

Differences in the prevalence of risk and protective factors for SIDS between Germany and the Netherlands



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Abstract

Background

Sudden infant death syndrome (SIDS) is the sudden and unexpected death of an infant younger than one year of age and older than one week of age, which remains unexplained after a thorough postmortem examination. Risk and protective factors of SIDS are well known. Familiar risk factors are the prone sleeping position, parental smoking and overheating and familiar protective factors are the supine sleeping position, sleeping in a sleeping-sack, the use of a dummy and breast-feeding. In 2011 the incidence rate in the Netherlands was 8.25 SIDS cases per 100 000 infants younger than one year, in Germany in 2010 there were 24.42 SIDS cases per 100 000 infants younger than one year of age.

Problem description

Most children that die of SIDS decrease between the age of two and six months. However, a clear explanation why there is an increased risk for SIDS within these months is lacking. Therefore, it is worthwhile to explore the prevalence of risk and protective factors for SIDS of parents of newborns and parents of children aged two to six months.

Furthermore, the incidence rate of SIDS in Germany is much higher than in the Netherlands. This difference might be the result of differences in the health care for infants and the prevention campaigns for SIDS between the two countries. Hence, there is a need to explore the prevalence of risk and protective factors for SIDS of German and Dutch children and to compare these to find possible differences. These differences can be used as an indication for new, adapted preventive advices for SIDS in Germany.

Methodology

Three slightly different questionnaires are used to collect data about risk and protective factors for SIDS. 872 mothers that gave birth at the hospital Maria-Hilf in Stadtlohn (North Rhine-Westphalia) filled out a questionnaire for newborns (Gnb) in the period October 2009 till April 2012. After three months these mothers were invited to visit the hospital again to fill out a second questionnaire. 74.8% (n=652) of the mothers (G3m) finally returned the questionnaire. In the Netherlands a random sample of 1500 mothers was selected from a TNO database and invited by e-mail to fill out a questionnaire (NL). The response rate was 49.3% (n=740). The frequencies per response category per variable of each questionnaire are calculated using SPSS. Furthermore, the chi-square test is used to compare the German newborns with the German three months old infants and the German three months old infants with the Dutch infants.

Results

The prevalence of the prone sleeping position is varying between the different populations (Gnb: 1.0%, G3m: 11.2%, NL: 3.1%). There are also differences between the sleeping places of the infants, especially for infants that sleep in their own bed in their parents' bedroom (Gnb: 59.5%, G3m: 45.2%, NL: 15.1%) and for infants that sleep in their own bed in their own bedroom (Gnb: 39.4%, G3m: 49.6%, NL: 81.2%). Most infants of both German populations sleep in a sleeping-sack without other bedding (Gnb: 81.2%, G3m: 84.7%). Only 19.6% of the Dutch infants sleep in a sleeping-sack without other bedding. Moreover, there are also differences for sleeping in a sleeping-sack in combination with a blanket/quilt (Gnb: 22.5%, G3m: 15.6%, NL: 63.8%), for sleeping under an eiderdown duvet (Gnb: 1.5%, G3m: 0.5%, NL: 1.6%) and for sleeping with a towel/diaper (Gnb: 1.6%, G3m: 1.7%, NL: 3.4%).

There are also variations in the use of a dummy for every sleep (Gnb: 13.5%, G3m: 30.2%, NL: 36.4%) and the occasional use of it (Gnb: 75.3%, G3m: 50.3%, NL: 26.9%). Furthermore, the prevalence of exclusively breast-feeding varies between the populations (Gnb: 61.9%, G3m: 34.4%, NL: 14.6%). In about 70% of the households of the three study populations nobody is smoking. Furthermore, most mothers of both German populations live together with a husband or partner. Also most of the respondents of each population speak the language at home that is mainly spoken in their country (German or Dutch). There are also differences in the educational level of the mother. In the German sample of three months old infants there are less no or low graduated mothers compared to the newborn sample. However, the German sample of three months old infants exists of more no, low or average graduated mothers compared to the Dutch sample. Finally, there are some variations in how many mothers got information about the risk factors for SIDS (Gnb: 84.4%, G3m: 94.1%, NL: 84.6%) and in getting the information from midwives (Gnb: 79.6%, G3m: 63.6%, NL: 26.4%), the pediatrician (Gnb: 57.4%, G3m: 27.5%, NL: 3.7%), journals (Gnb: 44.6%, G3m: 49.9%, NL: 36.3%), television (Gnb: 14.8%, G3m: 20.4%, NL: 1.9%), handouts (Gnb: 19.7%, G3m: 33.2%, NL: 3.0%), friends/relatives (Gnb: 14.6%, G3m: 9.3%, NL: 1.4%) and other information sources like amongst others literature or internet (Gnb: 7.1%, G3m: 10.1%, NL: 36.6%).

Conclusion

There are some differences in the prevalence of the risk and protective factors for SIDS between both North Rhine-Westphalian parents of newborns and of three months old infants as well as North Rhine-Westphalian parents of three months old infants and Dutch parents of infants. The main differences in the German comparative study are a higher prevalence of sleeping in a sleeping-sack and a quilt and occasionally getting a dummy in the newborn sample and a higher prevalence of prone sleeping, not using a dummy and not being breast-fed in the sample of three months old infants. The main differences for the German – Dutch comparative study are a higher prevalence of prone sleeping, sleeping in a sleeping-sack, parental smoking and occasionally getting a dummy in the German sample and a higher prevalence of supine sleeping, no room sharing, using a sleeping-sack in combination with a blanket, getting a dummy every sleep and not getting a dummy, no breast-feeding and a higher immunization rate in the Dutch sample.

Especially the prone sleeping position is a very important risk factor for SIDS and the incidence rate for SIDS is the highest at two to six months of age. The prevalence of 11.2% three months old infants in Germany who sleep in the prone position is alarmingly high. This partially might explain the high incidence rate for SIDS in Germany. Furthermore, the underrepresentation of the low educated mothers in the Dutch sample partially might explain the dissimilarities between the prevalence of adverse factors in the samples of both countries. Mainly, one can conclude that the differences between the samples possibly may increase the incidence of SIDS. Moreover, the differences create possibilities for improvements in the prevention campaigns for SIDS in both countries.

Strengths of this research are the preclusion of sampling bias in all samples, the use of longitudinal data for the German comparison and that the Dutch data comes from a big database which represents a large group of Dutch mothers. Limitations of this research are the differences in age between the German and Dutch sample, confounding of the results of the German questionnaires (getting information about SIDS and a sleeping-sack while filling out the questionnaire), selective drop out in the German sample of three months old infants and that not every question is filled in by every respondent.

Samenvatting

Achtergrondinformatie

Wiegendood is het plotseling en onverwachte overlijden van een zuigeling jonger dan twee jaar. Sudden Infant Death Syndrome (SIDS) is de term die wordt gebruikt bij kinderen ouders dan een week en jonger dan een jaar die plotseling en onverwacht overlijden en waarbij na een volledig post-mortaal onderzoek geen verklaring voor het overlijden is gevonden. Bekende risicofactoren voor wiegendood zijn buikligging, rokende ouders en oververhitting en bekende beschermende factoren zijn rugligging, het slapen in een slaapzak, het gebruik van een fopspeen en het geven van borstvoeding. In 2011 was de incidentie van SIDS in Nederland 8.25 gevallen per 100 000 zuigelingen jonger dan een jaar en in Duitsland was deze gelijk aan 24.42 gevallen per 100 000 zuigelingen jonger dan een jaar in 2010.

Probleemstelling

De meeste kinderen die aan wiegendood overlijden zijn tussen de twee en zes maanden oud. De exacte reden voor een verhoogd risico voor deze maanden is niet bekend. Daarom is het van belang om de prevalenties van de risico en beschermende factoren voor wiegendood bij ouders van nieuwgeborenen en ouders van twee tot zes maanden oude zuigelingen te achterhalen. De incidentie van wiegendood in Duitsland is vele malen hoger dan in Nederland. Dit verschil kan wellicht verklaard worden vanuit verschillen in de gezondheidszorg voor zuigelingen en verschillen in preventie programma's tussen de landen. Daarom is het van belang om de prevalenties van de risico en beschermende factoren voor wiegendood voor Duitsland en Nederland te achterhalen om mogelijke verschillen op te kunnen sporen. Deze verschillen kunnen aangrijpingspunten vormen voor aanvullingen op Duitse preventie programma's voor wiegendood.

Methode

Drie vragenlijsten zijn gebruikt om data over de risico en beschermende factoren van wiegendood te verzamelen. In de periode van oktober 2009 tot april 2012 hebben 872 moeders die in het Maria-Hilf ziekenhuis te Stadtlohn (Nordrhein-Westfalen) zijn bevallen (Gnb) de vragenlijst ingevuld. Na drie maanden zijn deze moeders gevraagd om terug te komen om een tweede vragenlijst in te vullen. Uiteindelijk is deze door 74.8% (n=652) van de moeders (G3m) ingevuld. Verder is een random steekproef van 1500 moeders uit een TNO database geselecteerd en via email uitgenodigd om een vragenlijst in te vullen. Deze uitnodiging is door 740 moeders nageleefd (NL). De frequenties zijn berekend per antwoordcategorie per variabele van elke vragenlijst. Verder is de chi-kwadraat toets uitgevoerd om de Duitse nieuwgeborenen met de Duitse drie maanden oude zuigelingen en de Duitse drie maanden oude zuigelingen met de Nederlandse zuigelingen te vergelijken.

Resultaten

Verschillen in de prevalentie van de buikligging tussen de verschillende populaties zijn opgespoord (Gnb:1.0%, G3m:11.2%, NL:3.1%). De populaties verschillen ook in de slaap plek en dan met name de zuigelingen die in hun eigen bed op de ouderlijke slaapkamer slapen (Gnb:59.5%, G3m:45.2%, NL:15.1%) en de zuigelingen die in hun eigen bed op de eigen slaapkamer slapen (Gnb: 39.4%, G3m:49.6%, NL:81.2%). Verder slapen de meeste zuigelingen van beide Duitse populaties in alleen een slaapzak (Gnb: 81.2%, G3m: 84.7%). Daarentegen zijn dit bij de Nederlandse zuigelingen maar 19.6%. Verder zijn er ook verschillen in de prevalentie van het gebruik van een slaapzak en een deken (Gnb:22.5%,

G3m:15.6%, NL:63.8%), een donsdeken (Gnb:1.5%, G3m:0.5%, NL:1.6%) en een handdoek/luier (Gnb: 1.6%, G3m:1.7%, NL:3.4%). De steekproeven verschillen in het gebruik van een fopspeen bij elke slaap (Gnb:13.5%, G3m:30.2%, NL:36.4%) en af en toe (Gnb:75.3%, G3m:50.3%, NL:26.9%). De prevalenties verschillen ook voor het geven van uitsluitend borstvoeding (Gnb:61.9%, G3m:34.4%, NL:14.6%). In ongeveer 70% van de huishoudens van elke populatie wordt niet gerookt. Verder wonen de meeste moeders van beide Duitse populaties samen met hun echtgenoot of partner. Bijna alle respondenten van elke populatie spreken de taal die voornamelijk in het betreffende land wordt gesproken (Duits of Nederlands). In de Duitse vergelijking zijn de niet of laag opgeleide moeders minder vertegenwoordigd in de steekproef van de drie maanden oude zuigelingen. In de Duits – Nederlandse vergelijking is deze groep juist minder vertegenwoordigd in de Nederlandse steekproef. De populaties verschillen in het aantal moeders dat informatie heeft gekregen over de risicofactoren van wiegendood (Gnb:84.4%, G3m:94.1%, NL:84.6%) en van wie de moeders informatie hebben gekregen, namelijk verloskundigen (Gnb:79.6%, G3m:63.6%, NL:26.4%), kinderartsen (Gnb:57.4%, G3m:27.5%, NL:3.7%), tijdschriften (Gnb:44.6%, G3m:49.9%, NL:36.3%), televisie (Gnb:14.8%, G3m:20.4%, NL:1.9%), handouts (Gnb:19.7%, G3m:33.2%, NL:3.0%), vrienden/verwanten (Gnb:14.6%, G3m:9.3%, NL:1.4%) en andere informatiebronnen zoals b.v. literatuur (Gnb:7.1%, G3m:10.1%, NL:36.6%).

Conclusie

Verschillen zijn gevonden in de prevalentie van de risico en beschermende factoren voor wiegendood in zowel de Duitse als de Duits – Nederlandse vergelijking. De belangrijkste verschillen in de Duitse vergelijking zijn de hogere prevalentie van het slapen in een slaapzak en een deken en het af en toe gebruiken van een fopspeen in de nieuwgeborenen steekproef en de hogere prevalentie van buikligging, het niet gebruiken van een fopspeen en het niet krijgen van borstvoeding in de steekproef van drie maanden oude zuigelingen. De belangrijkste verschillen in de Duits – Nederlandse vergelijking zijn de hogere prevalentie van buikligging, het slapen in een slaapzak, rokende ouders en het af en toe gebruiken van een fopspeen in de Duitse steekproef en de hogere prevalentie van het niet delen van een slaapkamer, het slapen in een slaapzak en een deken, het wel en niet gebruiken van een fopspeen tijdens slaap, het niet geven van borstvoeding en een hoger percentage gevaccineerde zuigelingen in de Nederlandse steekproef. Buikligging is een van de belangrijkste risicofactoren voor SIDS en de SIDS incidentie is het hoogst tussen de leeftijd van twee en zes maanden. De prevalentie van 11.2% van de drie maanden oude zuigelingen in Duitsland die op de buik slapen, is alarmerend hoog. Deze hoge prevalentie van buikligging in Duitsland en de andere opgespoorde verschillen kunnen mogelijk de hoge incidentie van SIDS in Duitsland en de verschillen in prevalentie van de risicofactoren tussen beide steekproeven mogelijk gedeeltelijk verklaren. Te concluderen valt dat de verschillen in de steekproeven mogelijk de incidentie van wiegendood kunnen verhogen. Verder scheppen de verschillen mogelijkheden voor verbeteringen van de preventie programma's voor wiegendood in beide landen. Sterktes van dit onderzoek zijn de exclusie van sampling bias in alle steekproeven, het gebruik van longitudinale data voor de Duitse vergelijking en het feit dat de Nederlandse data uit een database afkomstig is, die een grote groep Nederlandse moeders vertegenwoordigd. Zwakten van dit onderzoek zijn het verschil in leeftijd in de Duits - Nederlandse vergelijking, vertekeningen van de resultaten van de Duitse vragenlijsten door het geven van een slaapzak en informatie over wiegendood tezamen met het invullen van de vragenlijsten, selectieve uitval in de Duitse steekproef van drie maanden oude zuigelingen en het feit dat niet elke vraag door elke respondent beantwoord is.

Foreword

During the last three months we worked hard and with much pleasure to finally be able to present you the results of our research, which completes our bachelor of Health Sciences.

We have learned much about research during the process of writing this thesis. Examples are the project management and the corresponding pitfalls of continuously enhancing and adapting the thesis, as well as doing profound statistical analyses and establishing a good collaboration.

There are some people, who helped us during the process of doing this research. Without them, the result of the research would not have been the same as it finally is. Therefore we would like to thank them. First, we would like to thank Magda Boere-Boonekamp and Karin Groothuis-Oudshoorn for attending us, answering all of our questions and giving constructive feedback. Moreover, we thank Monique L'Hoir and Mechtild Vennemann for their enthusiasm about our research, providing the data and answering all of our questions. We also would like to thank Ellis Vlessert and Johanna Wegmann for critically reading our thesis on spelling and content. Finally, we thank all mothers from the Netherlands and Germany, who participated by filling in the questionnaires.

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Stephanie Blaset & Ursula Wegmann

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1. Introduction

Sudden infant death syndrome (SIDS) is the sudden and unexpected death of an infant younger than one year of age and older than one week of age, which remains unexplained after a thorough case investigation [1]. SIDS is by definition unexplained and at this time many risk and protective factors are known. The most important risk factors are prone or side sleeping, parental smoking, bed sharing, different types of bedding and a low socio-economic status. The most important protective factors are breast-feeding, immunizations, room sharing, the use of a dummy, the use of a sleeping-sack and being female.

There are differences in the incidence rates of SIDS between different countries. The Netherlands has a low incidence rate of SIDS in comparison with other countries. Germany has a relatively high incidence rate of SIDS. In both countries the incidence rate increased, had a peak and then decreased. The countries had different peaks at different moments, the Netherlands in 1984 and Germany in 1986. In general Germany has a higher incidence rate of SIDS than the Netherlands. In 2011 the Netherlands had an incidence rate of 8.25 SIDS cases per 100 000 infants younger than one year of age, while Germany had an incidence rate of 24.42 SIDS cases per 100 000 infants younger than one year of age in 2010 [2-4]. So, in comparison with Germany, the Netherlands has a low incidence rate for SIDS. Therefore, for this research, Dutch and German parents were asked to participate in a study in which the risk and protective factors for SIDS are investigated.

In the Dutch health care system there are several actors who are involved in the health care for infants, namely midwives, maternity assistants and well-baby clinics [5-7]. Moreover, in the Netherlands there are several campaigns addressing directly or indirectly the prevention of SIDS. In 1987 prone sleeping was discouraged at the well-baby clinics and a campaign to reduce smoking was launched in 1990, 'Roken, niet waar de kleine bij is'. Furthermore a leaflet 'Safe Sleeping' (Veilig Slapen) was circulated. Other kinds of prevention in the Netherlands are other advices (for example type of bedding), websites and a prevention guideline [8-11]. In Germany the three main actors in the health care for infants are the gynecologists, the pediatricians and the midwives [12-14]. Furthermore, in Germany there are several regional prevention campaigns for SIDS that promote the supine sleeping position, sleeping in a sleeping-sack and warn the parents of parental smoking. For example in North Rhine-Westphalia a sleeping-sack campaign was implemented [15]. Other projects are an EUREGIO project to educate mothers about the risk factors and reduce the incidence of SIDS, and GEPS (Gemeinsame Elterninitiative Plötzlicher Säuglingstod), an initiative from SIDS parents that supports affected families and performs prevention for SIDS [16-20].

