural mothers contribute to the high discontinuation of breastfeeding in the sample.

Only six infants were identified with abnormal middle ear functioning in the study. Although the sample of infants with abnormal middle ear functioning was very small, the influence of the feeding method chosen on the presence or absence of abnormal middle ear functioning was significant and was investigated through the use of cross tabulation and is presented in Figure 4.15 below.

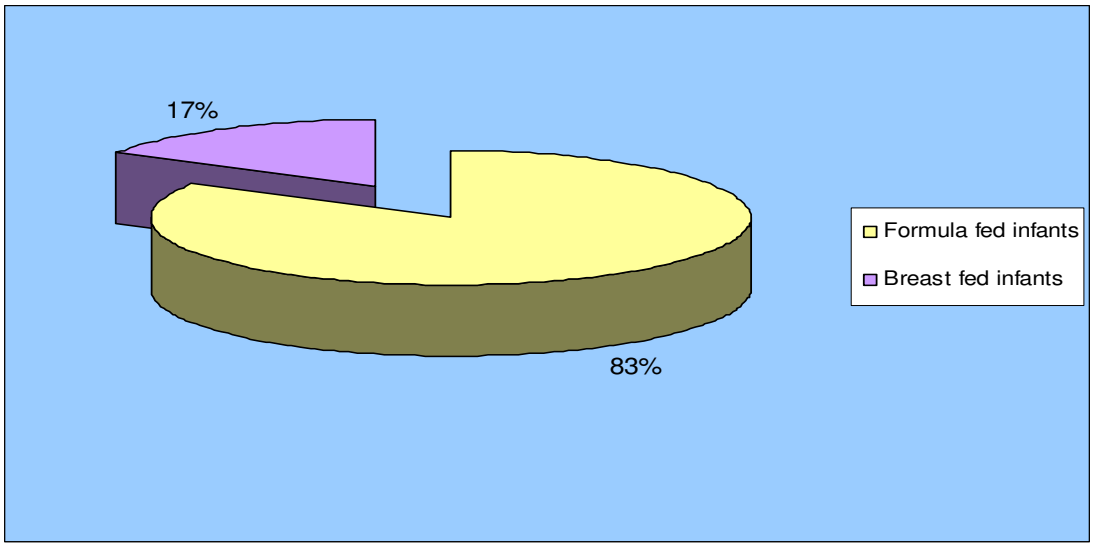

FIGURE 4.15: Prevalence of abnormal middle ear functioning amongst breastfed and formula fed infants (n=6)

According to Figure 4.15, abnormal middle ear functioning was more prevalent amongst formula-fed infants (83%) than breastfed infants (17%). This finding corroborates those of previous studies which have indicated that breastfeeding is associated with a decrease in the presence of abnormal middle ear functioning in infants (Dufy *et al.,* 1997:10; Duncan *et al.,* 1993:871).

It is apparent that formula-fed infants in this study had a much higher risk of developing abnormal middle ear functioning compared to breast-fed infants. However, the reasons for the protective function of breastfeeding are not clear. Immunocological factors, the feeding position and lack of irritation from bovine-based formula may explain the protection observed by breast milk (Riordan, 2005:114). This finding highlights the importance of informing mothers of the benefits of breastfeeding in order to prevent the discontinuation rate of breastfeeding beyond three months of age as indicated in the study.

4.4.2 Age at which infants were introduced to solid foods

The introduction of solids to infants participating in the study was determined from information gathered under the section of feeding in the Surveillance Tool for Communication Development and is displayed in Figure 4.16.

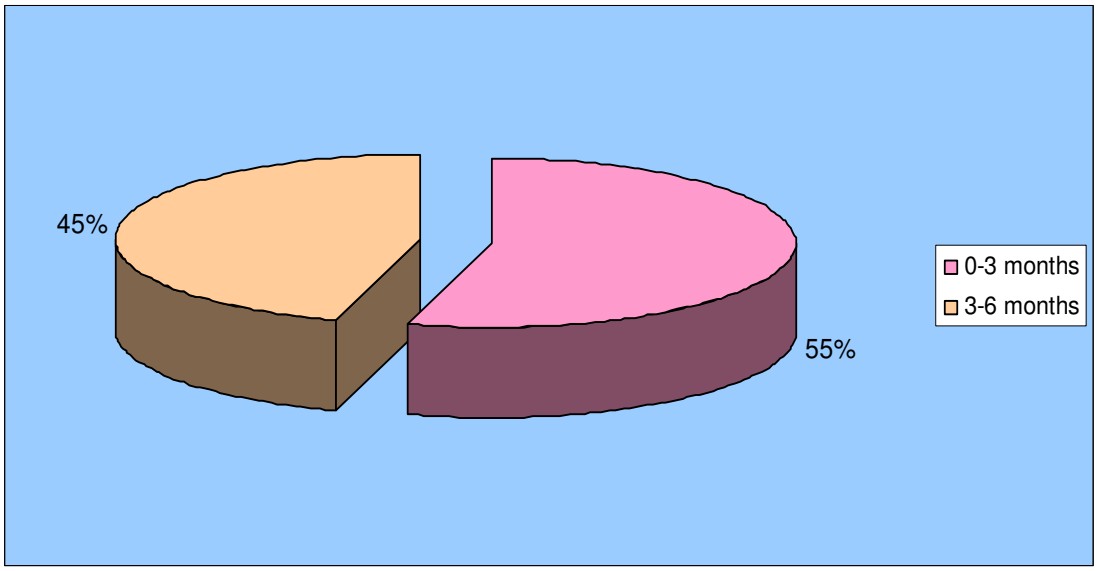

FIGURE 4.16: Intervals at which solids were introduced to the infants (n=55)

Figure 4.16 indicates that 55% of infants in the study were introduced to solid foods at the age of 0 to 3 months. It is, however, recommended that the introduction of solid food to infants occur between 4 to 6 months of age due to the immaturity of the gastrointestinal system (Forstyth *et al.,* 1993:1573). The early introduction of solid foods to infants in the study may be due to different child-rearing practices as well as poor socio-economic status amongst caregivers as solid food is less expensive than formula milk.

Although literature and professional opinion varies regarding the effect of the early introduction of solid foods, there is research which indicates that the early introduction of solids to infants can result in vomiting and diarrhoea due to the immaturity of the infant's gastrointestinal tract (Forstyth *et al.,* 1993:1573). Malnutrition is responsible for one-third of the 8.8 million deaths annually among children under five (UNICEF website, www.unicef.org, accessed 9 August 2010). Over two thirds of these deaths are often associated with inappropriate feeding practices such as bottle-feeding or untimely and inadequate complementary foods which occur during the first months of life (UNICEF website, www.unicef.org, accessed 9 August 2010).