The higher incidence rate in Germany compared to the Netherlands makes it interesting to study the prevalence of the risk and protective factors for SIDS of both countries. Differences between the prevalence of the risk and protective factors might be detected and can be used as an indication for giving recommendations for new prevention campaigns for SIDS in Germany. The goals of this research are to explore the differences in the prevalence of risk and protective factors between German newborns and German three months old infants as well as between German three months old infants and Dutch infants of about the same age. Finally, some recommendations will be given about which risk or protective factors need to be addressed in German prevention programs to diminish the differences in the incidence of SIDS between Germany and the Netherlands.

2. Theory

2.1 Sudden infant death syndrome

Sudden infant death syndrome (SIDS) is the sudden and unexpected death of an infant younger than one year of age and older than one week of age, which remains unexplained after a thorough case investigation. This case investigation contains a complete autopsy, an examination of the death scene and a review of both the clinical and the family history. This definition of SIDS is based on the International Classification of Diseases and Related Health Problems (ICD-10) and therefore mainly used in international literature [1,21,22]. The Pediatric Association of the Netherlands (Nederlandse Vereniging voor Kindergeneeskunde, NVK) uses another definition of SIDS. They define SIDS as the sudden and unexpected death of an infant younger than two years of age, because 15% of all infants who die because of SIDS in the Netherlands are dying in the period between one year and two years of age. This definition does not make clear whether infants younger than one week are also part of the risk group for SIDS [22]. In this report the definition based on the ICD-10 will be used.

According to the Cot Death Foundation (Stichting Wiegedood), most infants that die because of SIDS decrease between the second and sixth month of their life [23]. Figure 1 depicts the age distribution of SIDS cases, registered in conjunction with the German study on sudden infant death (GeSID), with the absolute numbers of cases on the y-axis and the age of the infant in weeks on the x-axis.

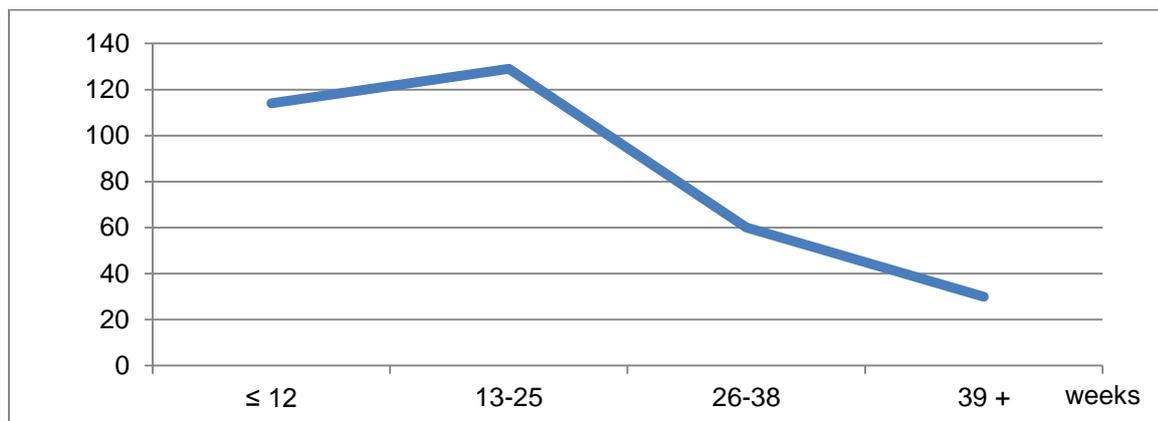


Figure 1: Age distribution (in weeks) of SIDS cases from GeSID (absolute numbers) [24].

The sudden infant death syndrome is part of the group of sudden unexpected infant deaths (SUID). SUID defines any sudden and unexpected death of an infant younger than one year of age and older than one week of age, whether explained or unexplained (SIDS). The distinction between SIDS and other SUIDs is difficult and can only be made by an autopsy, an examination of the death scene and a review of the clinical and family history of the deceased infant [21]. In some cases, physical abnormalities can be found, but these mostly do not give a complete explanation of the death. When during the case examination a cause of death is found, the deceased infant is not diagnosed with SIDS anymore. A classification of SIDS used by the working group of the Dutch Pediatrician Association (Landelijke Werkgroep Wiegedood, LWW) and based on the Avon classification of SIDS depicts the fluent transition from SIDS to other SUIDs and therefore shows the difficulty to distinct between SIDS and other SUIDs (see table 1) [22].

Table 1: Classification of SIDS [22].

Classification	Description
SIDS A	No physical abnormalities, or physical abnormalities which probably did not contribute to death
SIDS B	Minor physical abnormalities which probably contributed to death
SIDS C	Major physical abnormalities which do not give a complete explanation of the death
No SIDS	Physical abnormalities which completely explain the death

2.2 Risk factors and protective factors

Sudden infant death syndrome is by definition unexplained and many theories of causation have been proposed [25]. At the moment only the risk and protective factors of SIDS are known. A risk factor is a characteristic, a situation, a condition, a behavior or a person's environment that increases the risk for SIDS. The risk factors influence each other and thus influence the risk for SIDS. There are avoidable and non-avoidable risk factors. The avoidable risk factors can be modified, unlike the non-avoidable risk factors, which cannot be modified. In table 2, the risk factors are described [1, 24, 26]. In the following, the most important risk factors will be discussed.

Table 2: Avoidable and non-avoidable risk factors of SIDS.

Avoidable risk factors	Non-avoidable risk factors
Prone or side sleeping position	Pre-term delivery/duration of pregnancy
Swaddling	Low birth weight
Inappropriate environmental organization	Male gender
Lack of adequate developmental stimulations	Age of the mother
Maternal smoking during pregnancy	Low socio-economic status
Parental smoking (father and/or mother) after delivery	Parity
Fluffy/stuffed bedding, pillow, duvet	Ethnicity
Co-sleeping/bed-sharing	
Overheating	

One of the major risk factors is the infant prone sleeping position. The prone sleeping position is on the belly. A covered head and body are correlated with this position. The secondary prone sleeping position, turning from another position to the prone position, also increases the risk for SIDS. Side sleeping is a risk factor as well. Side sleeping is a risk on its own, but an added effect is that the infant easily can turn to the, even more risk increasing, prone position [27]. Sleeping on the belly with the face down can have unfavorable consequences. The body temperature of the infant can be regulated less easily than in the supine position. The body is warmer and the temperature rises more rapidly. In the prone position the babies are more vulnerable to rebreathe their own expired gases, the arousal threshold is higher, hypoxia may have more effects which eventually leads to death, there is a compromised cerebral blood flow due to neck extension, the baby moves less and the heart rate is higher [28]. An important preventive program is the campaign with the motto 'Back to sleep', which is used in most western countries. In the Netherlands the campaign is called 'Veilig Slapen' and in Germany the campaign is called 'Die optimale Schlafumgebung

für Ihr Baby'. This campaign encourages parents to place their infants in the supine position for sleeping. After the implementation of this program, the incidence rate of SIDS in most countries decreased [8].

Smoking during pregnancy and after delivery is another important risk factor for SIDS. Maternal smoking during pregnancy exposes the fetus to smoke via the uterus, resulting in a higher risk of sleep disorders, like difficulties to fall asleep and a more irregular sleep, in combination with an increased irritability and tremors in the waking state. Changes in sleep integrity and altered arousal mechanisms have been repeatedly implicated in literature about SIDS [26]. The number of cigarettes the mother smokes determines the risk of maternal smoking. The more cigarettes are smoked, the higher the risk for SIDS [24]. Maternal smoking is also a risk for the development of the unborn child. Postnatal parental smoking was found to be a major risk for SIDS. When both parents are smoking there is even a higher risk [1].

Bed sharing is defined as the practice of sharing a sleep surface between adults and young children. Bed sharing strongly increases the risk of SIDS, which is even higher when parents smoke and with infants who are younger than 12 weeks of age [29]. Also the duration of bed sharing influences the risk. Infants who spend the whole night in bed with their parents have a higher risk for SIDS than infants who spend parts of the night in bed with their parents [26].

Teddy bears, pillows, blankets, duvets and other beddings in bed are also risk factors for SIDS. Fluffy or stuffed bedding increases the risk of CO₂ rebreathing. Low oxygen breathing potentially leads to death [1]. A duvet or pillow can cover the child's face and next to possible suffocation, the temperature may rise to risk increasing levels. [30]. In a Dutch research about SIDS, a correlation was found between duvet use and being found in bed with a covered head and body. The combination of both means an increasing risk [27].

A low socio-economic status is reported to be a relevant risk factor for SIDS [31]. The age of the pregnant mother, the ethnicity and the education of the mother are related to her socio-economic status. A low socio-economic status is associated with a higher mortality risk of the infant around pregnancy and birth. For example most of the teenage-mothers have a low socio-economic status and so their babies have a higher risk for SIDS [32].

A protective factor decreases the risk for SIDS and therefore has a defensive effect. In table 3 the protective factors are described [1,22]. Next, the most important protective factors will be discussed.

Table 3: Protective factors for SIDS.

Modifiable protective factors
Breast-feeding
Immunization
Use of a dummy
Room sharing
Use of a sleeping-sack
Supervision
Daily routine

There is a protective effect for the use of dummies; placing the infant to sleep with a dummy would reduce the risk with 50% (in New-Zealand) to 84% (in the Netherlands) [27]. The use

of a dummy may prevent the infant to put its face down and also may avoid respiratory obstruction. Furthermore, it may prevent the infant from sleeping under the bedding, because it soothes the infant. The sucking is very important, because it helps keeping the tongue in the front of the mouth and therefore it ensures upper airway patency [27]. Pacifiers or dummies are recommended in the Netherlands and Germany for all infants until the infant is one year old [33]. The brochure Safe Sleeping recommends to use clean dummies and to use dummies only as an aid to fall asleep and to comfort the baby. If a dummy is used, it is important that parents use it consequently, for all sleep moments. This is because the dummy prevents the infant to turn in the prone sleeping position, which is a risk factor for SIDS [34]. Moreover, it is recommended that after one year the use of the dummy has to be phased out [35]. The American Academy of Pediatrics also advises parents to consider offering a dummy to infants at bedtime, up to the age of 12 months [34].

Children have twice a higher risk for SIDS when they are not breast-fed. Breast-feeding reduces the risk with 50% at all ages. The protection continues as long as the infant is breast-fed. The World Health Organization (WHO) recommends exclusive breast-feeding for the first six months of life. It reduces the mortality and morbidity of infants. The most likely mechanism that reduces the risk for SIDS is the immunological effect, which prevents infections [36].

Immunizations may also be a protective factor for SIDS. It is known that there is no relation between SIDS and immunizations, but according to a study from Germany, immunizations could reduce the risk for SIDS. Also cross-immunizations with different types of bacteria or viruses protect the infants [37].

Room sharing means that the infant sleeps in its own bed in the same room as its parents. There is evidence that room sharing has a protective effect for SIDS, probably because the parents are able to supervise their child easier [21-22] The parents, who sleep more lightly, can prevent their baby from turning to or sleeping in the prone position. A study from New Zealand suggests that parents should be advised to sleep in the same room as their baby at night, at least until the infant is six months old and has passed the age of the highest risk for SIDS [38].

Finally, the use of a sleeping-sack has a protective effect for SIDS. By using the sleeping-sack, the infant automatically lays in the supine sleeping position and the sleeping-sack avoids turning prone. When a thin sleeping-sack is used, a thin blanket can be tucked in, which prevents turning to prone even more. When a thick sleeping-sack is used, no extra bedding is necessary, which prevents an infant to get with the face under the bedding and prevents overheating. Therefore, the sleeping-sack is protective for hyperthermia and hypoxia [27]. A combination of a sleeping-sack and a duvet is risk increasing.

2.3 Health care for infants and prevention of SIDS in the Netherlands

In the Dutch health care system, there are different actors that are involved in the care for infants. The three main actors are midwives, maternity care and well-baby clinics. Other actors are gynecologists and pediatricians. Parents receive advice and recommendations about SIDS, which are given in the guideline, from these professionals. Moreover, they get brochures and information about SIDS. In the following, the different tasks of the health care professionals within the care for infants will be discussed.

Midwives support mothers before, during and after delivery. The midwife is responsible for the health of mother and child in uncomplicated pregnancies and deliveries. The main tasks of the midwife are the physical examination of the mother and child and giving advice and information to the mother. The midwife performs the role of a coach and counselor for the mother during and after her pregnancy. Furthermore, the midwife can decide to send the mother to another specialist if necessary [6]. Midwives work together with gynecologists. A gynecologist treats diseases of woman [39]. Furthermore, the gynecologist is a doctor who is medically qualified to do examinations and interventions. For these examinations and interventions the midwives are not qualified. When there are complications during pregnancy, the mother has to go to the gynecologist [40].

The maternity care assists the midwife during the delivery. Every woman in the Netherlands has the right to use the maternity care for 49 hours. The maternity care supports the family with instructions, advice, information and hygiene care related to birth. Maternity care takes place at the home of the mother [7].

The well-baby clinics follow the growth and development of children younger than four years. The well-baby clinic team consists of a youth health care doctor, a youth health care nurse and a well-baby clinic assistant [41]. The well-baby clinics are part of the youth health care. The tasks of the clinics are determined by the government and laid down as the basic duties package in the Netherlands. Examples of tasks are signaling risks, supporting the parents, following the child's development, growth and health and answering questions and problems of parents. Moreover, parents have the right of child-rearing support and children have the right of unconditional support. Thus, well-baby clinics support the parents and children. For SIDS it is important that the clinic team answers the parents' questions, supports them and gives advice and information about prevention [5]. Furthermore, the well-baby clinics vaccinate children. When parents enroll their child in the municipality, the well-baby clinic makes an appointment with the parents and informs them about what the well-baby clinic can do for them. A couple of times a year, the parents get an invitation to visit the clinic (see appendix 4). The use of the clinic is free and not obligatory [42]. In the first year, the parents can visit the well-baby clinic seven times and in the second, third and fourth year once.

Pediatricians are specialized in health care for children. A few pediatricians are part of the working group of the Dutch Pediatrician Association, who has every half a year a meeting about SIDS cases. The pathologist and/or pediatrician have to follow the protocol for physical examination of the deceased child and hence make the diagnosis for SIDS [43]. A pediatrician is specialized in treatment and examination of childhood diseases. He or she treats children with a congenital abnormality or disease and children who have an impaired development or growth. Furthermore, the pediatrician supports not only the children but also the parents [44].

From 1970 onwards, the prone sleeping position was recommended and at the same time the incidence of SIDS increased [9]. In 1987, a correlation between the prone sleeping position and an increased risk for SIDS was detected. From then on the advice to let the infant sleep in the supine sleeping position was implemented in the Netherlands [10].

Additionally, the campaign 'Roken, niet waar de kleine bij is' was introduced in 1990. This campaign advises parents not to smoke in the proximity of their children. Public media and the well-baby clinics warned the parents of passive smoking [22]. Other advice like the type

of bedding, bed sharing, supervision of the infant and type of nutrition were added to the cot death prevention in 1993 [8].

In 1996, the 'Consensus Prevention Sudden Infant Death Syndrome' was introduced. This consensus, which was subscribed by all occupational groups that participate in guiding and advising parents, contains the risk factors and advice for the care of the infant [9]. The Consensus from 1996 was replaced in 2007 by the Dutch Child Health Care Guideline Prevention SIDS [8]. The guideline describes advices for parents. All professionals working in child care are responsible to give these advice to the parents of children between one day and three years of age. The most important recommendations of the guideline are the supine sleeping position, no parental smoking, a not too warm sleeping environment, a safe sleeping environment and a safe environment when the baby is awake [11]. The protocol for day care centers, also from 2007, was attached to the guideline [8].

The Dutch parents can get information about SIDS from several websites and from health care professionals that are involved in the health care for infants. For everyone who takes care of an infant, there is a leaflet 'Veilig Slapen' (Safe Sleeping), which contains advice and recommendations [23]. The leaflet is provided by the Foundation for the Study and Prevention of Infant Mortality, in short Cot Death Foundation (Stichting Wiegedood). The foundation was founded in 1996 in cooperation with parents, health care professionals and other specialists. Their aim is to reduce the incidence of SIDS. Therefore, they perform different activities, like research, prevention, providing information, public relations, professional education and fundraising [23]. www.Veiligslapen.info is a website of the foundation and it contains evidence-based information about SIDS for parents [45].

2.4 Health care for infants and prevention of SIDS in Germany

In Germany, several health care professionals are involved in the health care for infants. The three main actors are the gynecologist, the pediatrician and the midwife. Furthermore, if necessary, also the pediatric nurse and maternity centers are involved in the health care for infants. In the following, the fields of activity of each of these professionals will be described in the sequence the mother and infant get in contact with the health care professionals.

The gynecologist is one of the actors who are involved in the health care of infants. He is the medical expert concerning pregnancy. There are different tasks the gynecologist has to perform at pregnant women, according the obstetric guideline. First, the gynecologist has to do the general preventive examinations of the pregnant woman and the unborn infant. In these examinations, the growth of the uterus, the heart sound of the infant and the infant's position in the uterus have to be examined. Second, the gynecologist has to make the diagnosis and treatment according to the risk of the pregnant woman with the aim to treat possible upcoming problems on time. Furthermore, the gynecologist has to inform and advise the pregnant woman about her own and the infant's condition. The aim of this is to create awareness for changes and to reduce the fear and nescience of the mother [45].

The midwife is another main actor who is involved in the health care of the infant. The midwife is the professional concerning pregnancy, birth and the follow-up. Therefore, the midwife usually is the most important contact person from the beginning of pregnancy until the end of lactation. In Germany, every woman has the right to get supported by a midwife [13]. There are several services of the midwife that are paid by each statutory health insurance company. In table 4, the services, which are paid by each statutory health

insurance company, are listed. Especially in the consultations, the mothers can ask questions regarding the infant care and receive support with caring for their infant. Therefore, prevention can be performed best during these consultations. However, as shown in table 4, it is not clearly indicated in the guidelines that the midwives also have to perform prevention of several infant health problems [14].

Table 4: Midwifery services, which are paid by statutory health insurance companies in Germany [14].

Midwifery services
Consultations
Preventive examination of pregnant women
Assistance with problems during pregnancy, pelvic presentation, preterm contractions
Prenatal classes
Obstetrics
Child-bed care
Breast-feeding counseling
Postnatal gymnastics

In Germany, it is also possible to get supported by a family midwife. These midwives usually work in families where the mothers need intense assistance with the daily care of their children. This group of mothers mainly consists of teenager mothers, families with a migration background, women and/or partners with mental stress or problems of addiction, chronically ill women and women with experiences of violence. The support of family midwives is possible until the infant is at an age of one year [13].

The pediatrician is a further main actor in the health care for infants in Germany. His main task is to perform the preventive medical check-ups of infants. For German infants younger than one year, there are six free and obligatory preventive medical check-ups (see appendix 5). The parents are obligated to comply with these medical check-ups. Therefore neglected check-ups will be reminded. When an infant is born, the parents will get a yellow booklet, which serves as a documentation booklet for all preventive medical check-ups until the age of five years. The first two medical check-ups mostly are performed at the hospital. The other four medical check-ups have to be performed by a pediatrician, who is chosen by the parents. Moreover, beside these medical check-ups also information is given to the parents about immunization of the infant. The medical check-ups do not aim at informing and educating the parents about important aspects of infant care [12]. The characteristics of the six preventive medical check-ups for infants younger than one year will be described in appendix 5.

Other actors, which are involved in the health care of infants, are pediatric nurses and maternity centers. Pediatric nurses usually work in hospitals. The main duties of pediatric nurses are to care for and to observe ill infants, children and adolescents during the hospitalization [47]. Thus, pediatric nurses are only part of the infant care during the hospitalization of the mother and the infant. Another part of infant care are maternity centers, which belong to the local public health departments. The main function of maternity centers is to advise, instruct and support mothers in the daily care of their infants and children till they are six years old. The information mothers receive mainly refers to nutrition and care,

development of the child and disruption of the development by daily problems, immunizations and preventive medical check-ups and procurement of further services. Mothers are not obligated to visit the maternity center and thus only mothers who think they need the help and support of the maternity center are using the services [48].

Summing up, all health care professionals monitor the health and the development of the children. Furthermore, they all advise and support the parents and give necessary information to parents. Hereby, they try to ensure that the infant can grow up in an environment as healthy as possible. In contrast to this, it seems that the health care professionals all fail at providing information about how to prevent SIDS, because the task description of each professional do not name prevention of infant health problems. For though the continuous contact with the pediatrician and the midwife provide the possibility of prevention.

Since the early 1990s, the supine sleeping position has been promoted in many industrialized countries. Also maternal smoking during pregnancy and heat stress were identified as risk factors for SIDS. Therefore, prevention campaigns in many industrialized countries were centered on these risk factors. According to Vennemann et al., there has never been a nationwide prevention campaign in Germany, but only localized promotion of the supine sleeping position [24]. Meanwhile even more risk and protective factors of SIDS are known. Next, some of these prevention campaigns will be discussed.

A first great success concerning a decreased incidence rate of SIDS can be reported in Hamburg. Since 1995, the "Hamburger Bündnis gegen den Plötzlichen Säuglingstod" (Hamburger alliance against SIDS) has been active on the field of prevention for SIDS. A working group of the alliance meets twice a year to create information material and to organize activities related to the prevention of SIDS. Furthermore, the alliance yearly organizes expert talks to discuss themes related to SIDS prevention. Through the work of the alliance, the incidence of SIDS in Hamburg decreased from 15 children in 1996 to three children in 2010 [49].

In April 2008, the sleeping-sack campaign of hospitals in North Rhine-Westphalia began. The aim of this campaign is to encourage the use of a sleeping-sack in hospitals and at home. With the use of a sleeping-sack, the risks of covering the head, overheating and the side and prone sleeping position can be reduced. The idea is to offer the parents that they can keep the sleeping-sack when they leave the hospital after birth. In addition, they get information about risk and protective factors and the prevention of SIDS. If there are hospitals, which do not use a sleeping-sack, they just can inform the parents about the risk and protective factors and the prevention of SIDS [15].

Since 2009, another project has been organized by EUREGIO (an organization that establishes and supports cross-border structures between Germany and the Netherlands), in cooperation with the Universities of Münster, Duisburg-Essen and Twente, TNO Leiden and the Association of Statutory Health Insurance Physicians Westfalen-Lippe. The project 'Sudden Infant Death Syndrome' has two different goals. The first goal is to elucidate the risk factors of SIDS to midwives, pediatric nurses, pediatricians and employees of the maternity centers, so that they can provide the parents of newborns with information. Hereby, the project aims to reduce the incidence of SIDS to 0.3 cases per 1000 live births in the EUREGIO-area until 2012. The second goal is to systematically investigate the deaths of

children who suddenly died within their first two years of life. Through this, possible risk factors can be detected and further deaths can be prevented [16-17].

Also the common parents' initiative sudden infant death syndrome Germany (Gemeinsame Elterninitiative Plötzlicher Säuglingstod Deutschland e.V., GEPS), among other things, implements prevention of SIDS. The GEPS has three different goals. The first one is to support families who are affected by a SIDS case. Second, the GEPS wants to enlarge the network of services that helps families and occupational groups that are affected by SIDS. Finally, the GEPS aims to elucidate the public about the avoidable risk factors for SIDS. However, the GEPS is not represented in all parts of Germany and therefore no nationwide prevention can be provided by the GEPS [18-20].

Summing up, there are many possibilities and enough capacity to implement prevention for SIDS all over Germany, though a nationwide prevention campaign for SIDS is missing.

2.5 Comparison of health care for infants and prevention of SIDS in the Netherlands and Germany

In Germany and the Netherlands the health care for infants is comparable with each other. The role of the Dutch youth health care doctor is comparable with the role of the German pediatrician. However, the youth health care doctor especially aims at prevention and the pediatrician especially aims at cure. Moreover, in both countries the midwives are responsible for the support of the mother before, during and after delivery. In Germany there is also a family midwife, but not every mother uses it. The task of the (family) midwife is comparable with the Dutch maternity care. The difference between the German and Dutch health care professionals is, that the Dutch professionals provide information and prevention to the parents about SIDS and the German professionals give advice and information about how to care for the infant. Concerning the prevention of SIDS, there has never been a national prevention campaign in Germany. Moreover, the advice of the supine sleeping position started much later in Germany than in the Netherlands. In 2008, in North Rhine-Westphalia the sleeping-sack campaign started and in 2009 the project Sudden Infant Death Syndrome began. In comparison with Germany, the Netherlands started much earlier with prevention campaigns for SIDS, like the supine sleeping position, smoking, other advices about risk and preventive factors and guidelines. Furthermore, in the Netherlands there are also websites with information about SIDS. In Germany, websites are upcoming. A last difference is the content and layout of the brochures. In the Netherlands the text of the brochures is short, simple and many pictures are used. This is developed to be able to reach the more difficult groups, such as teenage mothers and parents with a low socio-economic background. Furthermore, the brochures are translated in English, French, Turkish and Arabic (for the Moroccan population). The German GEPS brochure has a few pictures and much text.

2.6 Epidemiology

To be able to describe the occurrence of SIDS, the number of SIDS cases per year and the incidence rate are used. The number of SIDS cases per year can be defined as the absolute number of SIDS cases (incidence) in the country. In the case of SIDS, the incidence rate is the number of cases that dies because of SIDS in one year, divided by the average number of infants younger than one year in that specific year per 100 000. Hereby, the incidence rate of SIDS per 100 000 infants younger than one year is calculated per year [50].

In the Netherlands, it is the duty of Statistics Netherland (Centraal Bureau voor de Statistiek, CBS) to register the number of SIDS cases each year. The registration of the number of SIDS cases in the Netherlands began in 1969, because then a first definition and the term SIDS was proposed [51]. In 1969, there were 12 children who died because of SIDS. Therefore, the incidence rate in 1969 was 5.01 SIDS cases per 100 000 infants younger than one year. From 1969 onwards, there was an increase in the number of SIDS cases, probably because of the promotion of the prone sleeping position [9], with a peak of 218 children who died because of SIDS in 1984. Thus, the incidence rate in 1984 was 127.06 SIDS cases per 100 000 infants younger than one year of age. Since 1984, a decreasing trend can be seen in the number of SIDS cases. In 2011, 15 children died of SIDS, which is an incidence rate of 8.25 SIDS cases per 100 000 infants younger than one year [2, 3].

Summing up, a decrease in the incidence rate of SIDS can be noticed. The question remains, whether this decrease is a real decrease or whether this decrease is due to misclassifications in the registration of SIDS. Misclassifications in the registration of SIDS means, that the infants who died of SIDS are registered as infants who died of adjacent categories of SIDS. According to the Cot Death Foundation (Stichting Wiegedood), the adjacent categories of SIDS are acute respiratory tract infections, pneumonia and influenza, bronchitis, cause of death unknown or indefinite, suffocation by food and accidental suffocation in cot or bed [23]. Figure 2 shows that there is a parallel development of the absolute numbers of SIDS and of SIDS plus its adjacent categories. This means, that the curves are not shifted and therefore that a real decrease in the incidence rate of SIDS can be noticed which is not due to misclassifications in the registration.

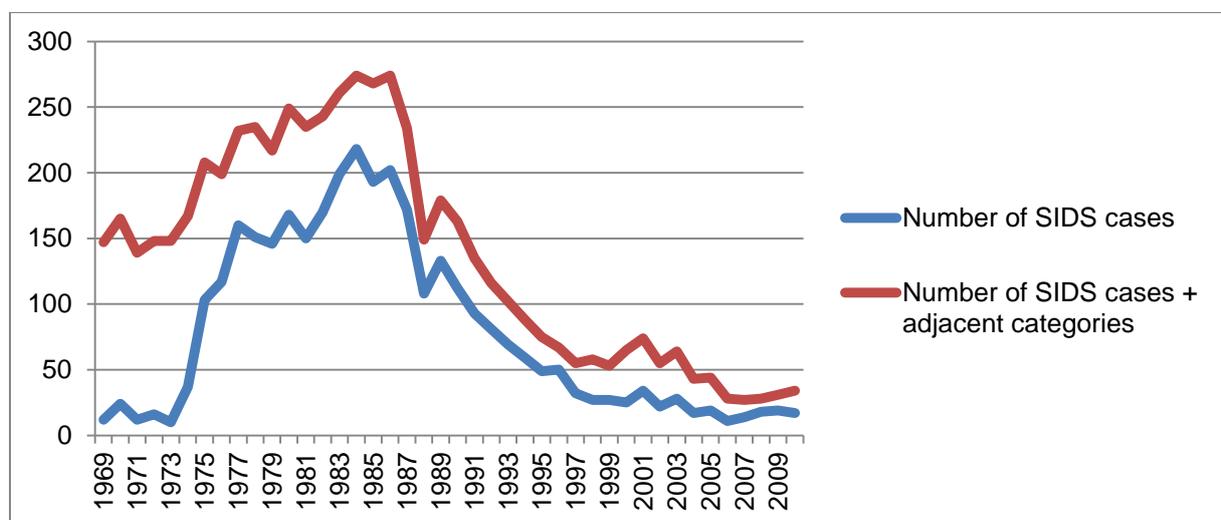


Figure 2: Absolute numbers infant mortality (younger than one year) because of SIDS and SIDS + adjacent categories in the Netherlands (1969-2010) [52].

According to literature, the decrease of the incidence rate of SIDS can be explained by the implementation of several prevention campaigns in the Netherlands. In October 1987, the advice of the supine sleeping position was introduced. This advice was complemented in 1993 by some advices concerning the smoking habits of the parents, the type of bedding, bed sharing, supervision of the infant and type of nutrition. These advices are considered to be the main reasons for the decrease of the incidence rate of SIDS [53]. In 1998 secondary prone sleeping and change of routine were added as risk factors and the use of a sleeping-sack and a dummy were added as protective factors.

In Germany, the registration of the number of SIDS cases began in 1980 and is done by the Federal Statistical Office (Statistisches Bundesamt, DESTATIS). The registration of causes of death in Germany is based on the law on statistics of population movement and the extrapolation of the population, which is announced on 14th march 1980 [54]. Beside the difference between the start of the registration in the Netherlands and in Germany, there is also a difference in the trend of the incidence rates of both countries. In 1980 there were 662 children younger than one year of age dying of SIDS as the cause of death. This is an incidence rate of 110.73 SIDS cases per 100 000 infants younger than one year. From 1980 onwards, the number of SIDS cases in Germany increased. The peak of the incidence rate was in 1986, when the incidence rate was 168.84 SIDS cases per 100 000 infants younger than one year of age. From 1986 onwards till 1989, there was a slight stagnation of the incidence rate. Therefore, the incidence rate in 1989 was 167.02 SIDS cases per 100 000 infants younger than one year. Since 1989, a decrease of the number of SIDS cases can be noticed, which continues until now. Thus, in 2010 there were 164 cases of SIDS registered in Germany, which is an incidence of 24.42 SIDS cases per 100 000 infants younger than one year [4]. The development of the German and Dutch incidence rate of SIDS from 1969 to 2010 is depicted in figure 3.

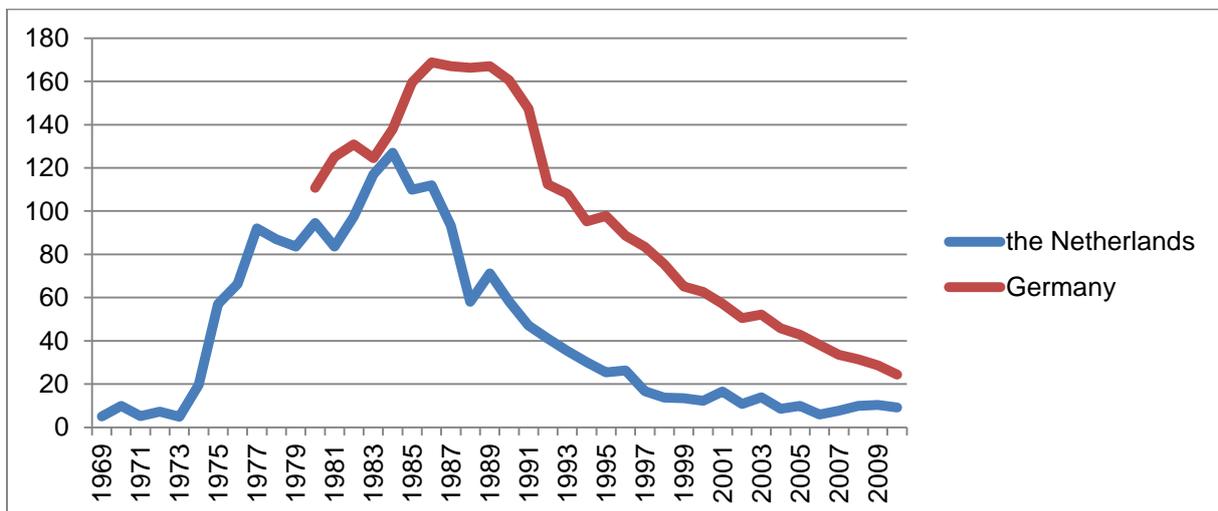


Figure 3: Incidence rate of SIDS per 100 000 infants younger than one year in Germany (1980-2010) and the Netherlands (1969-2010) [2-4].

There are also differences in the incidence rates of SIDS between different parts of Germany. According to Vennemann, Poets and Bajanowski [30], historically the incidence rate in the eastern part of Germany was much lower, because in 1972 the German Democratic Republic (DDR) passed an enactment that abolished the prone sleeping position. Therefore, in 2010 no SIDS cases were registered in Brandenburg [55]. In the former Federal Republic of Germany (western Germany), there are still some differences in the incidence rate. In Bavaria e.g., there is an incidence rate of 24.7 per 100 000 infants younger than one year, which assimilates with the average incidence rate in Germany [56, 57]. The highest incidence rate in Germany has always been in North Rhine-Westphalia (NRW) [30]. Thus, in 2010 there was in incidence rate of 25.39 per 100 000 infants younger than one year, which is still above the German average [58, 59].

As one can see, there are some differences in incidence rates of SIDS between the Netherlands and Germany. In both countries first the incidence rate increased, then had a

peak and after that decreased. However, the development of the incidence rates differs in the time horizon. In the Netherlands, there is a peak in 1984 and from then on the incidence rate decreases until 2010. In Germany the peak was not until 1986. Another difference is that in Germany there is an overall higher incidence rate of SIDS than in the Netherlands (see table 5), but there is almost no difference in the total infant mortality between Germany and the Netherlands. It might be stated, that the higher incidence rate of SIDS in Germany does not result in a higher total infant mortality (figure 4).