The symptoms of vomiting and diarrhoea are present in sixty four percent of infants and children admitted to the paediatric ward at Lydenburg Hospital, making these conditions the most common paediatric illness treated by the hospital (Department of Information, Lydenburg Hospital, 2009). The high prevalence of diarrhoea and vomiting experienced by the hospital may be explained by a number of factors. Bottle feeding is known to be a contributing factor to vomiting and diarrhoea due to the insufficient facilities to support bottle cleaning and sterilisation in rural households (Flower *et al.,* 2008:411). As described in 4.4.1, a significant number of infants participating in the study were bottle fed and therefore bottle feeding could be a contributing factor to the high incidence of vomiting and diarrhoea in the research context.

4.4.3 Caregiver-child interaction

Figure 4.17 shows the percentage of caregivers and infants in the sample identified with limited caregiver-child interaction in the study.

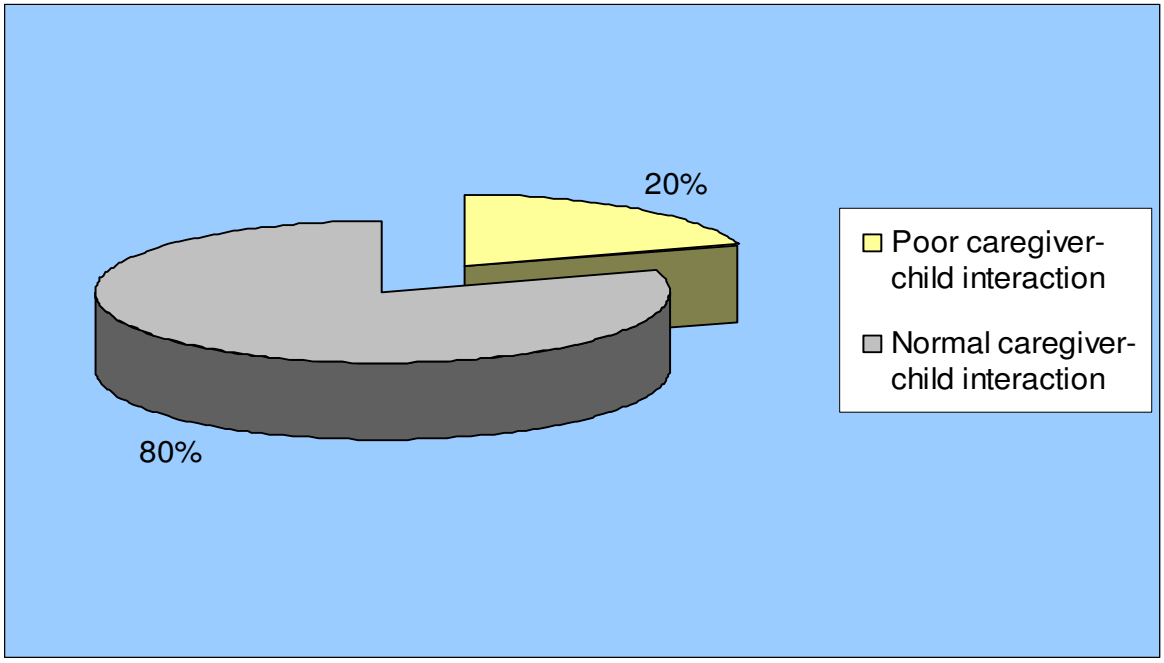

FIGURE 4.17: Percentage of caregivers and infants identified with caregiver-child interaction (n=55)

According to Figure 4.17, the majority of caregiver (80%) had normal caregiver-child interaction when the interaction was observed between the caregivers and their infants in the study. However, 11 caregivers and infants (20%) were identified with poor caregiver-child interaction. Caregivers and infants were identified with poor caregiver-child interaction when caregivers failed to respond appropriately to their infants, failed to look at their infants and were also unable to recognise when their infants were “happy” or “sad”. Poor caregiver-child interaction may be present due to the caregivers’ lack of knowledge on how to successfully interact with their infants. Swanepoel and Almec (2008:46) found that not all caregivers are equipped to facilitate optimal communication development in their infants due to lack of knowledge and information on how to do so.

4.4.4 General information regarding communication development

As previously indicated in Figure 4.5, 47% (26 infants) in the study were identified with delayed communication development. Figure 4.18 is used to show the number of infants identified with delayed communication development at the first and second screening intervals.

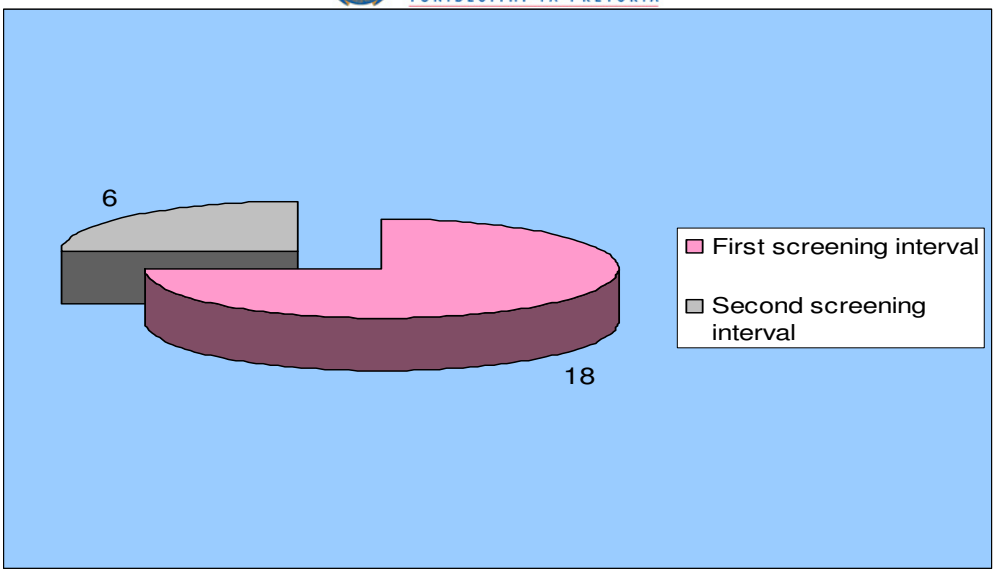

FIGURE 4.18: Number of infants identified with delayed communication development at the first and second screening interval (n=24)

According to Figure 4.18, out of the 26 infants who were identified during developmental surveillance, 24 of these infants were identified with delayed communication development. Due to the high number of infants identified in the study with delayed communication development, information should to be provided to caregivers regarding communication development in infants. Further, the importance of screening developmental milestones in infants at regular periods should be discussed. Information of such a nature would empower the caregivers to identify and suspect delayed communication development in their infants and seek intervention.