Table 5: Comparison of the Dutch (1969-2011) and German (1980-2010) SIDS mortality rate per 100 000 infants younger than one year of age [2-4].

Year	Country	Netherlands	Germany
1969		5.01	-
1970		9.98	-
1971		5.21	-
1972		7.32	-
1973		4.94	-
1974		19.59	-
1975		56.96	-
1976		66.33	-
1977		91.95	-
1978		87.05	-
1979		83.64	-
1980		94.56	110.73
1981		83.62	125.02
1982		97.46	130.89
1983		116.90	124.46
1984		127.06	137.88
1985		109.90	159.53
1986		111.89	168.84
1987		93.13	167.03
1988		58.11	166.35
1989		71.26	167.02
1990		58.21	160.56
1991		47.08	147.35
1992		41.14	112.36
1993		35.30	108.01
1994		30.19	95.24
1995		25.35	97.81
1996		26.25	88.59
1997		16.73	83.48
1998		13.77	75.44
1999		13.45	65.17
2000		12.23	62.69
2001		16.54	57.11
2002		10.83	50.45
2003		13.89	52.18

2004	8.62	45.77
2005	9.98	42.85
2006	5.92	38.11
2007	7.67	33.56
2008	9.86	31.41
2009	10.30	28.62
2010	9.22	24.42
2011	8.25	-

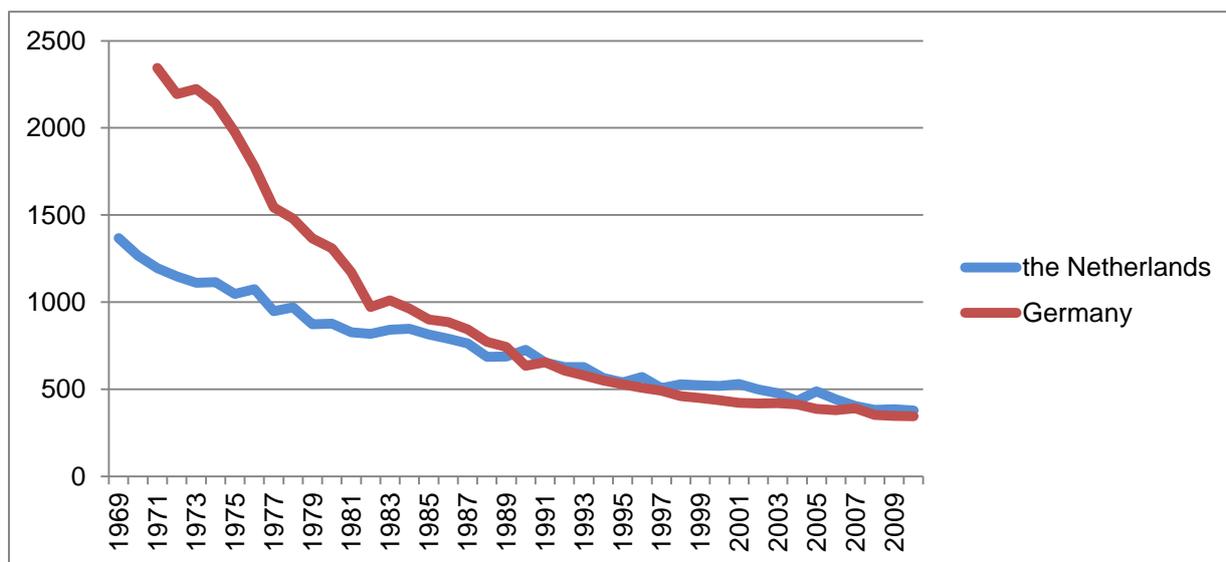


Figure 4: Incidence rate of infant mortality per 100 000 infants younger than one year in Germany (1971-2010) and the Netherlands (1969-2010) [2-4, 60].

3. Research question

3.1 Problem description

Literature shows that most infants, who die of SIDS, decess within their first year of life. As mentioned earlier, most of them die between the age of two and six months (see figure 1) [5]. One can state that there is an increased risk for SIDS within these months. However, the literature fails to explain why there is an increased risk for SIDS within the second and sixth month of life. A logical conclusion would be, that there is an increase in the prevalence of the risk factors for SIDS and/or a decrease in the prevalence of the protective factors for SIDS within these four months. Hence, there is a need to explore the prevalence of risk and protective factors for SIDS of parents of newborns and parents of children aged two to six months. Hereby, possible differences in the prevalence of the risk and protective factors between these two groups could be detected that possibly explain the higher incidence of SIDS within the second and sixth month of life.

Furthermore, literature shows that the incidence rate of SIDS in Germany is much higher than in the Netherlands (see figure 3). These differences in the incidence rate probably can be a result of differences in the registration and definition of SIDS between the two countries. Therefore, there is a need to examine whether the differences in the incidence rates of SIDS between the two countries is a real difference or is a distorted difference due to misclassification in registration or differences in the definition of SIDS.

As mentioned earlier, both countries use the same definition of SIDS for the registration of SIDS cases. This means, both statistical offices register SIDS cases as the sudden and unexpected death of infants between the 8th and 365th day of life, which remains unexplained after a thorough case investigation. This case investigation exists of a complete autopsy, an examination of the death scene and a review of both the clinical and the family history [1-3]. So differences in the definition between both countries can be eliminated as a cause of the differences in incidence rates.

Also the misclassification in the registration of SIDS can be eliminated as a cause of the differences in incidence rates. Misclassification in the registration of SIDS means that also the infants who died of adjacent categories of SIDS are registered as infants who died of SIDS. Misclassification in the registration can be eliminated because of one specific reason. The thorough case investigation usually precludes that infants who died of adjacent categories of SIDS are registered as SIDS cases. This can be supported by the fact that curves of the absolute numbers of SIDS cases and of the absolute number of SIDS cases plus adjacent categories develop parallel and are not shifted (see figure 2). The curve shows that a real decrease in the incidence rate of SIDS cases can be noticed and that the differences between the incidence rates of the two countries are not due to misclassification in the registration of SIDS [2-4].

Misclassification in the registration of SIDS and differences in the definition of SIDS can be eliminated as avoidable causes of the differences between the incidence rates of both countries. Therefore, it can be stated that the differences in incidence rates between the two countries are real differences that are a result of differences between the care systems and prevention campaigns of the two countries. The differences in health care systems and the differences in prevention campaigns between Germany and the Netherlands are closely related to each other. In the Netherlands the parents usually use the services of well-baby

clinics, maternity care and midwives, who give them advice, support them and are responsible for the health of the mother and child [5-7, 22, 43]. Every mother receives preventive information about SIDS from these professionals [61]. The health care professionals in Germany monitor the health and development of the child and give support to the mother, but they all fail at providing prevention about SIDS [13, 14]. In Germany, the prevention campaigns are also organized on a local level and are not aligned to each other [62], while in the Netherlands coherent prevention campaigns for SIDS are organized by the government and performed by health care professionals [8].

Summing up, it can be noticed that the incidence of SIDS is much higher in Germany than in the Netherlands and that the prevention campaigns in Germany are not as extensive as the prevention campaigns in the Netherlands. Because of the differences in the incidence of SIDS between Germany and the Netherlands, there is a need to explore the prevalence of the risk and protective factors for SIDS of German parents and to compare these with the prevalence of the risk and protective factors for SIDS of Dutch parents to detect whether there are differences. These differences can be used as an indication for giving recommendations about new, adapted preventive advices for SIDS in Germany.

3.2 Research goal

This research has two different goals. The first goal is to explore the differences in the prevalence of risk and protective factors for SIDS between German parents of newborns and of three months aged infants. Differences can be found between the care habits when the infant is a newborn and when the infant is three months old. Hypotheses can be generated about the reasons for the higher risk for SIDS between two and six months of age. The second goal is to explore the differences in the prevalence of risk and protective factors for SIDS between the German and the Dutch parents of infants of three months of age. Finally, hypotheses can be generated about the reasons of the differences between the German and Dutch incidence rates. Some recommendations will be given about which risk or protective factors need to be added to the German prevention campaigns to diminish the differences in prevalence of these risk and protective factors and therefore in the incidence of SIDS between Germany and the Netherlands.

3.3 Research question

To be able to reach the goals of this research the following two research questions are made:

- 1. What are the differences in the prevalence of risk and protective factors for SIDS between German parents of newborns and of three months old infants in North Rhine-Westphalia (NRW) in the period 2009-2012?*
- 2. What are the differences in the prevalence of risk and protective factors for SIDS between German parents of three months old infants that gave birth in North Rhine-Westphalia (NRW) in the period 2009-2012 and Dutch parents of three months old infants born in the Netherlands in 2008?*

Several sub questions are made to be able to answer the main questions. For the first research question the following sub questions are made:

- *What is the prevalence of risk and protective factors for SIDS of German newborns' parents that gave birth in NRW (Stadtlohn)?*
- *What is the prevalence of risk and protective factors for SIDS of German parents of three months old infants that gave birth in NRW (Stadtlohn)?*
- *Which differences can be found in the prevalence of risk and protective factors for SIDS between German parents of newborns and of three months old infants that gave birth in NRW (Stadtlohn)?*

For the second research question the following sub questions are made:

- *What is the prevalence of risk and protective factors for SIDS of German parents of three months old infants that gave birth in NRW (Stadtlohn)?*
- *What is the prevalence of risk and protective factors for SIDS of Dutch parents of three months old infants?*
- *Which differences can be found in the prevalence of risk and protective factors for SIDS between German parents that gave birth in NRW (Stadtlohn) and Dutch parents of three months old infants?*

4. Methodology

This research is a descriptive exploratory quantitative research. According to Bouter, van Dongen and Zielhuis [63], exploratory research is research, which reconnoiters a specific problem. Exploratory research is mainly used with new and unexplored problems. The goal of exploratory research is to generate promising hypotheses. Quantitative research means measuring the size of specific phenomena [64]. In this research the prevalence of risk and protective factors for SIDS in parents of infants of different ages and from different countries will be determined. This is done by three different questionnaires. Two questionnaires are made for German parents, of which one is for parents of newborns and one for parents of three months old infants. Furthermore, one questionnaire is made for Dutch parents of two to six months old infants. By using the results of the questionnaires the prevalence of the risk and protective factors for SIDS of the different groups of parents will be described.

To be able to compare the results, different statistical methods will be used. First, the prevalence of risk and protective factors of German parents directly after birth of their infant and three months after birth will be calculated and compared.

Second, the prevalence of risk and protective factors of German parents of three months old infants and Dutch parents of two to six months old infants will be calculated and compared. Both parts of the research can be defined as cross-sectional research. With cross-sectional research there is only one moment of measurement for each individual. This moment of measurement has not to be the same moment for all individuals of the population [65].

Summing up, significant differences between the prevalence in the different groups of parents can be detected and finally new hypotheses can be generated about the reasons for a higher risk for SIDS with two to six months and about the reasons for the differences in incidence rates between Germany and the Netherlands.

4.1 Population

4.1.1 German population

In Germany, all 872 mothers that gave birth in the period of October 2009 till April 2012 at the hospital Maria-Hilf in Stadtlohn in North Rhine-Westphalia were asked to participate in this research. No inclusion or exclusion criteria were used. In this research, Stadtlohn functions as a representative for North Rhine-Westphalia. As mentioned earlier, North Rhine-Westphalia is the part of Germany with the highest incidence rate for SIDS. Therefore, North Rhine-Westphalia is chosen as the study population for Germany.

4.1.2 Dutch population

In 2008 in the Netherlands, 1500 parents of infants between two and six months of age were asked to participate in this research. These parents were selected from an existing database at TNO, which contains information from 66 033 mothers. The 1500 parents were randomly selected from the database and invited by e-mail to participate. No further inclusion or exclusion criteria were used.

4.2 Measurement

In this research, three questionnaires are used to measure the prevalence of the risk and protective factors in the three populations. As mentioned earlier, two questionnaires were used for the German population, one directly after birth and the other one three months after birth, and one questionnaire was used for the Dutch population, two to six months after birth.

The questionnaires were made by Prof. Dr. Mechtild Vennemann, Institute of Legal Medicine at the University of Münster, and Dr. Monique L'Hoir, TNO Leiden, and are based on the known risk and protective factors for SIDS. Because they are developed on the same basis, the questionnaires can be compared with each other. While the questions for the most parts are consistent with each other, there are still little differences between the questionnaires. In table 6 the three questionnaires are compared with each other.

Table 6: Comparison of the questionnaires.

Question	German questionnaire directly after birth	German questionnaire three months after birth	Dutch questionnaire two to six months after birth
Date	Open question	Open question	-
Gender of infant	Boy or girl	Boy or Girl	-
Date of birth of infant	Day/month/year	Day/month/year	Day/month/year
Parity of mother	-	First; second; third; fourth; other, namely ...	-
Sleeping position	Supine; side; prone; other, namely ...	Supine; side, which side: left, right or changing; prone; other, namely ...	Supine; side; prone; other, namely ...
Sleeping place at night	Own bed in parental bedroom; own bed in own bedroom; in bed with parents; own bed together with ...; other, namely ...	Own bed in parental bedroom; own bed in own bedroom, alone or with siblings; in bed with parents; own bed together with ...; other, namely ...	Own bed in parental bedroom; own bed in own bedroom; in bed with parents; own bed together in bedroom with siblings; other, namely ...
Temperature in sleeping room (estimated)	15-17°C; 18-20°C; 21-22°C; 23-25°C	15-17°C; 18-20°C; 21-22°C; 23-25°C or more; I do not know	-
Type of bedding (multiple answers possible)	Only sleeping-sack; sleeping-sack and duvet; eiderdown duvet; duvet/quilt; towel/diaper; pillow; nest; other, namely ...	Only sleeping-sack; sleeping-sack and duvet; sleeping-sack and eiderdown duvet; eiderdown duvet; thin blanket/cotton blanket; towel/diaper; pillow; nest; swaddling; other, namely ...	Only sleeping-sack; sleeping-sack and blanket; eiderdown duvet; duvet/quilt; towel/diaper; pillow; other, namely ...
Use of a dummy during sleep	Yes, during every sleep; yes, occasionally; no, never	Yes, during every sleep; yes, occasionally; no, never	Yes, during every sleep; yes, occasionally; no, never
Breast-feeding	Yes, exclusively; yes, with supplementary feeding; no, I do not	Yes, exclusively; yes, with supplementary feeding; no, I do not	Yes, exclusively; yes, with supplementary feeding; no, I

	breast-feed	breast-feed	stopped breast-feeding when my child was ... weeks old; no, I do not breast-feed
Immunization	Yes, from: general practitioner, pediatrician, kind of immunization: ...; no	Yes, from: general practitioner, pediatrician, kind of immunization: ...; no	Yes; no
Smoking habits at home	Only mother; only father; mother and father; other, namely ...; nobody	Only mother; only father; mother and father; other, namely ...; nobody	Only mother; only father; mother and father; other, namely ...; nobody
Age of mother	-	Open question	-
Highest graduation of mother	No graduation; general-education secondary school; junior high school; vocational diploma/general qualification for university entrance; university of applied sciences/university	No graduation; general-education secondary school; junior high school; vocational diploma/general qualification for university entrance; university of applied sciences/university; other ...	No graduation; primary school; preparatory secondary vocational school/higher secondary school; vocational diploma/preparatory scientific diploma; university of applied sciences/university
Living situation at home	Alone; with a husband/partner; together with ...	Alone; with a husband/partner; together with ...	-
Language spoken at home	Open question	Open question	Open question
Information about risk factors for SIDS	No; yes, from: midwife, pediatrician, journals, television, handout from ..., friends/relatives, other, namely ...	No; yes, from: midwife, pediatrician, journals, television, handout from ..., friends/relatives, other, namely ...	No; yes, from: midwife, pediatrician, journals, television, others, namely ...
Most important advisor about care for infant	Pediatrician; pediatric nurse; midwife; own mother; maternity center; other, namely ...	Pediatrician; pediatric nurse; midwife; own mother/mother-in-law; maternity center; other, namely ...	Pediatrician; maternity care; midwife; own mother; other, namely ...
Any comments or remarks?	Open question	-	Open question
May we contact you when your baby is one year old?	-	Yes, address: ...; no	-

4.3 Data collection

4.3.1 German data collection

The German participants were asked to fill in two questionnaires, thus there were two moments of measuring. The first questionnaire had to be filled out directly after birth (within the first two days after birth). Hence, the first questionnaire was filled out during the hospitalization. Accompanied with filling out the first questionnaire, the mothers got a sleeping-sack for their infant. 872 mothers filled out the first questionnaire, which consequently is a response rate of 100%. The second questionnaire had to be filled out three months after birth. After discharge from the hospital, the mothers got a small piece of paper with a reminder to come back to the hospital over three months. When they came back, they got another, bigger sleeping-sack for their infant and they had to fill out the second questionnaire. Mothers who did not come back were called several times by the pediatric nurse to remind them. 652 mothers filled out the second questionnaire. This is a response rate of 74.8%.

4.3.2 Dutch data collection

The Dutch respondents were invited to participate in this research by e-mail. The e-mail contained a link that directly led to the online questionnaire. Within one week 561 mothers responded and filled out the questionnaire. After one week, a reminder was sent to all mothers that did not fill out the questionnaire until then. Two weeks after the start of data collection 740 mothers had completed the questionnaire. This is a response rate of 49.3%.

4.4 Sample size

In this research a power of 95% is used to be able to prove the differences in the prevalence of risk and protective factors for SIDS between the different populations. Thus, the probability of type II error is 0.05. Furthermore, the α has to be two-sided, because the size of the difference has to be proved and not the fact whether there is any difference. For a 95% confidence interval, the two-sided α has to be equal to 0.05. For a power of 95% and a two-sided α of 0.05 a sample size of $n=290$ is needed to be able to prove even a small difference of 0.3 between the prevalence of the risk and protective factors [66].

The sample sizes of this research are $n=872$ (German parents of newborns), $n=652$ (German parents of three months old infants) and $n=740$ (Dutch parents of two to six months old infants). Thus, the sample sizes are large enough to be able to prove even smaller differences in the prevalence of risk and protective factors for SIDS between the different populations.

4.5 Analysis

The collected data is analyzed by using the Statistical Package of Social Science (SPSS) version 16.

4.5.1 Analysis of German data

First, descriptive statistics are applied to describe the two samples, German newborns and German three months old infants. This description contains the sample sizes, the distribution of boys and girls in the samples and the mean age of the infants of the two samples. Moreover, the frequencies (absolute and percentage) are described for each response category of each variable from the different questionnaires.

Second, the descriptive statistics of the German newborn questionnaire and the German three months questionnaire are compared with each other. Because of differences in birth dates and gender per respondent serial, it was not possible to connect the data of both populations. Therefore, longitudinal analyses, like the McNemar test, were not possible. According to van Houwelingen, Stijnen and van Strik, the chi-square test is an appropriate test to compare percentages from two samples, which are gathered randomly. The fraction of persons with a specific characteristic of the first sample is estimated and compared to the fraction of persons with the specific characteristic of the second sample [67]. In this research, the Pearsons chi-square and the Fisher's exact test are relevant to use and therefore either the Pearsons chi-square or Fisher's exact test will be applied. When the expected value is either lower than 5 or lower than 10 and there is only one degree of freedom, the Fisher's exact test is used. The Pearsons chi-square tests whether two nominal variables are independent of each other. A significance level of $\alpha=0.05$ is used to determine whether the null hypothesis can be dropped. If the p-value (significance) is smaller than 0.05, the null hypothesis is dropped. The null hypothesis varies per variable, but for each variable it has in common that it tests whether there are significant differences between the two populations for the relevant variable.

The use of the chi-square test requires two conditions:

1. All expected frequencies have to be minimal equal to 1 and
2. maximum 20% of the expected frequencies are allowed to be smaller than 5 [68].

There are some variables that are not important to compare or that cannot be compared. It is not possible to compare the variables parity, parts of the type of bedding (sleeping-sack and eiderdown duvet, swaddling), immunization and age of the mother, because these variables are not apparent in the German newborn questionnaire. Furthermore, parts of the type of bedding (towel/diaper, pillow, other), the living situation at home and the most important advisor related to infant care are not that important for the risk for SIDS and therefore not compared.

4.5.2 Analysis of Dutch and German data

The data is analyzed in the same way as the German data is analyzed. In the first step, some descriptive statistics are used to describe the samples. The sample sizes, distribution of boys and girls and the mean age of each sample, the German three months questionnaire and the Dutch questionnaire, are described. In addition, the frequencies (absolute and percentages) are calculated for each response category of each variable from the two questionnaires.

In the second step, the descriptive statistics of the German three months questionnaire and the Dutch questionnaire are compared with each other also by using the chi-square test. In this way one can detect whether the observed differences are statistically significant. A significance level with $\alpha=0.05$ is used with the chi-square test. Thus the null hypothesis, that there are significant differences between the two populations for the relevant variable, is dropped if the p-value is higher than 0.05.

There are some variables that are not important to compare or that cannot be compared. It is not possible to compare the variables gender, parity, temperature in the infant's bedroom, parts of the type of bedding (sleeping-sack and eiderdown duvet, nest, swaddling), age of the mother and living situation at home, because these variables are not apparent in either the

German three months old questionnaire or the Dutch. The variable most important advisor related to infant care is not compared, because the response categories are difficult to compare and the Dutch questionnaire misses the important response category well-baby clinics. Furthermore, some parts of the type of bedding (towel/diaper, pillow, other) are not that important for the risk for SIDS and therefore not compared.

5. Results

5.1 Comparison German newborn sample and German sample of three months old infants

In this chapter, a comparison will be made of the results of the German newborn sample (Gnb) and the German sample of three months old infants (G3m). Because the two questionnaires are not completely similar (see table 6), not every variable can be compared in this analysis. As mentioned in the methodology, only the most important variables of the background information, risk factors and protective factors are compared: gender, highest graduation of the mother, language spoken at home, information about risk factors for SIDS (yes/no, midwife, pediatrician, journal, television, handout, friends, other), sleeping position, sleeping place, temperature in the infant's bedroom, type of bedding (sleeping-sack, sleeping-sack and duvet, eiderdown duvet, duvet/quilt, nest), smoking habits at home, use of a dummy and breast-feeding. With some variables, the response categories of the two questionnaires are not completely similar, but then an adapted categorization is used so that the variables are comparable. All tests of this comparison meet the two requirements of the chi-square test.

Background information

In this paragraph, the background information related to SIDS of both samples will be described and compared with each other. This information finally can be used to explain the results concerning the prevalence of the risk and protective factors for SIDS.

Table 7: Comparison of the background information of the German newborn sample and the German sample of three months old infants and the related chi-squares and p-values of the chi-square test.

Variable	Gnb (%)	G3m (%)	chi-square	p-value
Age of the infant	Median: 1 days	Median: 99 days	-	-
Age of the mother	-	Mean: 30.9 years Std.dev.: 4.78	-	-
Gender (N=1509)	(N=870)	(N=639)	0.1	0.818
Boy	50.6%	49.4%	-	-
Girl	51.2%	48.8%	-	-
Highest graduation of the mother (N=1464)	(N=851)	(N=613)	-	-
No graduation	2.2%	0.2%	11.3	0.000
General-education secondary school	20.9%	19.1%	0.7	0.389
Junior high school	39.7%	41.6%	0.5	0.470
Vocational diploma/general qualification for university entrance	24.3%	25.1%	0.1	0.727
University of applied sciences/university	12.8%	14.0%	0.5	0.503
Language spoken at home (N=1404)	(N=846)	(N=558)	-	-
German	86.5%	91.8%	9.1	0.003
German + other language(s)	8.7%	6.8%	1.7	0.190
Only other language(s)	4.7%	1.4%	11.0	0.001

Age and gender

The German newborn sample consists of 872 respondents. The median age in the sample is one day (min. 0 days, max. 73 days). Most infants are zero, one or two days old, but several infants are older, up to 73 days. The reason for this is that the infants are premature infants and therefore they are still assigned to the newborn sample. Furthermore, 50.6% of the infants are male and 49.4% are female (see table 7).

The German three months old sample consists of 652 respondents. The median age of the infants in the sample is 99 days (min. 30 days, max. 455 days). The mean age of the mothers is 30.9 years (min. 17 years, max. 46 years). Furthermore, 51.2% of the infants are male and 48.8% of the infants are female (see table 7). The chi-square test shows no significant differences between the two populations for gender.

Highest graduation of the mother

Most mothers of the newborn sample graduated at junior high school (41.6%), got a vocational diploma/general qualification for university entrance (25.1%) or they graduated at general education secondary school (19.1%). Smaller percentages of the respondents of the newborn sample have no graduation or graduated at university of applied sciences/university.

In the sample of three months old infants, most mothers also graduated at junior high school (39.7%), got a vocational diploma/general qualification for university entrance (24.3%) or graduated at general-education secondary school (20.9%). Smaller percentages have no graduation or graduated at university of applied sciences/university.

The chi-square test shows that there is a significant difference between the German newborn sample and the German sample of three months old infants for no graduation ($X^2=11.3$, p-value=0.000). No significant differences are found between the two populations for the other educational levels (see table 7).

Language spoken at home

86.5% of the respondents of the newborn sample speak only German. Another 8.7% of the respondents of the newborn sample speak German and other languages at home. Furthermore, 4.7% of all respondents of the newborn sample are only speaking other languages than German at home. Besides German, the five most spoken languages, well or not in combination with German, are Russian, Turkish, Arabic, Dutch and Albanian. All in all, 23 different languages are spoken in this sample.

91.8% of the respondents of the sample of three months old infants speak only German at home. Another 6.8% speaks German in combination with other languages. 1.4% of the respondents of the three months old sample do not speak any German at home. Besides German, the five most spoken languages in this sample, well or not in combination with German, are Russian, Arabic, Dutch, Turkish and Aramean. In total, 15 different languages are spoken in this sample.

The results of the chi-square test show that there are significant differences between the two samples for only speaking German ($X^2=9.1$, p-value=0.003) and only speaking other languages ($X^2=11.0$, p-value=0.001) (see table 7).

Information about risk factors for SIDS

The information that the respondents had received about risk factors can be split into yes/no; the source of the information in: midwife, pediatrician, journal, television, handout, friends

and other. Table 8 shows the percentages and results of the chi-square test per population per response category.

Table 8: Comparison of the information about risk factors for SIDS of the German newborn sample and the German sample of three months old infants and the related chi-squares and p-values of the chi-square test.

Variable	Gnb (%) (N=853)	G3m (%) (N=641)	chi-square	p-value
Information about risk factors for SIDS (N=1494)*			-	-
Yes	84.4%	94.1%	33.7	0.000
Midwife	53.7%	74.9%	70.3	0.000
Pediatrician	23.2%	54.0%	0.0	0.000
Journals	42.1%	42.0%	0.0	0.963
Television	17.2%	13.9%	3.1	0.079
Handouts	28.0%	18.6%	17.9	0.000
Friends/relatives	7.9%	13.7%	13.6	0.000
Other	8.6%	6.7%	1.8	0.186

*Multiple answers possible.

In the German newborn sample, 84.4% of the respondents received information about risk factors for SIDS. Most of these respondents got the information from midwives (53.7%), journals (42.1%), handouts (28.0%) and the pediatrician (23.2%). Smaller percentages got their information from television, friends/relatives or other information sources (see table 8).

In the German three months old sample, 94.1% of the respondents received information about risk factors for SIDS. Most of them got their information from the midwife (74.9%), the pediatrician (54.0%) or journals (42.0%). Smaller percentages got their information from television, handouts, friends/relatives or other information sources (see table 8).

The chi-square test shows significant differences between the two populations for in general getting information about the risk factors for SIDS ($X^2=33.7$, p-value=0.000) and getting the information from midwives ($X^2=70.3$, p-value=0.000), the pediatrician ($X^2=0.0$, p-value=0.000), handouts ($X^2=17.9$, p-value=0.000) and friends/relatives ($X^2=13.6$, p-value=0.000) (see table 8).

Risk factors for SIDS

In this paragraph the most important modifiable risk factors for SIDS will be described and compared between the German newborn sample and the German sample of three months old infants. Table 9 shows the percentages and results of the chi-square test per population per response category.

Table 9: Comparison of the modifiable risk factors for SIDS of the German newborn sample and the German sample of three months old infants and the related chi-squares and p-values of the chi-square test.

Variable	Gnb (%) (N=871)	G3m (%) (N=652)	chi-square	p-value
Sleeping position (N=1523)			-	-
Supine	86.8%	80.5%	11.1	0.001
Side	8.7%	6.6%	2.4	0.125
Prone	1.0%	11.2%	75.6	0.000
Other	3.4%	1.7%	4.4	0.036
Sleeping place (N=1522)			-	-
In own bed in parents' bedroom	59.5%	45.2%	30.3	0.000

In own bed in children's bedroom	39.4%	49.6%	15.9	0.000
In parents' bed	0.1%	2.5%	18.5	0.000
In own bed together with other children	0.1%	1.5%	10.5	0.001
Other	0.9%	1.2%	0.4	0.616
Temperature in the infant's bedroom (N=1505)	(N=858)	(N=647)	-	-
15-17°C	23.0%	23.3%	0.0	0.873
18-20°C	65.4%	65.8%	0.0	0.853
21-22°C	10.0%	9.6%	0.1	0.776
23-25°C	1.6%	0.3%	6.1	0.019
Type of bedding (N=1524)*	(N=872)	(N=652)	-	-
Sleeping-sack	81.2%	84.7%	3.1	0.077
Sleeping-sack and duvet	22.5%	15.6%	11.1	0.001
Eiderdown duvet	1.5%	0.5%	3.8	0.073
Duvet/quilt	1.6%	1.7%	0.0	0.901
Nest	12.6%	4.9%	26.2	0.000
Smoking habits at home (N=1513)	(N=872)	(N=641)	0.2	0.652
Yes	29.9%	28.9%	-	-
No	70.1%	71.1%	-	-

*Multiple answers possible.

Sleeping position

Most infants (86.8%) of the German newborn sample sleep in the supine sleeping position. Smaller percentages of newborns sleep in the side position, in the prone position and in other sleeping positions (see table 9). These positions are either varying in general or varying between the supine and side sleeping position.

Most of the infants of the German three months old sample (80.5%) sleep in the supine sleeping position. Moreover, smaller percentages of the three months old infants sleep in the prone position, in the side position or in other sleeping positions (see table 9). These positions are varying.

The results of the chi-square test show significant differences between the two populations for the supine ($X^2=11.1$, p-value=0.001), prone ($X^2=75.6$, p-value=0.000) and other sleeping positions ($X^2=4.4$, p-value=0.036) (see table 9).

Sleeping place

59.5% of the respondents of the newborn sample named that their infant sleeps in an own bed in the parents' bedroom. Moreover, 39.4% of the infants sleep in an own bed in their own bedroom. Smaller percentages are sleeping in their parents' bed, in an own bed in the children's bedroom together with other children or at other sleeping places (see table 9).

The majority of the infants of the three months old sample are sleeping in their own bed in their parents' bedroom (45.2%) or in their own bed in their own bedroom (49.6%). Smaller percentages are sleeping in their parents' bed, in an own bed in the children's bedroom together with other children or at other sleeping places (see table 9).

The chi-square test shows that there are significant differences between the two samples for the infants that sleep in their own bed in their parents' bedroom ($X^2=30.3$, p-value=0.000), in their own bed in their own bedroom ($X^2=15.9$, p-value=0.000), in their parents' bedroom ($X^2=18.5$, p-value=0.000) and in their own bed together with other children in a bedroom ($X^2=10.5$, p-value=0.000) (see table 9).

Temperature in the infant's bedroom

Most infants of the German newborn sample (65.4%) sleep in a bedroom with 18-20°C. Furthermore, 23.0% of the infants sleep in a colder bedroom, namely 15-17°C. Smaller percentages occur in the categories of 21-22°C or 23-25°C (see table 9).

Most infants of the three months old sample (65.8%) sleep in a bedroom that has a temperature of 18-20°C. Another 23.3% sleep in a bedroom with 15-17°C. Smaller percentages sleep in a bedroom with a temperature of 21-22°C or 23-25°C or chose the response category 'I don't know' (see table 9).

The results of the chi-square test show, that there is a significant difference for the temperature 23-25°C ($X^2=6.1$, $p\text{-value}=0.019$) between the two samples (see table 9).

Type of bedding

In the newborn sample, 81.2% of the parents chose the sleeping-sack as the type of bedding for their infant. Also the combination of a sleeping-sack and a duvet (22.5%) is used. Smaller percentages sleep in an eiderdown duvet, in a duvet/quilt or in a nest (see table 9).

The vast majority of the three months old infants (84.7%) sleep in a sleeping-sack. Another 15.6% uses a sleeping-sack in combination with a duvet as the type of bedding. An eiderdown duvet, duvet/quilt or nest is used by smaller percentages of the respondents.

The chi-square test shows significant differences between the two populations for sleeping in a sleeping-sack and a duvet ($X^2=11.1$, $p\text{-value}=0.001$) and in a nest ($X^2=26.2$, $p\text{-value}=0.000$) (see table 9).

Smoking habits at home

In 70.1% of the households of the German newborn sample nobody is smoking. In comparison with this, in 71.1% of the households of the German three months old sample nobody is smoking. The chi-square test shows that there is no significant difference between the two samples for the smoking habits at home ($X^2=0.2$, $p\text{-value}=0.652$) (see table 9).

Protective factors for SIDS

In this paragraph, the most important modifiable protective factors for SIDS will be described and compared between the German newborn sample and the German sample of three months old infants. Table 10 shows the percentages and results of the chi-square test per population per response category.

Table 10: Comparison of the modifiable protective factors for SIDS of the German newborn sample and the German sample of three months old infants and the related chi-squares and p-values of the chi-square test.

Variable	Gnb (%)	G3m (%)	chi-square	p-value
Use of a dummy (N=1495)	(N=847)	(N=648)	-	-
Yes, every sleep	13.5%	30.2%	62.9	0.000
Yes, occasionally	75.4%	50.3%	0.0	0.000
No, never	11.1%	19.4%	20.4	0.000
Breast-feeding (N=1491)	(N=869)	(N=622)	-	-
Yes, exclusively	61.9%	34.4%	0.0	0.000
Yes, and I give supplementary nutrition	4.0%	8.0%	10.9	0.001
No, I don't breast-feed	34.1%	57.6%	81.8	0.000

Use of a dummy

The majority of the respondents of the newborn sample (75.4%) named that their infant occasionally gets a dummy for its sleep. Smaller percentages of the infants get a dummy during every sleep or do not use a dummy for their sleep (see table 10).

Half of the respondents of the German three months old sample (50.3%) answered that their infant occasionally gets a dummy for its sleep. Other 30.2% of the three months old infants use a dummy for every sleep. Moreover, 19.4% of the three months old infants do not use a dummy for their sleep (see table 10).

The results of the chi-square test show that there are significant differences between the two populations for all response categories, using a dummy for every sleep ($X^2=62.9$, p-value=0.000), occasionally using a dummy ($X^2=0.0$, p-value=0.000) and never using a dummy ($X^2=20.4$, p-value=0.000).