As identified by the current study, caregiver education during developmental surveillance at the Early Intervention Screening Clinic should include information on the protective function of breastfeeding on abnormal middle ear functioning, the potential harm of the early introduction of solids foods to infants, positive caregiver-child interaction as well as general information on communication development in infants. Prevention of communication disorders cannot occur in isolation and therefore information should be provided to caregivers during developmental surveillance visits by the professionals serving the infants and their caregivers. The provision of such information would be in line with current trends in early intervention, both locally and internationally, to focus on promoting wellness, optimal development and resilience (White Paper on Integrated National Disability Strategy, 1997:6).

4.5 CONCLUSION

It is concluded that the Surveillance Tool for Communication Development provided valuable information for the development and standardisation of an early identification tool within a PHC setting in Mpumalanga. The Surveillance Tool for Communication Development was found to be valid for use within a PHC context at Lydenburg Hospital. The results obtained in the study revealed that PHC clinics can be used as a platform for conducting developmental surveillance programs. Not only has the tool highlighted the influence of different risk factors on communication development, but it has been proven accurate in identifying infants between 0 to 6 months with typical communication development. Although the tool proved less accurate in identifying infants with developmental delay at the second screening interval, the tool has provided a basis for the further development of developmental surveillance tools for the South African population. Caregiver education is most effective when it is directly addresses specific needs.

4.6 SUMMARY

This chapter displayed, described, analysed and discussed the results of the research as they relate to the main aim of the study, namely to determine the validity of the Surveillance Tool for Communication Development for infants between 0 and 6 months in the Lydenburg area. The Surveillance Tool for Communication Development compared favourably with the results obtained on the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). A high prevalence of risk factors for communication disorders was identified in the sample. Certain topics for information sharing were highlighted for caregiver training during developmental surveillance visits.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The chapter reflects on the research conducted, drawing conclusions and highlights the theoretical and clinical implications of the results. A critical review of the study in order to discuss the implications of the results found is provided and recommendations for future research are made.

5.1 INTRODUCTION

Over the last quarter of the 20th century, there has been a boom in research discoveries that, for the most part, have not been successfully utilised for improving intervention and/or assessment procedures (Pober, Neuhauser & Pober, 2001:2304). This lack of success is surprising because there is a broad consensus within academic centres that a primary goal is to translate scientific discoveries into meaningful clinical outcomes. The limited success of translation can be attributed to various factors, the main reason being that translation is rarely straightforward and requires continuing research within the clinical context (Pober *et al.,* 2001:2304). Despite these challenges, it is the responsibility of those involved in research to interpret the findings of their studies into useful health gains for the community.

Dunst and Trivette (2009:41) describe the process used to conduct practice-based research syntheses which indicate the manner in which synthesis findings are used to inform and evaluate early childhood intervention practices. The main focus of a practice-based research synthesis is the unbundling of an intervention practice to identify those practice characteristics that are associated with desired outcomes and benefits for infants and their families, making the translation of research findings a possibility (Dunst & Trivette, 2009:41).

Translation of research findings to support evidence-based practice has been an essential component in the area of early communication intervention (ECI) (ASHA, 2008:2). Research in ECI has indicated that the prevention of delayed communication development and communication disorders is a worthwhile activity to invest in (Rossetti, 2001:263). In order to reduce the high

prevalence of communication disorders, long waiting lists and large caseloads in South Africa, all speech-language therapists and/or audiologists need to become increasingly involved in primary and secondary prevention efforts (Popich *et al.,* 2007:79). Prevention programs, such as the early identification of communication developmental delay and disorders, should utilise procedures which have strong research support in order to improve the effectiveness of such programs (Romanczyk *et al.,* 2005:220). Early identification through valid screening tools during developmental surveillance is the first step in allowing infants and their families to access early communication intervention services. The current study aimed to determine the validity of the Surveillance Tool for Communication Development on an infant population in a Primary Health Care context in Mpumalanga in order to standardise the tool for use within this specific context.

The findings of the current study provides evidence to support the use of the Surveillance Tool for Communication Development for the early identification of delayed communication development in infants within a primary health care (PHC) setting in Mpumalanga, South Africa. The aim of this chapter is to critically examine the research findings in order to discuss the implications of the results found and to provide an example from which developmental surveillance activities and tools in similar contexts in South Africa can be used and improved. Figure 5.1 provides an outline for the chapter.

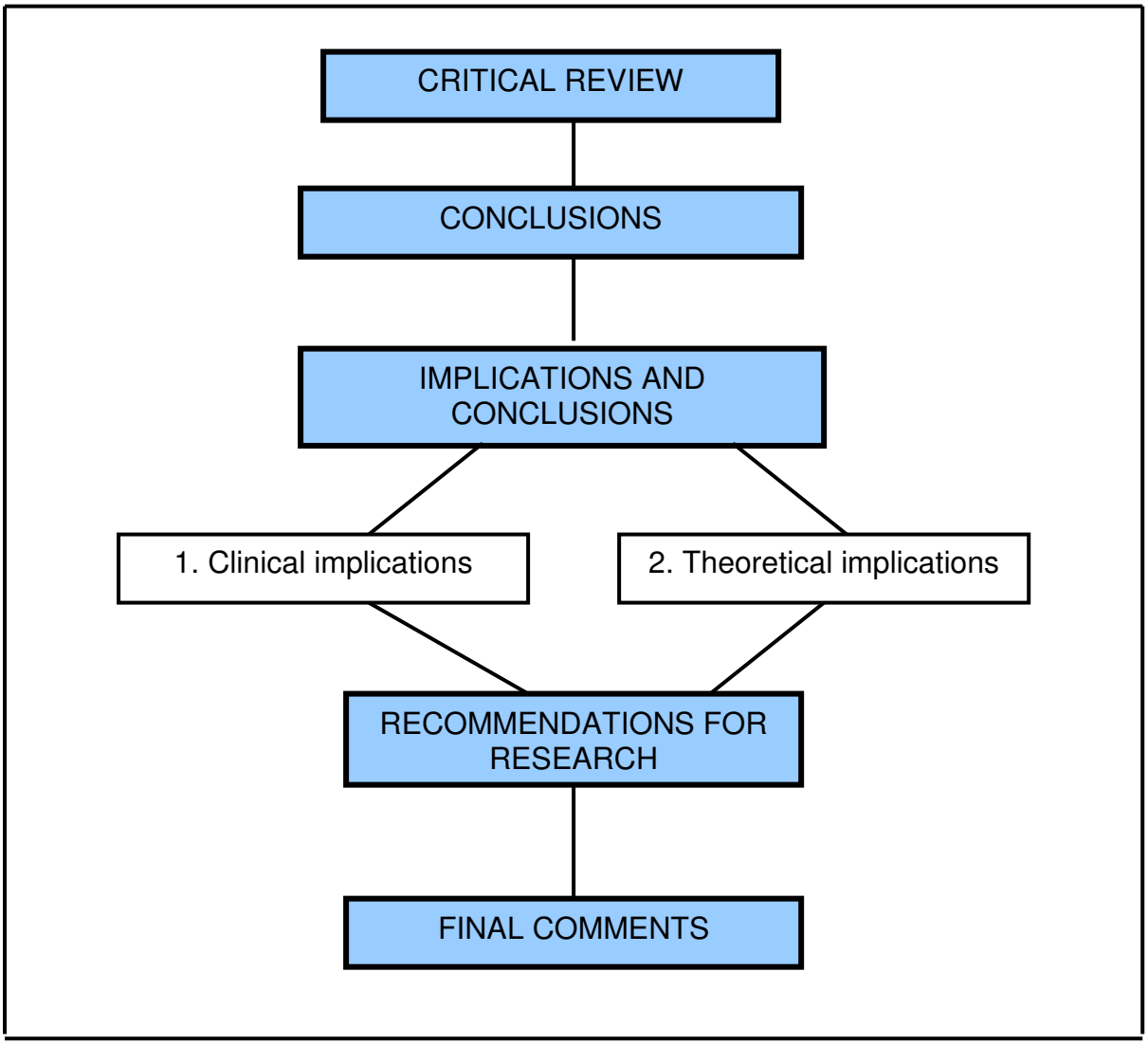

FIGURE 5.1: Outline of Chapter 5

5.2 CRITICAL REVIEW OF THE STUDY

It is important to acknowledge and discuss the positive aspects as well as the limitations which are inherent to this study in order to justify conclusions and gain perspective regarding the implications of the results (Denzin & Lincoln, 2000:162). The following section provides a critical reflection on the limitations and strengths of the research study.

5.2.1 Limitations of the study

Limitations of the current study pertain to the research context, instrumentation for hearing evaluations and the statistical analysis of risk factors and are discussed below.

The study was limited to the Lydenburg area in Mpumalanga, which is *area specific* and therefore the results cannot be generalised to all PHC contexts in South Africa. However, the context chosen is representative of a typical PHC context in South Africa. One manner in which to overcome this limitation is to reduplicate the study in more geographical contexts as to generalise the findings of the study (Leedy & Ormrod, 2001:61). By applying and testing the Surveillance Tool for Communication Development the findings of the current study will be validated. The current methodology may serve an example from which other tools can be developed depending on the nature of context.

The unavailability of instrumentation at the PHC hospital, in which the data was collected, prevented physiological hearing screening through the use of OAE or ABR measurements. Swanepoel & Theunissen (2008:24) have indicated that the lack of audiological testing and screening equipment in South African government hospitals is common to most government hospitals. By including physiological hearing screening measures in the study, a more accurate means of identifying hearing loss in infants would have been possible (JCIH, 2007:23). However, otoscopic and tympanometry results were obtained for each infant as well as asking the caregivers questions regarding the hearing abilities of their infants. These methods are suitable for the identification of middle ear pathologies but are not an accurate means of identifying infants with congenital hearing loss (Katz, 2002:441). Even though the method is not accurate in identifying infants with congenital hearing loss, this method aided in identifying two infants with confirmed hearing loss in the study. The results justify requesting the purchase of OAE or ABR screening equipment for the hospital.

Finally, a limitation in the data analysis of the variable of risk factors was identified. In the analysis of risk factors using inferential statistical methods, each risk factor was considered individually during statistical analysis. This method was used as the main focus of the study was not to determine the influence of risk factors on communication development in infants, but rather to determine the validity of the Surveillance Tool for Communication Development. As risk factors are known to have an accumulating effect on development, it is recommended that the Multiple Logistic Regression Model be used during statistical analysis of risk factors in future studies

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Diamantopoulos & Schlegelmilch, 2000:214). The Multiple Logistic Regression Model may be used to determine how each risk factor interacts with another to influence communication developmental outcomes (Diamantopoulos & Schlegelmilch, 2000:214). This model is used to analyse the relationship between one dependent variable and a number of independent variables and provides an assessment of the relative impact of each independent variable on the results (Diamantopoulos & Schlegelmilch, 2000:214). The model also calculates the combined ability of the independent variables in explaining the variation in the dependent variable (Diamantopoulos & Schlegelmilch, 2000:214).

Although limitations existed within the research, these did not negatively influence the data obtained in the study as measures were put into place to limit the impact of the limitations on the study as discussed above.

5.2.2 Strengths of the study

Many strengths were identified in the research and pertained to the use of a second fieldworker, interpreter, the early intervention program and the early identification of infants in the study. The strengths of the study are discussed below.

Research bias was reduced by using a second fieldworker in conjunction with the researcher to collect the data. In doing so, accurate data could be collected from the participants attending the Early Intervention Screening Clinic (Oliver, 2003:36).

The Early Intervention Screening Clinic is an established early identification program which makes use of developmental surveillance. By using an established early intervention program as the research context, a high return rate for developmental surveillance visits was attained. Further, the results obtained from the study may be integrated into adapting the current practice followed at the Early Intervention Screening Clinic through careful record keeping and establishing a database of the characteristics of infants and caregivers attending the clinic. Translation of the research findings into current practices followed at the clinic may improve the early identification of infants with delayed communication development (Dunst & Trivette, 2009:41).

As the clinic is an established program, translation of the research findings into the current practice can be easily performed.

The statistical procedures employed in the study were based upon accurate statistical methods and proved to yield valid results (Diamantopoulos & Schlegelmilch, 2000:189). Therefore, the statistical procedures employed in the study can be used in follow-up studies where instruments need to be validated.

A further strength was the use of an interpreter during developmental surveillance visits. Cultural and linguistic barriers may have impacted the results obtained in the study as both the infants and the caregivers were from different cultural backgrounds than that of the researcher (Louw & Avenant, 2002:146). However, the potential barriers of cultural diversity and low educational levels were overcome by gaining informed consent from the caregivers through the use of an *interpreter* when caregivers did not understand English or Afrikaans. By using an interpreter, the accuracy of the data obtained from the caregivers and caregivers improved and caregivers were more relaxed during the interview process. The caregiver interview, which formed part of the Surveillance Tool for Communication Development, was also completed through use of an interpreter when caregivers were unable to converse in English or Afrikaans, therefore aiding in the collection of accurate data as well as the inclusion of more caregivers in the study. The interpreter's knowledge of the clinic and risk factors enabled her to relay information obtained from the caregivers accurately.