Breastfeeding

In the German newborn sample, most respondents (61.9%) mentioned that their infant exclusively is breast-fed. Moreover, 34.1% of the newborns are not breast-fed. A minority of 4.0% is breast-fed and gets supplementary nutrition.

More than half of the three months old infants (57.6%) are not breast-fed. Furthermore, another 34.4% of the three months old infants are exclusively breast-fed. Only 8.0% of the infants are breast-fed and get supplementary nutrition.

Significant differences are found between the two populations for all response categories, exclusive breast-feeding ($X^2=0.0$, p-value=0.000), breast-feeding and supplementary nutrition ($X^2=10.9$, p-value=0.001) and no breast-feeding ($X^2=81.1$, p-value=0.000).

5.2 Comparison German three months old sample and Dutch sample

The German and Dutch questionnaire will be compared in the next section. The German three months old sample consists of 652 respondents and the Dutch sample of 740 respondents. In the following, differences in background information, getting information about risk factors for SIDS, risk factors and protective factors will be discussed. To be able to see whether these differences are significant, the differences will be tested with the chi-square test. All variables meet the two requirements of the chi-square test.

Background information

In this paragraph the background information related to SIDS of both samples will be described and compared with each other. This information finally can be used to explain the results concerning the prevalence of the risk and protective factors for SIDS.

Table 10: Comparison of the background information of the German sample of three months old infants and the Dutch sample and the related chi-squares and p-values of the chi-square test.

Variable	NL (%)	G3m (%)	chi-square	p-value
Age of the infants (mean age)	6.2 months	3.3 months		
Language spoken at home (N=1296)	(N=738)	(N=558)	0.9	0.625
Language of country	91.3%	91.8%	-	-
Language of country + other languages	6.1%	6.5%	-	-
Only other languages	2.6%	1.8%	-	-
Highest graduation of the	(N=740)	(N=612)	3.6	0.000

mother* (1352)	(median=4)	(median=2)		
Level 0	0.8%	0.2%	-	-
Level 1	3.2%	0.0%	-	-
Level 2	13.9%	60.6%	-	-
Level 3	0.0%	0.0%	-	-
Level 4	38.5%	25.2%	-	-
Level 5	43.5%	14.1%	-	-

* According to the classifying educational programs: Manual for ISCED-97 Implementation in OECD Countries, 1999 Edition. Level 0 is the lowest (no graduation) and level 5 the highest (university).

Age of the infants

The mean age of the infants in the German sample is 3.3 months and the mean age of the Dutch sample is 6.2 months (table 10).

Language spoken at home

To be able to compare the spoken languages of the populations the answer categories are divided in 'Only language of country', 'Language of country and other languages' and 'Only other languages'. The language of country for the Dutch sample is 'Dutch' and for the German sample it is 'German'. The frequency per response category and sample is shown in table 10. In the Dutch sample 91.3% speak only Dutch against 91.8% of the German sample that speak only German. This difference is not significant ($X^2=0.9$, p-value=0.625).

Highest graduation of the mother

The Netherlands and Germany have different school systems. To be able to compare the highest graduation of the mother the answer categories are divided in levels according to an international classification (see appendix 6) [69]. 0.8% of the Dutch mothers and 0.2% of the German mothers are graduated on level 0, which means no graduation. 3.2% of the Dutch mothers are graduated on level 1. More mothers of the German sample (60.6%) than Dutch mothers (13.2%) are graduated on level 2. More Dutch mothers than German mothers (25.2% and 14.1%) are graduated level 4 (38.5%) and level 5 (43.5%). The Netherlands have a mean graduated level of 4.03 and the Germany a mean level of 2.92. The German and the Dutch sample significantly differ for the highest graduation of the mother ($X^2=3.6$, p-value=0.000).

Information about risk factors for SIDS

Table 11 shows the percentages and results of the chi-square test per population per response category from whom the participants got information about risk factors for SIDS.

Table 11: Comparison of the information about risk factors for SIDS of the German three months old sample and the Dutch sample and the related chi-squares and p-values of the chi-square test.

Variable	NL (%)	G3m (%)	chi-square	p-value
Information about risk factors for SIDS (N=1381)*	(N=740)	(N=641)	-	-
Yes	84.6%	94.1%	31.5	0.000
Midwife	22.3%	74.9%	3.8	0.000
Pediatrician	3.1%	54.0%	4.5	0.000
Journals	30.7%	42.0%	19.0	0.000
Television	1.6%	13.9%	76.2	0.000
Handout	2.6%	18.6%	97.7	0.000
Friends, relatives	1.2%	13.7%	82.3	0.000

Other	31.0%	6.7%	1.3	0.000
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* Multiple answers possible.

15.4% of the Dutch respondents and 5.9% of the German respondents did not get any information about the risk factors for SIDS against 84.6% of the Dutch respondents and 94.1% of the German respondents, who did get information from several sources of information. This difference is significant ($X^2=31.5$, $p\text{-value}=0.000$). More German respondents got information from the midwife, pediatrician, journals, television, handouts and friends/relatives in comparison with the Dutch respondents who received their information from other information sources, namely maternity care and well-baby clinics. The differences for every source of information are significant.

Risk factors for SIDS

In this paragraph, the most important modifiable risk factors for SIDS will be described and compared between the German three months old sample and the Dutch sample. Table 12 shows the percentages and results of the chi-square test per population per response category.

Table 12: Comparison of the modifiable risk factors for SIDS of the German three months old sample and the Dutch sample and the related chi-squares and p-values of the chi-square test.

Variable	NL (%)	G3m (%)	chi-square	p-value
Sleeping position (N=1392)	(N=740)	(N=652)	40.3	0.000
Supine	90.6%	80.5%	-	-
Side	5.0%	6.6%	-	-
Prone	3.1%	11.2%	35.3	0.000
Other	0.9%	1.7%	-	-
Sleeping place (N=1391)	(N=740)	(N=651)	0.0	0.000
In own bed in parents' bedroom	15.1%	45.2%	-	-
In own bed in children's bedroom	81.2%	49.6%	-	-
In parents' bed	1.6%	2.5%	-	-
In own bed in children's bedroom together with other children	1.1%	1.5%	-	-
Other	0.9%	1.2%	-	-
Type of bedding (N=1392)*	(n=740)	(N=652)	-	-
Sleeping-sack	19.6%	84.7%	0.1	0.000
Sleeping-sack and blanket	63.8%	15.6%	0.0	0.000
Eiderdown duvet	1.6%	0.5%	4.4	0.040
Duvet/quilt	3.4%	1.7%	3.9	0.047
Smoking habits at home (N=1381)			1.9	0.166
Yes	25.6%	28.9%	-	-
No	74.4%	71.1%	-	-

* Multiple answers possible.

Sleeping position

In table 12 the prevalence of the sleeping positions of the Dutch and the German sample are shown. 90.6% of the Dutch sample and 80.5% of the German sample put their infants in the supine position to sleep. A difference of 1.6% (Dutch 5.0% and German 6.6%) can be seen for the side position. Furthermore, more respondents from the German sample (11.2%) put their child into the prone position in contrast to the Dutch sample (3.1%). In the answer

category 'Other', respondents of both samples named that the sleeping position is varying, the infant turns in their sleep or they use other type of bedding to support the infants with their sleeping position. The difference between the two samples for the sleeping position is significant ($X^2=40.3$, $p\text{-value}=0.000$).

Sleeping place

There are some differences in the sleeping place between the Dutch and German population (see table 12). Most respondents of the Dutch sample (81.2%) answered 'In own bed in children's bedroom'. In the German questionnaire only about half of the respondents (49.1%) chose this category. Nearly the other half of the German infants sleep in their own bed in their parents' bedroom, while 15.1% of the Dutch infants sleep in their own bed their in parents' bedroom. The chi-square test shows that there is a significant difference between the two populations ($X^2=0.0$, $p\text{-value}=0.000$).

Type of bedding

In table 12, the prevalence of the different types of bedding is given per population. The different types of bedding (sleeping-sack, sleeping-sack and blanket, eiderdown duvet and duvet/quilt) are compared: 84.7% of the German sample and 19.6% of the Dutch sample use only the sleeping-sack as the type of bedding. Also a difference can be seen in the use of a sleeping-sack and a blanket. A percentage of 63.8% of the Dutch sample uses a sleeping-sack and blanket. For these comparisons the differences between the two samples for the different types of bedding are significant (see table 12).

Smoking habits

25.6% of the Dutch households and 28.9% of the German households smoke at home (see table 12). The chi-square test shows that there is no significant difference between the two populations ($X^2=1.9$, $p\text{-value}=0.166$).

Protective factors for SIDS

In this paragraph the most important modifiable protective factors for SIDS will be described and compared between the German sample of three months old infants and the Dutch sample. Table 13 shows the percentages and results of the chi-square test per population per response category.

Table 13: Comparison of the modifiable protective factors for SIDS of the German sample of three months old infants and the Dutch sample and the related chi-squares and p-values of the chi-square test.

Variable	NL (%)	G3m (%)	chi-square	p-value
Use of a dummy (N=1388)	(N=740)	(N=648)	90.037	0.000
Yes, every sleep	36.4%	30.2%	-	-
Yes, occasionally	26.9%	50.3%	-	-
No, never	36.8%	19.4%	-	-
Breast-feeding (N=1362)	(N=740)	(N=622)	4.626	0.000
Yes, exclusively	14.6%	34.4%	-	-
Yes, and I give supplementary nutrition	17.6%	8.0%	-	-
No, I don't breast-feed	67.9%	57.6%	-	-
Immunizations (N=1355)	(N=740)	(N=615)	1.670	0.000
Yes	97.4%	73.3%	-	-
No	2.6%	26.7%	-	-

Use of a dummy

More Dutch participants than German participants (36.4% vs. 30.2%) give their infant a dummy every sleep. Table 13 also shows that 26.9% of the Dutch sample and 50.3% of the German sample use the dummy occasionally. 36.8% of the Dutch respondents and 19.4% of the German never use a dummy. The results of the chi-square test show that there is a significant difference between the two samples ($X^2=90.0$, $p\text{-value}=0.000$).

Breast-feeding

14.6% of the infants of the Dutch sample are breast-fed; in the German sample 34.4% are breast-fed. 17.6% of the Dutch sample and 8.0% of the German sample are breast-fed and get also supplementary nutrition and 23.0% of the Dutch sample and 57.6% of the German sample do not get breast-feeding. The difference between the two samples for breast-feeding is significant ($X^2=4.6$, $p\text{-value}=0.000$).

Immunizations

97.4% of the Dutch infants are vaccinated. In contrast to this, 73.3% of the German infants are vaccinated (see table 13). The chi-square test shows a significant difference between the two populations ($X^2=1.6$, $p\text{-value}=0.000$).

6. Discussion

6.1 Conclusion of the comparison German newborns and German three months old infants

In this chapter, the first research question will be answered:

What are the differences in the prevalence of risk and protective factors for SIDS between German parents of newborns and of three months old infants in North Rhine-Westphalia (NRW) in the period 2009-2012?

Furthermore, if possible, the results will be related to findings from literature. From this, some conclusions and recommendations will be made. In the following, the most important results and conclusions per compared variable will be discussed.

Background information

Nearly no significant differences for the highest graduation of the mother are detected between the German newborn sample and the German three months old sample, besides the difference for no graduation. It is striking that in the German three months old sample there are slightly more mothers who have an average or high graduation. Because the same mothers were invited for both samples, one can conclude that significantly more mothers that have no or low graduation did not come back to fill out the second questionnaire.

Furthermore, it attracts attention that there are significantly fewer families that speak other languages. Because for both samples the same mothers were invited, it can be concluded that significantly less foreign mothers came back to fill out the second questionnaire.

Finally, it can be recommended that designing separate prevention campaigns for the different ethnicities and kinds of graduation might be useful, because parents of other ethnicities and/or lower educated mothers might need to be addressed in another way than parents of German origin and/or higher educated mothers. Another alternative might be to design the prevention campaigns in that way that everybody can understand it easily. This means that many pictures and little text has to be used.

Information about risk factors for SIDS

Significantly more parents of the German sample of three months old infants got information about the risk factors for SIDS than the parents of German newborns did. Furthermore, significantly more parents of the German three months old sample got information from the midwife, the pediatrician and/or friends/relatives. The reason of this is, that the parents of the German three months old sample simply had more time and possibilities to access information and that they got information about SIDS when they filled in the questionnaire for the first time. The parents also are more in contact with the relevant health care professionals than the parents of newborns are. Moreover, it can be concluded that much more parents receive information about the risk factors for SIDS than previously is assumed. This fact can be explained by the project, because besides filling out the questionnaire, one of the goals was to better inform parents about the risk factors for SIDS. To create some clarity about the prevention of SIDS in Germany, it can be recommended to make either the midwife or the pediatrician responsible for giving prevention about SIDS. Because pediatricians are very busy with their curative work, midwives seem to be the group pre-eminently to give the preventive information. They are well organized and should receive a training to offer information to parents about the prevention of SIDS and moreover should

give the messages about the prevention repeatedly. If the pediatrician gives information to parents, it should be coordinated with the midwife so that they give exactly the same information.

Risk factors for SIDS

It is conspicuous that significantly more German newborns sleep in the supine position or other sleeping positions than the German three months old infants. An explanation of this might be the fact that the parents are instructed to do so, when they leave the hospital in Stadtlohn. Furthermore, significantly less German newborns than German three months old infants sleep in the prone position. These results can be explained by the difference in age of the infants. With increasing age an infant is able to move by itself. Moreover, with beginning of the age of three months, infants increasingly are able to turn themselves from the supine to the prone position [22]. Moreover, literature shows that parents sometimes decide to place the infant prone, because in this position infants cry less and sleep better [70]. The parents of the three months old infants that placed their infant prone, could have found out by placing the infants that cried in this position. Furthermore, some infants simply do not like to sleep supine. These facts might result in a significantly higher prevalence of the prone sleeping position for older infants in comparison with newborns. To prevent this, more intrinsic information about the risk of the prone sleeping position for SIDS for German parents of older infants is recommended. Furthermore, it might be useful to recommended to check the sleeping position of the infant when the parents go to sleep or are awake at night.

There are significantly more newborns than three months old infants that sleep in their own bed in their parents' bedroom and significantly more three months old infants than newborns that sleep in their own bed in their own bedroom, in their parents' bed or in their own bed in the children's bedroom together with other children.

Because adults sleep more lightly than children and have a greater awareness of their infant's well-being, adults are more able to respond to movements of their infant and therefore are more able to sooner provide help when the infant sleeps in the same room. Therefore, literature states that room sharing with adults is associated with a reduced risk for the infant to sleep in the prone sleeping position and therefore a reduced risk for SIDS [2-3]. Finally, literature also shows that the percentage of infants that share the room with adults is inversely related with the infant's age [38]. Therefore it can be stated that the results of this research can be explained by the difference in age of the infants, because the German newborn sample and the German three months old sample are ascending in age. All in all, it can be concluded that the prevalence of room sharing declines as the infant gets older. However, the GEPS recommends room sharing until the infant is two years old [71]. It has to be recommended to provide a more intrinsic advice to parents about the importance of room sharing. This also might reduce the prevalence of the prone sleeping position, because there are significant interactions between not sharing the room with an adult and sleeping in the prone position [38]. Moreover, it can be recommended to further research why there is a change in sleeping place when the infant gets older.

There are significantly more newborns than three months old infants that sleep in a bedroom with 23-25°C. As overheating is one of the risk factors for SIDS, the only recommendation that can be given is an advice to newborns' parents to reduce the temperature of the newborns' bedroom to approximate 15-18°C, as also is recommended in the Dutch guideline for SIDS [11].

The results show that there are significantly more newborns than three months old infants who sleep in a combination of a sleeping-sack and a duvet or in a nest. The prevalence of using only a sleeping-sack is high for both samples, but the difference is not significant.

No explanation is found for the higher prevalence of the use of a sleeping-sack and duvet in the newborn sample in literature. An explanation could be that the parents of newborns tend to put their infants in a warmer environment than parents of older infants do. This correlates with the findings about the temperature in the infant's bedroom that show that more parents of newborns let their infant sleep in a warmer bedroom. Another explanation might be that a small infant in a large baby bed with only a sleeping-sack on might not seem very comfortable and parents might experience this as bare. In Germany, more often a large baby bed is used immediately after birth than a bassinet. Furthermore, also no explanation for the higher use of a nest with newborns could be found. A reason for the higher use of a nest with newborns could be that the use of a nest lets the infant sleep next to the parents but also creates more safety, because the infant sleeps in a protected area in its parents' bed. Parents of slightly older infants might not feel the need anymore to sleep next to their infant. Another reason could be that the infant is too big to sleep in a nest. These two explanations are correlated to the age of the infants. Moreover, one can also notice that particularly more parents that chose a sleeping-sack and duvet or a nest did not come back to fill out the second questionnaire and therefore there is a significantly lower prevalence for these types of bedding in the three months old sample. The high prevalence of the use of only a sleeping-sack in both samples is generated by the fact that the German parents got a sleeping-sack when they filled out the questionnaire and in combination with this the advice to let their infants sleep in a sleeping-sack.

It can be concluded that in both German samples the use of only a sleeping-sack, which is recommended to reduce the risk for SIDS, is relatively high. Furthermore, the use of a nest and the use of a sleeping-sack and duvet are significantly higher in the newborn sample. Because the use of a sleeping-sack and duvet increases the risk for overheating and hence the risk for SIDS, it can be recommended to inform newborns' parents that the use of only a sleeping-sack is sufficient.

No significant differences for the smoking habits at home are found between the German newborn sample and the German three months old sample. To further reduce the prevalence of smoking in the proximity of the infant, it can be recommended that stop-smoking campaigns for parents have to be further stimulated.