Through developmental surveillance, a high number of infants with delayed communication development were identified in the study. For the twenty-seven infants identified during developmental surveillance in the study, early intervention due to early identification could become a reality. The findings of the study highlight the roles and responsibilities of speech-language therapists and/or audiologists involved in early intervention as set forth by ASHA (2008:6). ASHA (2008:6) advocates for the early identification of infants and young children at risk for delayed communication development and/or communication disorders so that evaluation can be used to establish eligibility for services, and more in-depth assessment can be provided to guide the

development of an intervention program. Two infants were identified with hearing loss in the study. These infants were fitted with hearing aids before 6 months of age and could receive ECI. This proves that for the early identification of hearing loss, the surveillance program at Lydenburg Hospital is essential, as evidence of the effectiveness has been show.

The strengths identified aided in the attainment of accurate data as well as a high return rate for developmental surveillance visits and the early identification of infants displaying signs of delayed communication development.

5.3 CONCLUSIONS

Certain conclusions were drawn based on the results of the study and are discussed according to the objectives of the study.

5.3.1 Objective 1: Description of risk factors for communication development

Important clinical characteristics of the participants in the study emerged from the gathering of information during developmental surveillance. The high prevalence of risk factors in the sample of the study was expected due to extra recruiting efforts as well as higher prevalence of risk factors such as low birth weight and premature birth in the South African context (Kritzinger, 2000:48; Pickering *et al.,* 1998:6). Supplementary to these factors, the presence of poverty among the participants increases their threat for risk factors as children under five years who are living in poverty not only suffer from poor health, but are also at greater risk for developmental, behavioural and educational delay (Lequerica, 1997:285). Risk factors are known to influence developmental courses and outcomes (Bang, 2008:1254). The increased prevalence of risk factors among the participants necessitates for developmental surveillance visits as a method for early identification of delayed communication development in the research context.

5.3.2 Objective 2: Validation of the Surveillance Tool for Communication Development

- **The sensitivity and specificity of the tool**

Literature on the early identification procedures during childhood emphasises the significance of developmental surveillance using a standardised instrument (AAP, 2006:411; Rydz *et al.,* 2005:5). The validity of the Surveillance Tool for Communication Development was determined by using methods and calculations which comply with international guidelines and recommendations. The Surveillance Tool for Communication Development proved to be successful in fulfilling its purpose, by comparing favourably with the Rossetti Infant-Toddler Language Scale (Rossetti, 2006). The validation of the Surveillance Tool for Communication Development in a rural PHC context provided evidence for the use of a tool for the early identification of infants within a developmental surveillance program. Moreover, the validation of the Surveillance Tool for Communication Development yielded additional benefits such as the identification of risk factors in the sample, the influence of risk factors on communication development and topics for caregiver education. Furthermore, through validating the tool, the research indicates that the early identification of infants displaying delayed communication development is a possibility in a PHC setting.

- **The infants performance during developmental surveillance**

The high prevalence of infants who were identified with delayed communication development in the study is indicative of the high number of risk factors which was identified in the sample. Developmental surveillance as well as the application of the One-Stop Model (Lequerica,1997:288) proved to be the best approach in ensuring that appropriate referral for diagnostic evaluation and referral to early intervention services was made during the study (Rydz *et al.,* 2005:6). The study has provided evidence to support the application of the one-stop model (Lequercia, 1997:298) in a PHC setting in South Africa. Furthermore, by following a developmental surveillance approach to early identification, two infants with confirmed hearing loss were identified in the study and 26 infants were referred for diagnostic assessment. Consequently, the Surveillance Tool for Communication Development has immediate value as its implementation was tested within a PHC context in South Africa.

5.3.3 Objective 3: Identification of topics for caregiver education

Topics identified for caregiver education reflect the developmental needs of the infants in the research context. The prevention function of breastfeeding, the negative effects of the early introduction of solid foods to infants, the importance of positive caregiver-child interaction and general information concerning communication development are all topics supported by the literature on providing training and support for families with low education (Flower *et al.,* 2008:411; Duncan *et al.,* 1993:871; Dufy *et al.,* 1997:10). The identified information areas are related to economic status as caregivers from poor socio-economic backgrounds are often less educated (Lequerica, 1997:286). The identification of topics for caregiver education allows for the implementation of interdisciplinary teamwork. As speech-language therapists and audiologists at the PHC hospital work in the absence of an established interdisciplinary team approach, training caregivers can help to form an interdisciplinary approach to teamwork among professionals.

5.4 IMPLICATIONS

Figure 5.2 is used to summarise the clinical and theoretical implications which have been identified based on the results obtained.

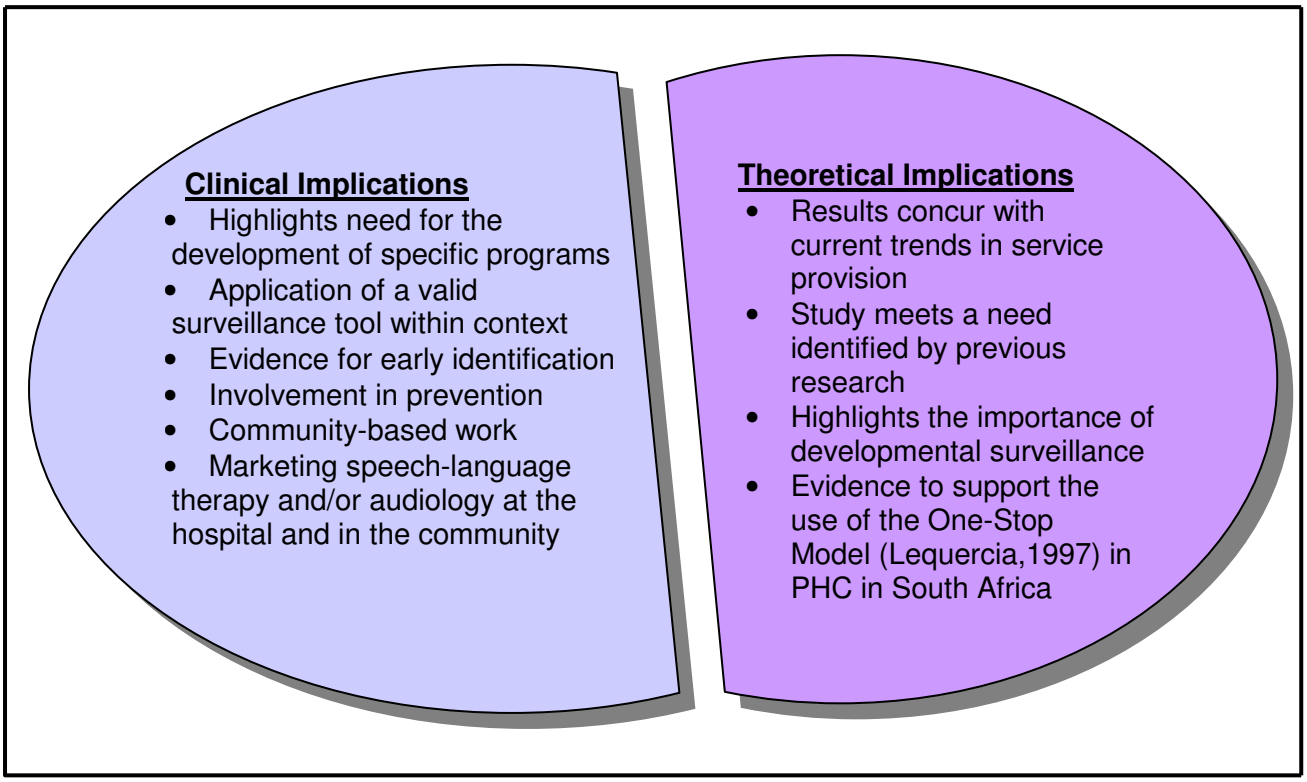

FIGURE 5.2: Clinical and theoretical implications identified from the research study

The clinical and theoretical implications of the research study, as indicated in Figure 5.2, are discussed below.

5.4.1 Clinical implications

Clinical implications present the key concepts, diagnostic, or therapeutic conclusions drawn from research results (Leedy & Ormrod, 2001:87). Clinical implications identified relate to the need for further programs, the application of a valid tool, community-based work as well as marketing of speech-language therapy and audiology services.

The negative impact of prematurity and low birth weight on the communication development of infants in the study indicates the need for implementing neonatal programs to foster the development of premature and low birth weight infants, such as kangaroo mother care (KMC) and developmentally appropriate care (Thurkral *et al.,* 2008:498). Infants who have undergone KMC, were found to gain weight quicker, have better thermal synchrony, feed better, experience stability in heart and respiration rate and show better mental and physical development than infants which have not received KMC (Thukral *et. al.,* 2008:498). Lydenburg Hospital does not have a formalised

KMC program and therefore, based on the results of the study as well as the proven benefits of KMC in South African hospitals, it is recommended that a KMC program be initiated at the hospital.

The Surveillance Tool for Communication Development can facilitate the process of speech-language therapists and/or audiologists in performing a prevention function through developmental surveillance programs. Newly qualified speech-language therapists and audiologists are required to perform a year of community service. The tool provides the ideal opportunity for speech-language therapists and audiologists to become involved in preventing communication disorders through early identification within an early intervention team. Speech-language therapists and/or audiologists should join other health care providers to form early intervention teams. If the success of these programs is well documented, then such programs could easily be used to justify for the implementation of supportive legislation as well as to acquire hearing screening equipment. The study has also highlighted the information areas for adult education to train parents about early communication development and their role, as indicated in the results of the study. The provision of adult education can be one of the most effective forms of prevention (Gerber, 1998:45). It is, however, essential that speech-language therapists wishing to use the tool in other contexts develop knowledge on screening procedures as well as the needs within their community to assess whether the tool would be appropriate for use within their context.

The presence and involvement of speech-language therapist and audiologists within PHC will increase the public's and health professionals' knowledge of the role which speech-language therapists and audiologists play in early identification of infants with risk conditions. The results from the study have proven that the Surveillance Tool for Communication Development is an effective tool for use within the research context. These results can justify the allocation of funds to the department as well as to start developmental surveillance programs in similar contexts. Further, improved knowledge of the roles and responsibilities of speech-language therapists and/or audiologists is built among professionals and the public, improving the number of referrals to speech-language therapy and/or audiology.

5.4.2 Theoretical implications

A critical review of research has indicated that the results of the study concur with current trends in service provision, such as early identification of infants displaying signs of delayed communication development. Theoretical implications are important for expanding the current knowledge base as well as for providing evidence to support findings and motivate for legislation (Leedy & Ormord, 2001:89). The theoretical implications indicated in the study are discussed below.

The Surveillance Tool for Communication Development meets a need identified by previous research namely the involvement of speech-language therapists and audiologists in prevention efforts (Popich *et al.,* 2007:72) as well as the need for screening tools for the South African population (van der Linde, 2008:64). The current study provides the first step in standardising an early identification tool for the Lydenburg infant population. The expansion of the tool as well as the testing of the tool in different research contexts may expand the current body of knowledge of developmental surveillance programs and tools. Further, the results from the study may also be used in training South African speech-language therapy and/or audiology students in early intervention and developmental surveillance by providing a practical example of an early identification program and tool.

This study has emphasised the important role which developmental surveillance programs have to play in the early identification of young infants already displaying delayed communication development and congenital hearing disorders. This is consistent with the principles of ECI which advocate that services be based on the highest quality internal and external evidence as well as being developmentally supportive and promoting children's participation in their natural environments (ASHA, 2008:3). Should similar studies be conducted in other contexts, a body of information will be obtained which could be used in the motivation of early identification services in position statements and eventually legislation mandating developmental surveillance services in South Africa. The Joint Committee on Hearing Screening (2007) in the United States of America has launched its position statement based on research findings both nationally and internationally.

From this position statement, the Health Professionals Board of South Africa (HPCSA) has provided guidelines for newborn infant hearing screening in South Africa (Swanepoel, 2004). A position statement specifically for the early identification of communication disorders is now needed.

Lequerica (1997:298) proposed a one-stop model for service delivery to facilitate coordination and communication among professionals and agencies involved in health care and ECI services in the United States of America. The proposed model meets the needs of low-income children and addresses some of the mothers' needs for information on behavioural or developmental issues. The Early Intervention Screening Clinic, which was used as the research context in the current study, employed the same principles used in the one-stop model proposed by Lequerica (1997:298). These principles included that services were accessible from one facility, were provided from a community-based agency which was already established, were interdisciplinary in nature and effective follow-up services were provided. The adherence to these characteristics can be considered the main contributing factor to the high return rate (91.7%) obtained in the study and can be used as support for the use of the one-stop model (Lequerica, 1997:298) in South Africa.

5.5 RECOMMENDATIONS FOR FURTHER RESEARCH

The study focused on a very specific community and as stated previously, the results cannot be generalised to other contexts in South Africa. However, certain inferences and predictions can be made for similar communities. The study may serve as the basis for further research where the use of the Surveillance Tool for Communication Development can be explored in other contexts in South Africa. This study may be replicated in other PHC contexts in South Africa which would serve as the first step in standardising the Surveillance Tool for Communication Development for the South African population or lead to the development of an improved tool for use in the local context (Stott *et al.,* 2001:143).

The current study focused on infants between 0 and 6 months of age who, following their immunisations, received developmental surveillance check-

ups. The coordination of services made the developmental surveillance visits easily accessible (Lequerica, 1997:288). However, the frequency of obtaining regular paediatric immunisations and health care visits tends to decrease after the infants have reached 24 months of age (Rydz *et al.,* 2006:1179). Therefore, it may be difficult to obtain and perform regular developmental check-ups following 24 months of age. It is recommended that research be conducted in order to determine the best method of reaching and identifying infants and young children at risk for developmental delay and disorders who are older than 24 months and have missed identification programs earlier in their lives.