Protective factors for SIDS

There are significantly more three months old infants that either use a dummy for every sleep or do not use a dummy for their sleep and significantly much more newborns that occasionally get a dummy for their sleep.

A reason for the lower percentage newborns that get a dummy for every sleep and for the higher percentage newborns that occasionally get a dummy could be the age of the infants. The GEPS recommends giving the infant a dummy for every sleep until the infant is 12 months old. Furthermore, they recommend that mothers who are breast-feeding shall wait with giving a dummy until breast-feeding is established [34, 72]. So it might be that there are lots of newborns' mothers that start breast-feeding and therefore do not give a dummy yet or at the same time with breast-feeding occasionally try to give a dummy. An explanation for the higher percentage of three months old infants that get a dummy for every sleep or never get a dummy might be that when the infant is older the parents get to know whether their infant

accepts a dummy or not. Therefore, the percentage of infants that occasionally get a dummy is lower. Another explanation for the low prevalence for using a dummy for every sleep could be that many parents are not aware of or underestimate the importance of the use of a dummy for the risk for SIDS.

Summing up, there are still some infants in both German samples that do not get a dummy for their sleep. Furthermore, mainly in the German newborn sample there are many infants that only occasionally get a dummy for their sleep. Because the use of a dummy for the sleep has a protective effect on the risk for SIDS, it can be recommended to give a more empathic advice for the use of a dummy for every sleep to the German parents. This advice also should contain the note that if a dummy is used, it should be offered at all sleep moments and not occasionally.

A significantly higher percentage of newborns than three months old infants are exclusively breast-fed. Compared to this, there are significantly more three months old infants than newborns that either are breast-fed and get supplementary nutrition or are not breast-fed. These prevalences might be explained by the age of the infants. When the infant is older the mothers experience whether they succeed in breast-feeding or not. In contrast with this, when the infant is several days old, there might be a lot of mothers that plan to breast-feed, but maybe afterwards they do not succeed in breast-feeding. Moreover, it might be, that the attention on the protective effect of breast-feeding declines when the infant gets older. All in all, it can be concluded that in the German three months old sample, there are little infants that are breast-fed. Therefore, a more empathic advice has to be added to the German prevention campaigns for SIDS to breast-feed until the infant is six months old. Moreover, prevention campaigns also should aim at giving education to the mothers about the protective effect of breast-feeding.

In conclusion, there are still some differences in the prevalence of the risk and protective factors for SIDS between North Rhine-Westphalian newborns' parents and North Rhine-Westphalian parents of three months old infants.

In the German comparative study between the newborns and three months old infants the parents of the newborns differ from the parents of three months old infants; they are generally lower educated and there are more foreign parents. Moreover, there are more parents of three months old infants that got information about the risk factors for SIDS.

In the three months old sample are more infants than in the newborn that sleep in the prone position. Moreover, more three months old infants sleep in a sleeping-sack and more newborns sleep in a nest or in a sleeping-sack and quilt. There are also more three months old infants that use a dummy every sleep or never use a dummy and more newborns that occasionally use a dummy. Finally, more newborns are exclusively breast-fed and more three months old infants are not breast-fed.

Mainly, one can conclude that the higher prevalence of prone sleeping, not using a dummy and not being breast-fed in the sample of three months old infants and the higher prevalence of sleeping in a sleeping-sack and a duvet and occasionally getting a dummy in the newborn sample possible may increase the risk for SIDS within the second and sixth month of life and therefore the incidence of SIDS. Moreover, these differences create possibilities for improvements in the prevention campaigns for SIDS in Germany. Therefore, some recommendations are made (see chapter 6.5), which aim at improving and completing the prevention of SIDS in Germany.

6.2 Strengths and limitations of the comparison German newborns and German three months old infants

This German comparative research has some strengths and limitations in the methodology. Next, these strengths and limitations will be discussed.

Strengths

The data of German newborns and German three months old infants is longitudinal data. The benefit of longitudinal data is that the persons of a cohort are followed over the time. During the research there are two or more moments for measuring. So this design makes it possible to detect changes in care habits over time. Furthermore, one can assume in this research that the data is gathered in the same way.

Another strength of this research is that sampling bias can be excluded. As mentioned earlier, all mothers that gave birth in the Maria-Hilf hospital in Stadtlohn in the period of October 2009 till April 2012 were asked to participate in this research. Thus, no inclusion and exclusion criteria were used to select the research population. The first German questionnaire is filled out directly (0-2 days) after birth and therefore it is filled out during hospitalization. 872 mothers filled out the first questionnaire (response rate=100%). For the second questionnaire the mothers were asked to come back after three months. If they were not coming back, the mothers got several reminders. Finally, 652 mothers came back to fill out the second questionnaire, this is a response rate of 74.8%.

The separate analysis of each response category of each variable is another strength of this research. When the chi-square test is performed per variable and not per response category per variable, other results might have been found. Another advantage of a separate analysis of each response category is that the analysis is more detailed and that it is more obvious on which points the samples really differ.

Limitations

Both German questionnaires are filled out by mothers who gave birth in the Maria-Hilf hospital in Stadtlohn. Stadtlohn is a city in North Rhine-Westphalia, one of the 16 states in Germany, near the Dutch border, which has 20 562 inhabitants. [73]. Because the incidence rate of SIDS highly differs between the states of Germany and Stadtlohn is only a small part of North Rhine-Westphalia, the samples are not representative for whole Germany and neither for North Rhine Westphalia. But one might state that they are a cluster sample of North Rhine-Westphalia. However, in the sample of three months old infants selective drop out can be recognized, because this sample consists of less low educated mothers and less foreign mothers.

The basis of this research is the results of the questionnaires. However, the way of filling out the questionnaires and the methodology of data collection might have influenced the results. All German parents got a sleeping-sack for their infant and information about the risk factors for SIDS when they filled out the first questionnaire. Furthermore, when the parents came back to fill out the second questionnaire they got a new and bigger sleeping-sack for their infant. Therefore, first the opportunity of socially desirable answers is apparent. Because the parents got information about the risk factors for SIDS, they might tend to fill out the questionnaire according to this and therefore response bias cannot be excluded. Furthermore, also the type of bedding is influenced by the methodology, because all mothers got a sleeping-sack for their infant and most likely use this as the type of bedding. Thus, this

questionnaire might not measure which types of bedding normally are used. Moreover, the way of asking the questions differs between the two questionnaires. In the newborn questionnaire the questions are phrased in the way that they ask what the parents plan to do regarding the different risk and protective factors for SIDS. In the three months questionnaire the questions are phrased in the way that they ask what the parents do regarding the different risk and protective factors for SIDS. Thus, the difference is that in the newborn questionnaire in fact not the prevalence of the risk and protective factors is measured, but the prevalence of the plans of the parents concerning the risk and protective factors.

Moreover, it is conspicuous that not all respondents filled out every question. Mainly the variables highest graduation of the mother and language spoken at home have many missing data. Several explanations are possible: First, there might be some questions the respondents do not want to answer. Second, it is possible that the respondents do not understand every question. As a result, the respondents possibly do not know the answer of the question or find it difficult to give an answer. Moreover, it is also possible that the respondents might feel touched in their privacy when answering a certain question and therefore do not answer this question. Another reason for not filling out one or several question might be, that the respondents have not enough time to fill out the whole questionnaire. The respondents also might overlook a question. Besides these explanations other explanations might be possible as well.

Some response categories of some questions do not completely agree with each other. Therefore, if necessary, the response categories are adapted to each other. This might have influenced the results of this research. Moreover, the response categories of the variable smoking habits at home are added to 'Yes' and 'No'. After this, the differences between the samples are not significant anymore.

In this research the chi-square test is used to measure whether there are significant differences between the two samples for the relevant variables. No correction of age, gender or socio-economic status is performed. Therefore, some significant or not significant differences might be based on confounding.

The data of the German newborns and German three months old infants are longitudinal. The McNemar test is a more suitable test than the chi-square test to measure whether there are significant differences between the two measurements of the cohort, because it opposes the one sample to the other sample. However, it was not possible to use the McNemar test in this research, because the respondent serials of the two samples do not match with each other. This means, that for example the date of birth or the gender do not agree with each other for the relevant respondent serial. Using the chi-square test instead of the McNemar test might have influenced the results.

6.3 Conclusion of the comparison German three months old infants and Dutch infants

In this paragraph, the results of the comparison of the German and the Dutch sample will be discussed. There is no significant difference between the two populations for the language spoken at home and the smoking habits (see table 10&12). Furthermore, the results will be related to findings from literature. Finally, conclusions will be made and some recommendations will be given.

The main question that has to be answered is:

What are the differences in the prevalence of risk and protective factors for SIDS between German parents of three months old infants that gave birth in North Rhine-Westphalia (NRW) in the period 2009-2012 and Dutch parents of three months old infants born in the Netherlands in 2008?

Background information

There is a great age difference between the infants of the parents who filled in the questionnaire. The Dutch infants have a mean age of 6.2 months and the German infants have a mean age of 3.3 months. This difference has an influence on the answers of the questionnaires, because for example the care habits of the parents can differ highly related to the age of the infant.

Because the school systems are not the same, an international classification is used to compare the graduation level. The mothers of the Dutch sample have a higher graduation than the German mothers. Most of the Dutch mothers have a graduation level 4 or higher. Most of the German mothers have a graduation level 2. The difference between the two samples might be explained by the different school systems. Furthermore, it also might be that Stadtlohn is a place of a lower social-economic status, which might explain the findings of this research.

Information about risk factors for SIDS

More German respondents than Dutch respondents received information about the risk and protective factors for SIDS. According to literature, there are several prevention programs in the Netherlands [8-11, 22, 23, 45]. That more German respondents have got information might be explained by the place where the different samples filled out the questionnaire. The Germans filled out the questionnaire at the hospital and additionally got some information about the risk factors for SIDS. The Dutch respondents filled out the questionnaire at home.

Risk factors for SIDS

The results show that more German than Dutch infants sleep in the prone sleeping position. Moreover, the prevalence for sleeping in the side is higher within the German three months old sample. In the Netherlands there are prevention campaigns for SIDS. As mentioned earlier, the campaign 'Safe Sleeping' promotes a safe sleeping environment for the infant and one of the main recommendations is that the infant should sleep in the supine position. In contrast to this, in Germany the knowledge about the risk of the prone sleeping position is well known, but there is no nationwide prevention campaign for SIDS. Only local prevention campaigns are present and they do promote the supine sleeping position.

It can be concluded that the German infants sleep less often in the supine sleeping position than the Dutch infants. Therefore, more and better information about the risk of the prone sleeping position for SIDS for German parents of older infants is recommended. To promote supine sleeping in Germany should become high priority in a prevention campaign.

More German children sleep in their own bed in their parent's bedroom than the Dutch children do. This might be explained by the fact that the German infants are younger and need more supervision by the parents. The brochure 'Safe Sleeping' recommends room sharing until the infants are six months old, so parents can supervise their children. There are fewer infants who share their bedroom with other children in both samples. Another recommendation of the brochure is to not let the children sleep in the bed of their parents. In both samples, only small percentages sleep in their parents' bed.

It can be recommended to stimulate parents of both countries to let the children sleep in their own bed and not in the parents' bed. Also the advice of room sharing until the infants are six months old could be stimulated more in both countries.

Results show that more German infants sleep in a sleeping-sack, which is generated by the fact that the German parents got a new sleeping-sack in combination with the advice to let their infants sleep in it. More Dutch infants sleep in a sleeping-sack with a blanket, because many Dutch parents use a thin sleeping-sack. The sleeping-sack that was given to the German parents was a thick sleeping-sack. Furthermore, in Germany it is not clear what a 'Decke' means in the questionnaire. Germans can understand 'Decke' as a cotton, fleece or woolen blanket, but also as a duvet. According to the brochure 'Safe Sleeping', which is more promoted in the Netherlands, the sole use of a sleeping-sack is recommended. The brochure informs that a blanket could be used with a sleeping-sack, but only if the sleeping-sack is not quilted. There are only small differences between the two samples for the use of an eiderdown duvet or a duvet/quilt.

It can be concluded that in both countries the use of only a sleeping-sack has to be recommended. The Dutch prevention campaigns should give a more empathic advice to the parents to use only a sleeping-sack and provide information about the use of a blanket in combination with a sleeping-sack. Because the German parents got their sleeping-sack at the hospital, these advices should be integrated in a prevention campaign, too.

There are no significant differences between the German three months old sample and the Dutch sample for the smoking habits at home. Therefore the only recommendation is, that stop-smoking campaigns for parents and family or friends can be further stimulated, so that more parents and other family members or friends stop smoking.

Protective factors

There are less German infants that use a dummy for every sleep, more German infants than Dutch infants that occasionally get a dummy for their sleep and a lot of Dutch and German infants that never get a dummy during sleep. In the Netherlands and Germany the use of a dummy is recommended until the infant is 12 months of age. After one year the use of a dummy should be phased out [33]. It can be concluded that in both countries not all infants get a dummy every sleep. Both countries should recommend more intrinsically the use of a dummy for every sleep until the infant is one year old and give more information about the benefits of the use of a dummy.

In the Dutch sample there are fewer infants that are breast-fed than in the German sample. However, breast-feeding until the infant is six months of age is recommended in both countries. The findings of this research can be explained by the fact that the Dutch infants have a mean age of 6.2 months and might already have stopped with breast-feeding. The difference in age might also be an explanation that more Dutch infants get supplementary nutrition.

All in all, it can be summarized that more German infants than Dutch infants are exclusively breast-fed. In both countries a more empathic advice of giving exclusively breast-feeding in the first six months of life can be added to the prevention campaigns for SIDS.

Findings of this research show that nearly all Dutch infants got immunization, but not all German infants did. A reason for this disparity can be the differences in the health care for infants between both countries. In the Netherlands, every infant is invited via post to receive

immunizations [74]. Meanwhile, the German parents are informed about the regular immunizations at the medical check-ups by the pediatrician. The preventive medical check-ups are obligatory, but the immunizations are optional [12, 75].

It can be summed up, that the Dutch parents are more pressed than the German parents to let their infant be vaccinated, because the Dutch continuously get reminding letters about the immunizations. As immunizations have a protective effect for many diseases and also for SIDS, it can be recommended that the German parents have to get more intrinsic information about the importance of the regular immunizations.

In conclusion, there are some differences in the prevalence of the risk and protective factors for SIDS between North Rhine-Westphalian parents of three months old infants and Dutch parents of infants. More parents of the German sample got information about the risk and protective factors in contrast with the Dutch. In the German-Dutch comparative study more German infants sleep in the prone position than the Dutch infants. More German infants sleep in their parents' bed, which is a risk factor, and more German infants sleep also in their parents' room, which is a protective factor. While the Dutch mothers use a sleeping-sack with a thin blanket, the German parents use only a sleeping-sack as the type of bedding. Slightly more German families smoke at home. Moreover, the Dutch mothers more often give a dummy every sleep, while the German mothers more often give it occasionally. More German infants are breast-fed, but more Dutch infants have gotten the regular immunizations. These differences might be a result of the different care habits of the parents, differences in health care systems and differences in the age of the infants of the samples. All these differences might be the reason for the higher incidence rate of SIDS in Germany than in the Netherlands. Therefore, the differences found in this research create possibilities to improve the prevention campaigns of both countries.

6.4 Strengths and limitations of the comparison German three months old infants and Dutch infants

This research also has some strengths and limitations in the methodology. Next, these strengths and limitations will be discussed for the comparative study of the German and Dutch sample.

Strengths

The mothers of the German sample have participated in a survey when they gave birth at the hospital in Stadtlohn. They got a reminder to come back to the hospital for the second questionnaire, which is used for the comparison between the German and Dutch sample. If they were not coming to the hospital the nurse gave them a reminder by telephone. There were no inclusion or exclusion criteria.

The Dutch questionnaire is spread online. 1500 mothers, randomly selected from a TNO database, were asked to fill in the questionnaire. There were no inclusion or exclusion criteria. After one week 561 mothers filled in the questionnaire. After this week a reminder was sent. Finally, after two weeks 740 mothers (response rate of 49%) filled in the questionnaire. Because the mothers are randomly selected from the TNO database the infants could be older than three months of age. Not everyone filled in the questionnaire directly and time is lost because of sending emails and reminders.

Another strength of this research is that the Dutch sample and the German sample are well comparable. In the Netherlands the incidence rate of SIDS is low in comparison with the

German incidence rate of SIDS. To improve the incidence rate of SIDS in Germany, the Germans can take a look at how the Dutch are doing. This research creates an overview of the differences in the prevalence of risk and protective factors for SIDS between Germany and the Netherlands so that the differences between the two countries can be seen more easily.

Limitations

The questionnaires of the German sample are taken in Stadtlohn. Stadtlohn is a city in the state North Rhine-Westphalia (NRW). Because the incidence rates in the states of Germany highly differ, Stadtlohn is not representative and generalizable for Germany. NRW has a higher incidence rate of SIDS in comparison with other states. Furthermore, Stadtlohn cannot be representative and generalizable for NRW, because the city only represents a small part of NRW. But one can state that Stadtlohn as a cluster sample of NRW. Other reasons why Stadtlohn is not representative and generalizable for Germany are the different prevention programs. In Stadtlohn other local prevention campaigns are used in comparison with whole Germany.

Because not all mothers came directly back after three months, there are also children in this sample that are older than three months. It is possible that the questionnaire is not filled out in the same way as when the infants had been three months of age, because an infant is growing fast and parents can change their care habits. All mothers that gave birth in the hospital of Stadtlohn are selected and no inclusion or exclusion criteria were used. Because not all mothers came back, there is selective drop out.