Although the findings have provided important information on developmental surveillance, there is still limited information available on the process which follows after the identification of delayed communication development during developmental surveillance in South Africa (van der Linde, 2008:188). It is recommended that a longitudinal study be performed where infants who were suspected of having delayed communication development during developmental surveillance are followed from assessment to intervention in order to determine their success in accessing these services (Guralnick, 2001:2). As different communities have access to different resources (Pizur-Barnekow *et al.,* 2010:323), information needs to be gathered nationally. This information may be used to lobby for early intervention services as well as indicating strengths and weaknesses of the early intervention systems in South Africa.

Currently in South Africa, newborn hearing screening programs are mainly conducted either in the maternity ward before discharge, or at the 6-week immunisation visits (Swanepoel, 2004:24). In this study, physiological hearing screening could not be performed due to the lack of such equipment within the PHC facility. It is proposed that a future study be conducted where developmental surveillance and hearing screening, which makes use of physiological procedures, is combined in order to investigate the success of identification of milder hearing loss or late-onset hearing loss in infants and young children. Most newborn hearing screening projects focus on the identification of infants with bilateral or unilateral moderate to profound hearing loss (Joint Committee on Infant Hearing. 2007:31). Developmental

surveillance may be a means of identifying infants with late-onset or milder degrees of hearing loss (Gravel *et al.,* 2000:135).

5.6 FINAL COMMENTS

The study has contributed a unique body of knowledge toward developing a developmental surveillance program in a specific context as well as providing a model for the standardisation of developmental surveillance tools in South Africa. It is an important, although small initial step that contributes to the development of surveillance programs for all infants in South Africa. The study meets a need identified by previous research, namely, the need for a surveillance tool for use within a PHC context (van der Linde, 2008:189). In pursuit of comprehensive health care services for all South African infants, small-scale developmental surveillance projects now need to be implemented throughout South Africa. The procedures followed by the Early Intervention Screening Clinic can be reduplicated in other PHC contexts in South Africa in order to attain this goal. Further, developmental surveillance instruments need to be standardised within such programs.

The implementation of developmental surveillance programs nationally requires collaboration of professionals and agencies in the form of teamwork. Professionals involved in ECI need to be trained in early identification. Training in ECI services forms part of the ECI primary prevention functions and should be phased in at different PHC facilities.

It is time that the benefits of early identification through developmental surveillance and the use of standardised tools become a standard of care for all South African infants.

"The first three years last forever" (Squires et al., 1990:46)

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APPENDIX A: SURVEILLANCE TOOL FOR COMMUNICATION DEVELOPMENT (0-6 MONTHS)

Surveillance Tool for Early Communication Development

0-6 months Bronwyn Dekker, Prof Alta Kritzinger, Prof Brenda Louw

Adapted from: Wetherby, A. & Prizant, B. 2000. Infant/Toddler Checklist for Communication and Language Development. Symbolix: United States of America.
Owens, R. E. 2001. Language Development. An Introduction. Fifth Edition. Pearson Education: United States of America.

Child's Name:_____ Date of Birth:_____
Chronological age:_____ Gender:_____
Date 1st screen:_____ Date 2nd screen:_____
Caregiver:_____ Home language:_____

Pregnancy and birth history

Duration of pregnancy:
Birth weight:
Birth order:
Complications during pregnancy, birth, perinatal period:

Other:

	V1
	V2
	V3
	V4
	V5
	V6

Medical History

Illness:
Family history of developmental delay:
Other:

	V7
	V8
	V9

Risk factors identified

1.
2.
3.

	V10
	V11
	V12

Outcome of screening

1.
2.
3.

	V13
	V14
	V15

1. Caregiver-child interaction	Yes	No	Comments	
1.1 Is there anything which worries you about the baby?				V16
1.2 What can the baby do?				V17
1.3 Do you know when the baby is happy?				V17
1.4 Do you know when the baby is sad/upset?				V18
				V19
				V20
				V21

2. Senses	Yes	No	Comments	
2.1 Can the baby see?				V22
2.2 If not, why and/or when?				V23
2.3 Can the baby hear?				V24
2.4 If not, why and/or when?				V25
				V26
				V27
				V28
				V29

3. Emotion and Use of Eye Gaze	Not Yet		Some-times		Often	Typical Age		
	1	2	3	4	5			V30
3.1 Does the baby look at you?						From birth		V31
3.2 Does the baby become quiet when he/she hears your voice?						From birth		V32
3.3 Does the baby laugh when you play with him/her?						3 Months		V33
3.4 When you look at and point to a toy across the room, does the baby look at it?						5 Months		V34
3.5 When the baby plays with toys, does he/she look at you to see if you are watching?						6 Months		V35
4. Use of Communication	Not Yet		Some-times		Often	Typical Age		V36
	1	2	3	4	5			V37
4.1 Does the baby have different facial expressions?						4 Months		V38
4.2 Does the baby let you know when he/she needs help eg: when an object is out of reach?						5 Months		
4.3 Does the baby get upset when objects are taken away from him/her?						5 Months		
4.4 When you are not paying attention to the baby, does he/she try to get your attention/						6 Months		
5. Use of Gestures	Not yet		Some-times		Often	Typical Age		
	1	2	3	4	5			V39
5.1 Does the baby give objects to you?						6 Months		V40
5.2 Does the baby point to objects?						6 Months		
6. Understanding	Not yet		Some-times		Often	Typical Age		
	1	2	3	4	5			V41
6.1 Does the baby look for you?						4 months		V42
6.2 When you call the baby's name, does he/she respond by looking or turning towards you?						6 months		

7. Use of sounds	Not yet		Some-times		Often	Typical Age	
	1	2	3	4	5		V43
7.1 Does the baby make sounds while lying in his/her cot or when you are talking to him/her?						From birth	V44 V45 V46 V47
7.2 Does the baby use Sounds to get your attention Or help?						3 Months	
About how many of the following sounds does your baby use: ma, na, ba, da, Ga, wa, la, ya, sa, sha.	None		1-2		3-4		

8. Use of objects	Not yet		Some-times		Often	Typical age	
	1	2	3	4	5		V48
8.1 Does the baby play with lots of toys?							V49

9. Feeding							
9.1 How do you feed the baby?	Breast	Bottle	Cup	Syringe	Spoon	Other:	V50 V51 V52 V53
9.2 What do you feed the baby?	Breast milk		Formula		Other: specify		V54 V55
9.3 Do you have any problems feeding the baby?	Yes		No		If yes, why?		V56 V57 V58 V59

10. Information relating to auditory status						
10.1 Otoscopy		Left			Right	V60
10.2 Tympanometry		Left			Right	V61 V62
10.3 Does the baby become frightened by loud sounds	Not yet 1	2	Sometimes 3	4	Often 5	V63 V64 V65
10.4 Has the baby had any ear pain/secretions coming out of the ears?		Yes			No	V66
10.5 Has the baby received any medicine for his/her ears?		Yes			No	V67

APPENDIX B:
LETTER OF INFORMED CONSENT TO CAREGIVERS

UNIVERSITEIT VAN PRETORIA
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University of Pretoria

Department of Communication Pathology Speech, Voice and Hearing Clinic

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LETTER OF INCORMED CONSENT FOR THE PARTICIPATION IN THE RESEARCH PROJECT: THE VALUE OF A SURVEILLANCE TOOL FOR COMMUNICATION DEVELOPMENT IN A PRIMARY HEALTH CARE HOSPITAL IN MPUMALANGA

Date:

Dear Mom/Gran/Aunt/Dad

A DEVELOPMENTAL CHECK FOR YOUR BABY

I am a student at the University of Pretoria and am doing research at Lydenburg Hospital to look at the development of your baby. We will be asking you questions on what your baby is able to do now as well as observing your baby's development. This is so that we know that your baby is growing well and is able to do all the things he/she is needing to do at his/her age. We will also be using equipment to test your baby's hearing. The hearing test does not hurt. This check-up will be done twice, once at 0-3 months and again at 4-6 months of age. The test is free. The results of your baby's test will be used for hospital purposes to improve services to babies with needs. Your baby's name will not be used and all the results will be completely confidential. You are allowed to withdraw your baby from the study at any time. Permission to perform this research has been obtained from The Department of Health as well as from the Research Committee, Department of Communication Pathology, Faculty of Humanities, University of Pretoria. The information you give us will only be used for this research project. The information will be kept for 15 years and will then be destroyed.

If you want your baby to receive a developmental test, please fill in the attached consent form. If you have any questions, please contact me, Bronwyn Dekker Tel: 013 235 2233 extension 1066.

Thank you

_____	_____
Bronwyn Dekker Community service speech-language therapist and audiologist	Prof Alta Kritzinger University of Pretoria

Your Name:_____ Your Surname:_____

Your baby's name:_____

Your baby's surname:_____

Your baby's Age:_____

First language:_____

I hereby consent to participate as a research subject in the development screening project at the Lydenburg Hospital, if the researcher abides by the information given to me.

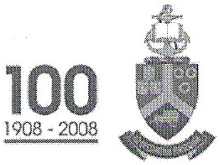
_____
Signature

Or as explained to me by _____ (interpreter)

_____
Interpreter signature

_____
Date

APPENDIX C:
ETHICAL CLEARANCE, UNIVERSITY OF PRETORIA



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities
Research Proposal and Ethics Committee

1 December 2008

Dear Prof. Louw

Project:	**The value of a surveillance tool for communication development used in a primary health care hospital in Mpumalanga**
Researcher:	**B Dekker**
Supervisor:	**Prof. B Louw**
Department:	**Communication Pathology**
Reference number:	**24129446**

Thank you for the well written application you submitted to the Research Proposal and Ethics Committee, Faculty of Humanities.

I have pleasure in informing you that the Research Proposal and Ethics Committee formally **approved** the above study on 25 November 2008. The approval is subject to the candidate abiding by the principles and parameters set out in her application and research proposal in the actual execution of the research.

The Committee requests you to convey this approval to Ms Dekker.

We wish you success with the project.

Sincerely

Prof. Elsabé Taljard
Acting Chair: Research Proposal and Ethics Committee
Faculty of Humanities
UNIVERSITY OF PRETORIA
e-mail: elsabe. taljard@up.ac.za

Research Proposal and Ethics Committee Members: Prof P Chiroro; Dr M-H Coetzee; Dr JEH Grobler; Prof KL Harris; Ms H Klopper; Prof E Krüger; Prof B Louw (Chair); Prof A Mlambo; Prof G Prinsloo; Mr C Puttergill; Prof H Stander; Prof E Taljard; Dr J van Dyk; Prof C Walton; Mr FG Wolmarans

APPENDIX D:
ETHICAL CLEARANCE, MPUMALANGA DEPARTMENT OF HEALTH AND SOCIAL SERVICES

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

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Department of Health and Social Services

Litiko Letemphilo Nemisebenti
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Umnyango WezePilo
neZehlalakuhle

Departement van Gesondheid
en Maatskaplike Dienste

Enquiries: Molefe Machaba (013) 766 3009/3235

20 May 2008

Miss Bronwyn Dekker
19 Farmers Folly
Lynnwood
Pretoria
0081

MPUMALANGA PROVINCE
DEPARTMENT OF HEALTH
PLANNING & INFORMATION
2008 -05- 20
PRIVATE BAG X 11285
NELSPRUIT 1200

Dear Miss Bronwyn Dekker

APPLICATION FOR RESEARCH & ETHICS APPROVAL: THE VALUE OF A SURVEILLANCE TOOL USED IN A PROMARY HEALTH CARE HOSPITAL.

The Provincial Research and Ethics Committee has approved your research proposal in the latest format that you sent. No issues of ethical consideration were identified.

Kindly ensure that you provide us with the report once your research has been completed.

Kind regards,

Molefe Machaba
Research and Epidemiology

20-05-2008
Date

Mpumalanga PHREC
Acting Chairperson: M. Machaba.

20-05-2008
Date

We care Do you?
Siyanakekela

APPENDIX E:
PERMISSION OBTAINED FROM THE CHIEF EXECUTIVE OFFICER AT LYDENBURG HOSPITAL

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

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Department Of Health & Social Services
Lydenburg Hospital

Litiko Le Temphilo ne Misebenti yeTenhlalakahle | Departement van Gesondheid en Maatskaplike Dienste | Umnyango We zamphilo ne Zomphakathi

I, Mohale, M. D, Chief Executive Officer of Lydenburg Hospital, hereby grant permission to Bronwyn Anne Dekker, speech-language therapist and audiologist, to carry out a research project in order to determine the value of a surveillance tool for communication development in Lydenburg Hospital.

Kind regards,

Signed
Chief Executive Officer
Lydenburg Hospital

23/04/08
Date

We care Do You?
Siyanakekela

APPENDIX F:
PERMISSION OBTAINED FROM REHABILITATION CO-ORDINATOR

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

MPUMALANGA PROVINCIAL GOVERNMENT

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I, Annelize De Jonge, Head of Rehabilitation services at Lydenburg Hospital, hereby give permission to Bronwyn Dekker, speech-language therapist and audiologist, to make use of the otoscope and tympanometer in her research project.

Signature

A. DE JONGE
Name

23/4/2008
Date

We care Do You?
Siyanakekela