The Dutch questionnaire is send online by e-mail to random selected mothers from the TNO database. The questionnaire did not ask where the mothers come from. For this reason it cannot be determined whether the mothers are equally spread in the Netherlands and whether they are representative and generalizable for the whole Netherlands. Because the Dutch sample consists of many high educated parents, the digital questionnaire give selection bias. Because low socio-economic status is a risk factor for SIDS it cannot be said with certainty that the Dutch sample is representative for whole Netherlands.

The German three months old sample and the Dutch sample are difficult to compare, because of the different age distributions of the infants. For this reason it might be that the questionnaire are filled out differently. For example, the care habits are different for an infant of two months and an infant of six months.

The German parents had to fill out the questionnaire at the hospital. Thus, there might have been the possibility to ask the help of a nurse or other hospital staff with filling out the questionnaire or got already information from them. The Dutch respondents did not have this possibility, because they had to fill out the questionnaire at home. Furthermore, not all respondents filled out every question. There might be some questions that the respondents do not want to answer. Moreover, it can also be that a respondent does not know the answer of the question or finds it difficult to give an answer on a question. The respondents also can feel touched in their privacy when answering a certain question. Other reasons for the missing answers might be that the respondent does not understand the question or does not have enough time to fill out the whole questionnaire. Beside these, more clarifications are possible. Reasons why some Dutch mothers did not fill out the questionnaire can be that they were not able to open the document, refused to fill out the questionnaire or did not receive the email.

As already mentioned, the questionnaires slightly differ in questions and response categories. During the completion of the questionnaire the response categories can be understood differently for each questionnaire. An example is the question ‘Who is smoking at home?’. Some respondents for example filled out by ‘Other’ mother and/or father outside the house. Respondents with the same situation could have chosen the answer category ‘Mother and father’. This might have influenced the results of this research.

The chi-square test is used to measure whether there are significant differences in the different answers between the samples. For this research no correction is performed during the analysis. Thus, some differences might be confounded. The two questionnaires were not completely the same as already shown in table 6. Also the response categories did not match completely. Because the response categories were adapted to each other, this might have influenced the results of this research. For some questions analyses were performed with either split or added response categories. If this had been done for every question, the results might have differed from the present results. Furthermore, the variable most important advisor related to infant care could not be compared, because in Germany and the Netherlands there are different care systems and the Dutch questionnaire misses the important response category well-baby clinics.

6.5 Recommendations

Besides drawing conclusions, also some recommendations are made in chapter 6.1 as well as chapter 6.3. These recommendations aim at providing better information about the risk and protective factors for SIDS to parents and therefore at further reducing the incidence of SIDS in Germany as well as in the Netherlands. Table 14 shows the most important recommendations that are given in this report to improve SIDS prevention in Germany and the Netherlands.

Table 14: Most important recommendations per type of population and risk or protective factor for SIDS.

Risk or protective factor	Gnb	G3m	NL
Highest graduation of the mother	Design separate prevention campaigns to be able to address mothers of different kinds of graduation or design prevention campaigns with many pictures and little text so that everybody understands it.		
Language spoken at home	Design separate prevention campaigns to be able to address mothers of different kinds of ethnicity or design prevention campaigns with many pictures and little text so that everybody understands it.		
Sleeping position	Give more and better information about the risk of the prone sleeping position to German parents concerning all ages. Give an advice to check the sleeping position of the infant when the parents go to bed or are awake at night.		
Sleeping place	Give a more intrinsic advice to parents about the importance of room sharing until the infant is six months old and the risk of bed sharing. Further research why there is a change in sleeping place when the		

	infant gets older.	
Temperature in the infant's bedroom	Give an advice to reduce the temperature in the infant's bedroom to at least 18°C.	-
Type of bedding	Give a more empathic advice to German parents to only use a sleeping-sack as the type of bedding and inform them better about the risk of a duvet.	Give a more empathic advice to only use a sleeping-sack if it is quilted, but explain that a blanket can be used together with a sleeping-sack to better tuck the infant in.
Smoking habits	Promote stop-smoking campaigns for parents.	
Use of a dummy	Give a more empathic advice to give a dummy during every sleep with a note that only occasionally offering a dummy is risk increasing.	
Breastfeeding	Recommend exclusive breast-feeding until an age of six months.	-
Immunizations	Inform parents more intrinsically about the importance of immunizations.	-

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Appendix 1 – German newborn questionnaire

Fragebogen

Datum:

Das Kind ist ein: Junge Mädchen

1. Wann wurde Ihr Baby geboren?

Tag Monat Jahr

Fragen zum Schlaf Ihres Kindes:



2. Wie werden Sie Ihr Kind zum Schlafen hinlegen?

- Auf den Rücken
- Auf die Seite
- Auf den Bauch
- Anders, und zwar _____

3. Wo wird Ihr Kind in der Regel schlafen?

- Im eigenen Bett im elterlichen Schlafzimmer
- Im eigenen Bett im Kinderzimmer
- Im Elternbett
- Im eigenen Bett mit _____
- Sonstiges, und zwar _____

4. Welche Temperatur hat das Zimmer des Babys (geschätzt)?

- 15°C - 17°C
- 18°C – 20°C
- 21°C – 22°C
- 23°C – 25°C

5. Welches Bettzeug werden Sie für Ihr Baby benutzen? (Mehrfachnennung möglich)

- Nur Schlafsack
- Schlafsack und Decke
- Dauendecke
- Steppbett
- Handtuch/Windel
- Kopfkissen
- Nestchen
- Anders, und zwar _____

6. Wird Ihr Kind zum Schlafen einen Schnuller bekommen?

- Ja, für jeden Schlaf
- Ja, ab und zu
- Nein, nie



7. Stillen Sie Ihr Baby?

- Ja, ausschließlich
- Ja, und ich füttere zu
- Nein, ich stille nicht

1. Wer raucht in Ihrem Haushalt?

- Nur die Mutter
- Nur der Vater
- Mutter und Vater
- Andere, und zwar _____
- Keiner

Fragen an die Mutter:

2. Welches ist Ihr höchster Schulabschluss?

- Keinen Schulabschluss
- Hauptschule
- Realschule
- Fachabitur/ Abitur
- Fachhochschule/ Hochschule



3. Leben Sie

- allein
- mit Ehemann/Partner zusammen
- mit _____ zusammen

4. Welche Sprache sprechen Sie zu Hause? _____

12. Sind Sie über Risikofaktoren des plötzlichen Kindstodes aufgeklärt worden?

- Nein
- Ja, und zwar durch
 - Hebamme
 - Kinderarzt
 - Zeitschriften
 - TV / Fernsehen
 - Informationsblätter, von _____
 - Bekannten/ Verwandten
 - Andere, und zwar _____

13. Wer sind für Sie die wichtigsten Ratgeber für Säuglingspflege? (Mehrfachnennung möglich)

- Kinderarzt
- Kinderkrankenschwester
- Hebamme
- Mutter
- Mütterberatungsstelle
- Andere, und zwar _____

14. Möchten Sie noch etwas mitteilen?

Vielen Dank für Ihre Mitarbeit und Hilfe, wir wünschen Ihnen und Ihrem Kind alles Gute!
Das ‚*Bettdecke-raus, Schlafsacke-rein*-Team‘, Stadtlohner Krankenhaus.

Aug. 2009

Appendix 2 – German three months questionnaire

Fragebogen

Datum: _____ Das Kind ist ein: Junge Mädchen

1. Wann wurde Ihr Baby geboren?

Tag Monat Jahr

2. Ihr wieviertes Kind ist dieses Baby?

Erstes Zweites Drittes Viertes _____



Fragen zum Schlaf Ihres Kindes:

3. Wie legen Sie Ihr Kind normalerweise zum Schlafen hin?

- Auf den Rücken
- Auf die Seite, welche Seite normalerweise links rechtes wechselnd
- Auf den Bauch
- Anders, und zwar _____

4. Schläft Ihr Kind nachts in der Regel:

- Im eigenen Bett im elterlichen Schlafzimmer
- Im eigenen Bett im Kinderzimmer alleine mit Geschwisterkindern
- Im Elternbett
- Im eigenen Bett mit _____
- Sonstiges, und zwar _____

5. Welche Temperatur hat das Zimmer des Babys (geschätzt)?

- 15°C - 17°C
- 18°C - 20°C
- 21°C - 22°C
- 23°C - 25°C mehr
- Ich weiß nicht

6. Welches Bettzeug benutzen Sie für Ihr Baby? (Mehrfachnennung möglich)

- Nur Schlafsack
- Schlafsack und Decke
- Schlafsack und Daunendecke
- Daunendecke
- dünne Decke/Baumwolldecke
- Handtuch/Windel
- Kopfkissen
- Nestchen
- Einpucken/Swaddeln
- Anders, und zwar _____

7. Bekommt Ihr Kind zum Schlafen einen Schnuller?

- Ja, für jeden Schlaf
- Ja, ab und zu
- Nein, nie



Seite 1 von 2

1. Stillen Sie Ihr Baby?

- Ja, ausschließlich
- Ja, und ich füttere zu
- Nein, ich stille nicht

2. Hat Ihr Kind schon Impfungen erhalten?

- Ja, bei : Hausarzt
 Kinderarzt
- Art der Impfung: _____
- Nein

3. Wer raucht in Ihrem Haushalt?

- Nur die Mutter
- Nur der Vater
- Mutter und Vater
- Andere, und zwar _____
- Keiner

Fragen an die Mutter: Alter der Mutter _____ Jahre



4. Welches ist Ihr höchster Schulabschluss?

- Keinen Schulabschluss
- Hauptschule
- Realschule
- Fachabitur/ Abitur
- Fachhochschule/ Hochschule
- Anderes _____

5. Leben Sie

- allein
- mit Ehemann/Partner zusammen
- mit _____ z usammen

6. Welche Sprache sprechen Sie zu Hause? _____

14. Sind Sie über Risiken des plötzlichen Kindstodes aufgeklärt worden? (Mehrfachantworten)

- Nein
- Ja, und zwar durch Hebamme
 Kinderarzt
 Zeitschriften
 TV / Fernsehen
 Informationsblätter, von _____
 Bekannten/ Verwandten
 Andere, und zwar _____

15. Wer sind für Sie die wichtigsten Ratgeber für Säuglingspflege? (Mehrfachnennung möglich)

- Kinderarzt
- Kinderkrankenschwester
- Hebamme
- Mutter/Schwiegermutter

Appendix 3 – Dutch questionnaire

Vragenlijst

1. Wanneer is uw kind geboren?

Dag

Maand

Jaar

Hierna een paar vragen over de slaap van uw kind:

2. Hoe legt u uw kind normaal gesproken neer voor het slapen?

- Op de rug
- Op de zij
- Op de buik
- Anders, namelijk.....

3. 's Nachts slaapt uw kind door gaans:

- In zijn/haar eigen bedje op de ouderlijke slaapkamer
- In zijn/haar eigen bedje op de kinderkamer
- In het ouderlijke bed
- In zijn/haar eigen bedje met meerdere kinderen op de kamer
- Anders, namelijk.....

4. Welk beddengoed gebruikt u voor uw baby? (meerdere antwoorden mogelijk)

- Alleen een slaapzak
- Slaapzak en deken
- Donsdeken
- Gewatteerd dekbed
- Handdoek/luier
- Hoofdkussen
- Anders, namelijk.....

5. Krijgt uw kind een fopspen om in slaap te komen?

- Ja, bij iedere slaap
- Ja, af en toe
- Nee, nooit

6. Geeft u uw kind borstvoeding?

- Ja, uitsluitend
- Ja, én ik geef bijvoeding
- Nee, ik ben gestopt met borstvoeding te geven toen mijn kind..... weken oud was
- Nee, ik heb geen borstvoeding gegeven

7. Heeft uw kind al vaccinaties/inentingen gehad?

- Ja
- Nee

zie ommezijde

Om af te sluiten zouden we graag nog enkele vragen willen stellen over de leefomgeving van uw kind

8. Wie rookt er bij u thuis?

- Alleen de moeder
- Alleen de vader
- Moeder en vader
- Anderen, en wel.....
- Niemand

Vragen aan de moeder :

9. Wat is uw hoogst afgeronde schoolopleiding?

- Geen afgeronde schoolopleiding
- Basisonderwijs
- Mavo/Havo
- MBO/ eindexamen VWO
- HBO/ Universiteit

10. Welke taal spreekt u thuis?

11. Bent u voor gelicht over risicofactoren van wiegendood?

- Nee
- Ja, namelijk door:
 - Verloskundige
 - Kinderarts
 - Tijdschriften
 - Televisie
 - Anders, namelijk.....

12. Wie zijn voor u de belangrijkste adviseurs over de zorg van uw baby? (meerder e antwoorden mogelijk)

- Kinderarts
- Kraamverzorgster
- Verloskundige
- Moeder
- Anders, namelijk.....

13. Heeft u nog opmerkingen of toevoegingen?

.....
.....
.....

**Veel dank voor uw hulp en medewerking!
We wensen u en uw kind al het goede!!!**

Appendix 4 – Consults and vaccinations in the well-baby clinic

Table 15: Consults and vaccinations in the well-baby clinic (1 month till 3 years and 9 month of age) [41].

Age of child	Consult pediatrician	Consult pediatrician nurse	Vaccination
1 month	X		
2 months		X	Vaccination against diphtheria, whooping cough, tetanus, polio or infantile paralysis Haemophilus influenza type B Hepatitis B Pneumococcal
3 months	X		Vaccination against diphtheria, whooping cough, tetanus, polio or infantile paralysis Haemophilus influenza type B Hepatitis B Pneumococcal
4 months		X	Vaccination against diphtheria, whooping cough, tetanus, polio or infantile paralysis Haemophilus influenza type B Hepatitis B Pneumococcal
6 months	X		
8 months		X	
11 months	X		Vaccination against diphtheria, whooping cough, tetanus, polio or infantile paralysis Haemophilus influenza type B Hepatitis B Pneumococcal
14 months		X	Mumps, measles, rubella Meningococcal C
18 months	X		
2 years		X	
3 years	X		
3 years and 9 months		X	Vaccination against diphtheria, whooping cough, tetanus and polio or infantile paralysis

Appendix 5 – Description of the preventive medical check-ups in Germany

Table 16: Description of the preventive medical check-ups in Germany [27].

Preventive medical check-ups	Age of the infant	Content of the medical check-ups
U1	Directly after birth	Examination of the state of health of the infant (lung, heart, perfusion of the skin, muscle tension, congenital reflexes, oxygen saturation of the blood and patency of nose and esophagus).
U2	3-10 days	Examination of the organs, genitals, skin, bones, digestion, reflexes of the nervous system, functioning of the hip and blood testing to detect possible metabolic disorders and hormone disturbances.
U3	4-5 weeks	Examination of the development of the infant (body functions, hearing and congenital reflexes) and ultrasound of the hip. Furthermore, the pediatrician asks the parents whether there are problems or abnormalities with feeding, digestion or sleeping.
U4	3-4 months	Examination of the organs, genitals, hearing, ability to see, size of the fontanel, mobility and ability to respond. Also the first immunization takes place.
U5	6-7 months	Examination of the body functions, mobility, body control, hearing and ability to see.
U6	10-12 months	Examination of the body functions, mobility and body control. Furthermore, the pediatrician asks the parents questions about the linguistic development and the general behavior of the infant. The parents finally get a reminder of the immunizations that have to be refreshed.

Appendix 6 – Classification education programmes of the Netherlands and Germany

Table 17: Classification education programmes of the Netherlands according to the manual for ISCED-97 implementation in OECD Countries.

Hoogst afgeronde opleiding	Level
Geen afgeronde schoolopleiding	0
Basisonderwijs	1
Mavo/Havo	2
MBO/eindexamen VWO	4
HBO/Universiteit	5

Table 18: Classification education programmes of Germany according to the manual for ISCED-97 implementation in OECD Countries.

Höchster Schulabschluss	Level
Keinen Schulabschluss	0
Hauptschule	2
Realschule	2
Fachabitur/Abitur	4
Fachhochschule/Hochschule	5

Appendix 7 – Allocation of tasks per chapter

Table 19: Allocation of tasks per chapter.

Chapter	Mainly written by
Abstract	Stephanie & Ursula
Samenvatting	Stephanie & Ursula
Foreword	Ursula
1. Introduction	Stephanie
2.1 Sudden infant death syndrome	Ursula
2.2 Risk factors and protective factors	Stephanie
2.3 Health care for infants and prevention for SIDS in the Netherlands	Stephanie
2.4 Health care for infants and prevention for SIDS in Germany	Ursula
2.5 Comparison of health care for infants and prevention of SIDS in the Netherlands and Germany	Stephanie
2.6 Epidemiology	Ursula
3.1 Problem description	Ursula
3.2 Research goal	Stephanie & Ursula
3.3 Research question	Stephanie & Ursula
4. Methodology	Stephanie & Ursula
4.1.1 German population	Ursula
4.1.2 Dutch population	Stephanie
4.2 Measurement	Stephanie & Ursula
4.3.1 German data collection	Ursula
4.3.2 Dutch data collection	Stephanie
4.4 Sample size	Ursula
4.5.1 Analysis of German data	Ursula
4.5.2 Analysis of Dutch and German data	Stephanie
5.1 Comparison German newborn sample and German three months old sample	Ursula
5.2 Comparison German three months old sample and Dutch sample	Stephanie
6.1 Conclusion of the comparison German newborns and German three months old infants	Ursula
6.2 Strengths and limitations of the comparison German newborns and German three months old infants	Ursula
6.3 Conclusion of the comparison German three months old infants and Dutch infants	Stephanie
6.4 Strengths and limitations of the comparison German three months old infants and Dutch infants	Stephanie
6.5 Recommendations	Stephanie & Ursula